

CHAPTER 10
ENVIRONMENTAL AND SOCIAL IMPACT
MITIGATION MEASUREMENT STUDY (ESIMMS)

CHAPTER 10 ENVIRONMENTAL AND SOCIAL IMPACT MITIGATION MEASURES STUDY (ESIMMS)¹

10.1 OUTLINE OF ESIMMS

10.1.1 Scope of Study

(1) Study Area

The study area of Environmental and Social Impact Mitigation Measures Study (ESIMMS) has been narrowed down 37 districts within 5 states based on the results of Environmental and Social Considerations Study (ESCS) conducted from November to March 2007 in the First Year of the JICA Study (the Study) as shown in Figure 10-1. The study area consists of the development stage sections between Rewari, Haryana and Vasai Road, Maharashtra (approx. 1,262 km) for the Western Corridor and the development stage sections between Dadri and Mughal Sarai, Uttar Pradesh (approx. 756 km) for the Eastern Corridor. In these 37 districts, the ESIMMS including natural environmental study, social environmental study, pollution control study and Stakeholder/Public Consultation Meetings (SHMs) at the 2nd and 3rd Stage has been conducted.

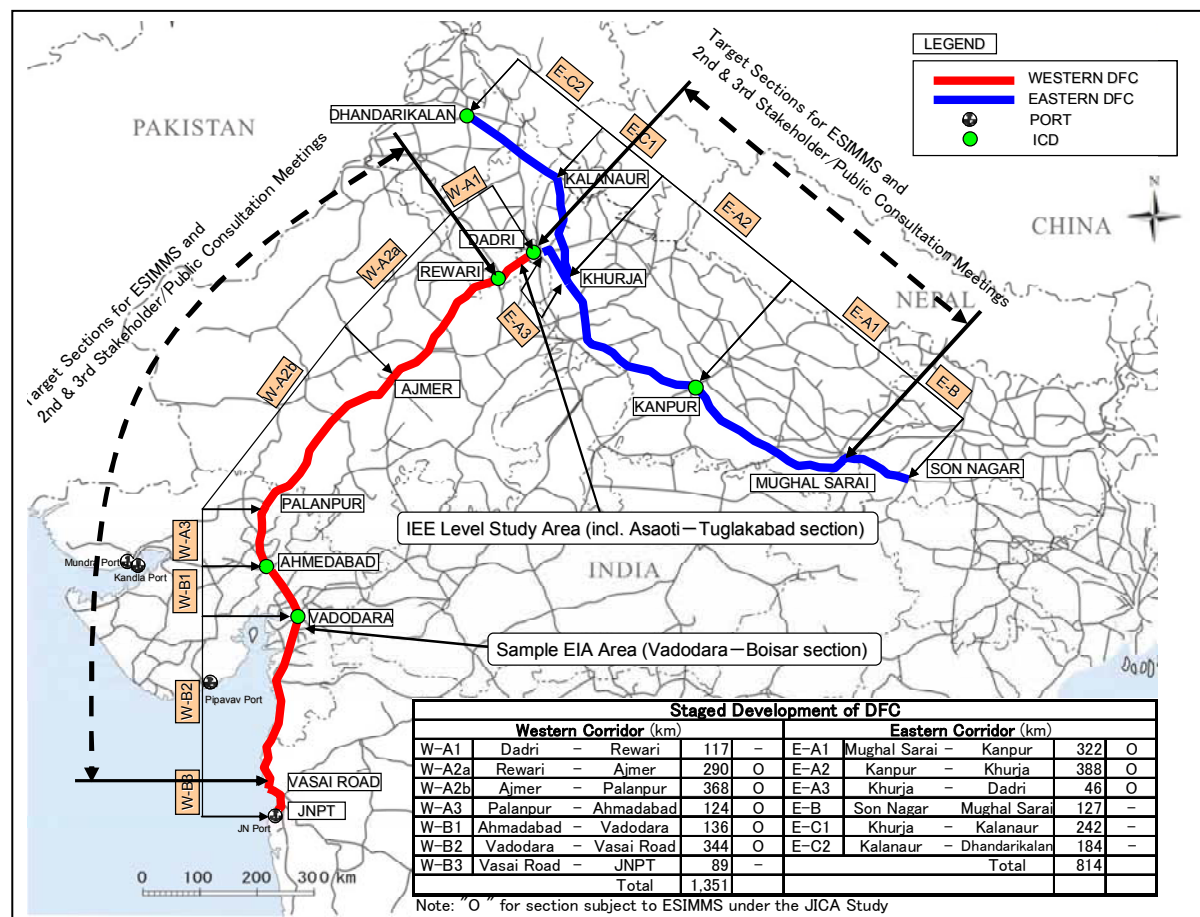


Figure 10-1 Study Area of ESIMMS

¹ The ESCS and ESIMMS are equivalent to the Environmental and Social Considerations Study at IEE Level and Environmental and Social Considerations Study at EIA Level under the JICA Guidelines for Environmental Social Considerations (2004), respectively.

(2) Division of DFC Sections for Implementation of ESIMMS

The study area covers the extensive area over 37 districts of 5 states where relevant railway facilities will be built for freight corridor development shown in Table 10-1, Table 10-2, and Table 10-3. Therefore, the study area was divided into 3 packages listed below, and the field study of each package has been conducted by a local consultant team.

- 1) Package 1: Maharashtra and Gujarat (13 districts);
- 2) Package 2: Rajasthan and Haryana (9 districts); and
- 3) Package 3: Uttar Pradesh (15 districts)

In addition, it has decided that the results of ESIMMS shall be summarised by district, considering that the future necessary action for land acquisition would be managed by a committee in charge of resettlement and rehabilitation issues by district-wise or village-wise as proposed in the National Rehabilitation Policy 2006 of India.

- 1) District-wise DFC Project alignment and its relevant facilities for a development stage section (See Figure 10-1) to be studied.
- 2) District-wise outcomes of the ESIMMS to be summarised by the said development stage section.
- 3) Thirty-seven (37) volumes of the district-wise ESIMMS report including a Resettlement and Rehabilitation Plan Framework will be prepared.

(3) Study Area of ESIMMS in Western Corridor

- 1) Package 1 Study Area

The study area of ESIMMS includes the districts where DFC Project alignment passes through. As shown in Table 10-1, the study area of Package 1 includes 13 districts in Gujarat and Maharashtra.

In each district, there is a number of publicly representative system, Panchayat Raj System, and each Panchayat represents 3-5 villages. In India, it is considered that the Panchayat heads are influential representatives of residents, and it was planned to involve the Panchayat to organise SHMs and disseminate information amongst residents for effective implementation regarding the DFC Project and likely impact of the project.

Table 10-1 ESIMMS Area for Western Corridor (Package 1: Maharashtra and Gujarat)

State	District	No. of Township Potentially Affected by the Project	No. of Villages Potentially Affected by the Project
Gujarat	Banas Kantha	1	38
	Patan	1	6
	Mahesana	3	41
	Gandhinagar	1	13
	Ahmedabad	1	17
	Kheda	1	34
	Anand	2	11
	Vadodara	3	27
	Bharuch	4	36
	Surat	3	45
	Navsari	5	26
	Valsad	8	56
	Sub-total	33	350
Maharashtra	Thane	14	93
	Sub-total	14	93
Total		47	443

2) Package 2 Study Area

As shown in Table 10-2, the study area of Package 2 consists of 9 districts in Haryana and Rajasthan. SHMs were organised in the same manner in Package 1.

Table 10-2 ESIMMS Area for Western Corridor (Package 2: Rajasthan and Haryana)

State	District	No. of Township Potentially Affected by the Project	No. of Villages Potentially Affected by the Project
Haryana	Rewari	-	38
	Mehendragarh	1	37
	Sub-total	1	75
Rajasthan	Alwar	-	23
	Sikar	2	49
	Nagaur	-	4
	Jaipur	2	51
	Ajmer	4	40
	Pali	3	81
	Sirohi	2	36
	Sub-total	13	284
Total		14	359

(4) Study Area of ESIMMS in Eastern Corridor

1) Package 3 Study Area

As shown in Table 10-3, the study area of Package 3 consists of 15 districts in Uttar Pradesh. SHMs were organised in the same manner in Package 1.

Table 10-3 ESIMMS Area for Eastern Corridor (Package 3: Uttar Pradesh)

State	District	No. of Township Potentially Affected by the Project	No. of Villages Potentially Affected by the Project
Uttar Pradesh	Gautam Buddha Nagar*	2	26
	Bulandshahr	3	73
	Aligarh	1	53
	Hathras	1	60
	Agra	1	18
	Firozabad	-	63
	Etawah	1	65
	Auraiya	1	53
	Kanpur Dehat	-	52
	Kanpur Nagar	1	26
	Fatehpur	2	86
	Kaushambi	3	57
	Allahabad	2	114
	Mirzapur	2	150
Chandauli	3	74	
Total		23	970

Note: * - The section is examined only for IEE level.

10.1.2 Study Components

The study components of ESIMMS are composed of as follows:

(1) Social Environment

- 1) Field survey to identify the number of Project Affected Families (PAFs)² shall be identified.
- 2) Socio-economic questionnaire survey shall be conducted at 10% of total number of the identified PAFs. The analysis shall be completed.
- 3) The social impact assessment along the DFC alignment shall be conducted. The Resettlement and Rehabilitation Plan Framework shall be formulated.

(2) Natural Environment

- 1) The secondary data collection and survey of natural reserves, such as national parks and wildlife sanctuaries along the DFC alignment shall be conducted. Reserved forests and protected forests along the DFC alignment shall be examined to assess their impacts.
- 2) The natural environment study of Balaram Ambaji Wildlife Sanctuary where the DFC alignment passes shall be conducted.

(3) Pollution Control

- 1) Sensitive Receptors (SRs) along the DFC alignment shall be identified for noise and vibration measurement. Ambient and railway noise/vibration levels shall be measured at the following sites:

² PAF is defined as Project Affected Families to be relocated; however, at the stage of ESIMMS, the number of affected residential structures is considered as PAF. The exact number of the PAF shall be identified by the detailed field survey at the next stage of the project.

- Ambient Noise and Vibration at Sensitive Receptors
 - Maharashtra & Gujarat (Package 1): 20 sites;
 - Rajasthan & Haryana (Package 2): 15 sites and
 - Uttar Pradesh (Package 3): 25 sites
- Railway Noise and Vibration at Sensitive Receptors
 - Maharashtra & Gujarat (Package 1): 10 sites;
 - Rajasthan & Haryana (Package 2): 10 sites and
 - Uttar Pradesh (Package 3): 10 sites

In addition to the above, railway noise and vibration measurements were conducted along the DFC alignment to obtain unit sample data at 15 sites in total.

- 2) The secondary data collection of water quality, air quality was and other components shall be conducted. The mitigation measures shall be proposed based on the analysis of the collected data.

(4) Stakeholder/Public Consultation Meetings

- 1) The 2nd Stage SHM was planned to be conducted in the following districts.
 - Maharashtra & Gujarat (Package 1): 13 districts;
 - Rajasthan & Haryana (Package 2): 9 districts; and
 - Uttar Pradesh (Package 3): 15 districts
- 2) Targeted SHM participants shall be representatives of Panchayats, villages and towns.
- 3) After the 2nd Stage SHM, participated representatives of Panchayats, villages and towns shall disseminate the information obtained from the SHM amongst villagers and town residents, discuss with the issues and exchange opinions with residents at a village feedback meeting. The results of the village meeting shall be recorded by NGOs hired by the local consultants subcontracted by the JICA Study Team.
- 4) In the 3rd Stage SHM, either one representative of each Panchayats, villages or towns or one representative of potential Project Affected Persons (PAPs) shall present their outcomes of the village meeting. The outcomes shall be discussed, and components of the suggested Resettlement and Rehabilitation Plan Framework shall be agreed by the participants of the 3rd Stage SHM.

(5) Formulation of the Resettlement and Plan Framework

- 1) In the village feedback meetings to be organised before the 3rd Stage SHM, the Resettlement and Rehabilitation Plan Framework shall be introduced to village residents. The components shall be confirmed and discussed by village residents.
- 2) The components of the Resettlement and Rehabilitation Plan Framework shall be discussed and agreed by participants of the 3rd Stage SHM.
- 3) The social environmental monitoring plan shall be formulated in order to use for 3-5 years after the resettlement is completed.

(6) IEE Study

- 1) In the Western and Eastern Corridors, an IEE level study of tunnels, viaducts and embankments within the DFC alignment between Rewari and Dadri including the connection point with the existing railway lines between Agra-Delhi and Dadri-Khurja shall be completed. A Terms of Reference (TOR) for EIA of the IEE study area shall be prepared. (Packages 2 and 3)

- 2) In the Western Corridor, the IEE within the DFC alignment starting from the connection point with the existing railway line between Agra and Delhi up to Tuglakabad shall be conducted. A TOR for EIA of the IEE study area shall be prepared. The Resettlement and Rehabilitation Plan Framework for residents in the affected areas including squatters shall be prepared. (Package 2)
- (7) Environmental Management Plan (EMaP) and Environmental Monitoring Plan (EMoP)**
- 1) EMaP and EMoP for construction of relevant railway facilities of each district shall be prepared.

Detailed TOR for the ESIMMS is shown in “Volume 4 Technical Working Paper Task 2, 10-(1)”.

10.1.3 Limitations in Implementation of ESIMMS

(1) Availability of Engineering Drawings and Topographic Sheets

It is not required for the railway development project to conduct the EIA under Indian laws. Although RITES-II Report was finalised, necessary information for ESIMMS, such as engineering drawings and topographic sheets are not available. Before ESIMMS was started the JICA Study Team faced difficulties to implement ESIMMS including SHMs due to the lack of basic information on the DFC Project. Limitations of ESIMMS caused by the lack of essential information are as follows.

There are 3 major difficulties caused by limited availability of the project information.

- 1) Basic engineering drawings showing the relevant structure locations on a map with a scale of 1 to 50,000 were not prepared by RITES when ESIMMS was started. The plain figure and longitudinal profile only between Ajmer and Palanpur in the Western Corridor have been finalised as of August 2007.
- 2) It was not recognized by MOR that basic design drawings showing exact locations of the railway facilities should be provided for SHMs because no EIA has conducted as a feasibility study of the railway development project in the past in India. After finalisation of the PETS-II Report, basic engineering design was revised several times. Therefore, in several districts, SHMs were held without introducing the basic engineering drawings.
- 3) Due to Indian laws, topographic sheets of “Restricted Area”, especially the southern part of the Western Corridor, were not procured. To obtain geographic information from alternative sources, satellite images were purchased and the extensive field survey was conducted. Thus, the DFC alignment was introduced with Google Earth™ in SHMs. In addition, provisional locations of the DFC alignment within affected villages were identified by the longitude and latitude with Google Earth™.

Above mentioned reasons, there is a possibility that the basic engineering design would be changed in several districts after this feasibility study. Therefore, it is suggested to establish the mechanism to check the revised design compared to the result of the ESIMMS in the Detailed Design stage.

(2) Materials/Information Used for ESIMMS

As mentioned previously, enough information for ESIMMS including engineering drawings showing all the relevant railway facilities in the study area was not available. To fill up the

information gap, maps, satellite images and longitude and latitude data listed below were utilised to conduct ESIMMS, and the data was provided to local consultants for SHMs, natural environmental study and social environmental study. In Table 10-4 to Table 10-8, availability of information are summarised on DFC Project.

1) Parallel Sections

Field work was carried out with standard cross-section drawings.

2) Detour Sections

DFC alignment proposed by RITES with a scale of 1 to 50,000 was traced by the JICA Study Team together with satellite images and saved as a shape file by Geographic Information System (GIS). Based on the shape file, the longitude and latitude data of the DFC alignment was obtained with Google Earth™ as well as in the field, the survey locations were recorded by Geographic Positioning System (GPS) device.

3) Existing ROBs to be Replaced

The field work was carried out without drawings to be prepared by Indian side. Considering replacement method of ROB proposed by the JICA Study Team, likely impacts to social and natural environment were examined.

4) Level Crossings to be Replaced with ROBs

The field work was carried out without drawings to be prepared by Indian side. By considering construction method of ROB proposed by the JICA Study Team, likely impacts to social and natural environment were examined.

Table 10-4 Available Data for ESIMMS (Western Corridor: Package 1) (1/2)

State/District	Parallel Section ¹⁾	Detour Routes	Junction Station	Crossing Station	ROB(Re-construction)	Important Bridge	Available Drawings/Plan ²⁾	Action Taken for ESIMMS
1 Maharashtra								
1) Thane	Vasai Rd	-	-	-	-	-	Feasibility Report's 1:50,000 maps for the parallel section are available	Field work is possible to carry out without detailed topographic sheets
		-	-	-	Vasai Rd.	-	Details of the reconstruction of ROB is not available	Explanation of the extent of impacts to PAFs is not possible but field work is possible to carry out
		-	-	-	Saphale	-	Details of the reconstruction of ROB is not available	Explanation of the extent of impacts to PAFs is not possible but field work is possible to carry out
		-	-	-	Kelve Rd.	-	Details of the reconstruction of ROB is not available	Explanation of the extent of impacts to PAFs is not possible but field work is possible to carry out
		-	-	-	Umroli,	-	Details of the reconstruction of ROB is not available	Explanation of the extent of impacts to PAFs is not possible but field work is possible to carry out
		-	-	-	Dahanu Rd	-	Details of the reconstruction of ROB is not available	Explanation of the extent of impacts to PAFs is not possible but field work is possible to carry out
		-	-	-	Boisar	-	Details of the reconstruction of ROB is not available	Explanation of the extent of impacts to PAFs is not possible but field work is possible to carry out
		-	-	-	-	N. Vaihara	Details of the bridge are not available	It is in the parallel section and field work is possible to carry out
		-	-	-	-	S. Vaihara	Details of the bridge are not available	It is in the parallel section and field work is possible to carry out
		-	-	Palghar	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
		-	-	Navasari	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
		-	-	Gholbad	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
2 Gujarat								
1) Valsad		-	-	-	Valsad	-	Details of the reconstruction of ROB is not available	Explanation of the extent of impacts to PAFs is not possible but field work is possible to carry out
		-	-	-	-	Daman Ganga	Details of the bridge are not available	It is in the parallel section and field work is possible to carry out
		-	-	-	-	Par	Details of the bridge are not available	It is in the parallel section and field work is possible to carry out
2) Navasari		-	-	-	-	Auranga	Details of the bridge are not available	It is in the parallel section and field work is possible to carry out
		-	-	-	-	S. Kaveri	Details of the bridge are not available	It is in the parallel section and field work is possible to carry out
		-	-	-	-	N. Kaveri	Details of the bridge are not available	It is in the parallel section and field work is possible to carry out
		-	-	-	-	Ambika	Details of the bridge are not available	It is in the parallel section and field work is possible to carry out
		-	-	-	-	N. Poorna	Details of the bridge are not available	It is in the parallel section and field work is possible to carry out
		-	-	-	-	Mindhola	Details of the bridge are not available	It is in the parallel section and field work is possible to carry out
3) Surat		-	-	Vapi	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
	Udhna Jn.	-	-	Joravasan	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
		Surat	-	-	-	-	Not available but field work is possible to carry out	Explicit field work is not possible and explanation to PAFs is not possible
		-	-	-	-	Tapi	Details of the bridge are not available	It is in the detour section and explicit field work is not possible and explanation to PAFs is not possible
4) Bharuch	Utran	-	Gothangam	-	-	-	Feasibility Report's 1:50,000 maps for the parallel section are available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
		-	-	Sanjali	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
	Ankleshwar	-	-	-	Vapi	-	Details of the reconstruction of ROB is not available	Explanation of the extent of impacts to PAFs is not possible but field work is possible to carry out
		Bharuchi	-	-	-	-	N/A	Explanation to PAFs was made using Google Earth TM satellite images
		-	-	-	-	Narmada	Details of the bridge are not available	The bridge is in the detour section and explicit field work is not possible and explanation to PAFs is not possible
	Nabipur	-	-	Varediya	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
5) Vadodara	Makarpura	-	Makarpura	-	-	-	Feasibility Report's 1:50,000 maps for the parallel section are available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
		Vadodara	-	-	-	-	-	Explanation of detour to PAFs was made using Google Earth TM satellite images
			-	-	-	Mahi	Details of the bridge are not available	The bridge is in the detour section and explicit field work is not possible and explanation to PAFs is not possible/Sample EIA is carried out

Table 10-5 Available Data for ESIMMS (Western Corridor: Package 1) (2/2)

State/District	Parallel Section ¹⁾	Detour Routes	Junction Station	Crossing Station	ROB(Re-construction)	Important Bridge	Available Drawings/Plan ²⁾	Action Taken for ESIMMS
1 Maharashtra								
6) Anand		Vasad	-	-	-	-	N/A	Explanation to PAFs is not possible
			-	Vasad	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
			-	-	Vasad	-	Details of the reconstruction of ROB is not available	ROB is deleted by new detour route suggested by JICA Study Team
			-	Changa	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
7) Kheda			-	-	-	-	N/A	Explanation of parallel section to PAFs is possible and filed work is carried out
8) Ahmedabad		Ahmedabad	-	-	-	Siri	Details of the bridge are not available	The bridge is in the detour section and explicit field work is not possible and explanation to PAFs is not possible/Sample EIA is carried out
			Sabarmati	-	-	-	Details of junction station are not available	Location and arrangement of junction station for explaining to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
			-	-	-	Sabarmati	Details of the bridge are not available	The bridge is in the detour section and explicit field work is not possible and explanation to PAFs is not possible/Sample EIA is carried out
9) Ghandinagar			-	-	-	-	Details of detour routes are not available	Explanation of parallel section to PAFs is possible and filed work is carried out
10) Mahesana		Mahesana	-	-	-	-	Details of detour routes are not available	Explicit field work is not possible and exact extent of resettlement for explaining to PAFs is not possible
11) Patan	Bhandu Motidan	-	-	-	-	-	Feasibility Report's 1:50,000 maps for the parallel section are available	Explanation to PAFs is possible
12) Banaskantha		-	-	Siddhpur	-	-	Details of crossing station are not available/Feasibility Report's 1:50,000 maps for the parallel section are available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
	Umarashi	-	-	-	Siddhpur	-	Details of the reconstruction of ROB is not available	Explanation of the extent of impacts to PAFs is not possible but field work is possible to carry out
		Palanpur	-	-	-	-	Details of detour routes are not available	Explicit field work is not possible and exact extent of resettlement for explaining to PAFs is not possible
	Karjoda	-	Palanpur	-	-	-	Feasibility Report's 1:50,000 maps for the parallel section are available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
	Shri Amirgadh	-	-	-	-	Saraswati	Feasibility Report's 1:50,000 maps for the parallel section are available but not the details of the bridge	It is in the parallel section and field work is carried out

Note: 1) Nearest station name
2) Relevance to topographic feature that are comprehensive to the local residents

Table 10-6 Available Data for ESIMMS (Western Corridor: Package 2)

State/District	Parallel Section	Detour Routes	Junction Station	Crossing Station	ROB (Re-construction)	Important Bridge	Available Drawings/Plan ²⁾	Action Taken for ESIMMS
3 Rajasthan								
1) Sirohi	Amirgarh	-	-	-	-	-	Feasibility Report's 1:50,000 maps for the parallel section are available	Filed work is possible to carry out
2) Pali	↑	-	-	Shri Amirgadh	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
		-	-	Bhimana	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
		-	-	Keshavganj	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
		-	-	Biroliya	Bar	-	Details of crossing station are not available	Explanation to PAFs on the details of crossing station is not possible but approximate location is explained using "Google Earth TM" satellite images
		-	-	Jawali	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
		-	Marwar	-	-	-	Details of junction station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
3) Ajmer			-	-	Chandawal	-	-	Details of crossing station is not available
		-	-	New Bar	-	-	Details of crossing station is not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
		-	-	Pipla	-	-	Details of crossing station is not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
	Gegal Akhli	-	-	Saradhna	-	-	Details of crossing station is not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
		-	-	Kishangarh	-	-	Details of crossing station is not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
		Kishangarh	-	-	-	-	Details of detour route is not available	Explicit field work is not possible and exact extent of resettlement for explaining to PAFs is not possible
	Mandawariya	-	-	Phulera	-	-	Details of crossing station is not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
4) Jaipur	↑	-	-	-	-	-	Feasibility Report's 1:50,000 maps for the parallel section are available	Filed work is possible to carry out
		-	-	-	-	-	Feasibility Report's 1:50,000 maps for the parallel section are available	Filed work is possible to carry out
	Naraina	-	-	-	-	-	Feasibility Report's 1:50,000 maps for the parallel section are available	Filed work is possible to carry out
		Phulera	Phulera	-	-	-	Details of detour route/junction station are not available	Explicit field work is not possible and exact extent of resettlement for explaining to PAFs on the detour routes and junction station are not possible
	Khandel	-	-	-	-	-	Feasibility Report's 1:50,000 maps for the parallel section are available	Filed work is possible to carry out
5) Sikar	Kishan Manpura	-	-	Malikapura	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
		Ringas	-	-	-	-	Details of detour route are not available	Explicit field work is not possible and exact extent of resettlement for explaining to PAFs is not possible
	Sri Madhopur	-	-	Shrimadhpor	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
	↑	-	-	-	-	-	Feasibility Report's 1:50,000 maps for the parallel section are available	Filed work is possible to carry out
6) Nagaur		-	-	Bhageoa	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
		-	-	Dabla	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
		-	-	Ateli	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
7) Alwar		-	-	-	-	-	Feasibility Report's 1:50,000 maps for the parallel section are available	Filed work is possible to carry out
2 Haryana								
1) Mahendar	Kholi						Feasibility Report's 1:50,000 maps for the parallel section are available	Filed work is possible to carry out
		(Rewari)	Rewari	-	-	-	No details of junction station is available	Explanation to PAFs is not possible but approximate location is explained using
2) Rewari	-	New	-	-	-	-	No details of junction station is available	

Table 10-7 Available Data for ESIMMS (Eastern Corridor: Package 3) (1/2)

State/District	Parallel Section ¹⁾	Detour Routes	Junction Station	Crossing Station	ROB(Reconstruction)	Important Bridge	Available Drawings/Plan ²⁾	Action Taken for ESIMMS
1) Uttar Pradesh								
1) Chandauri	Mughal Sarai	-	-	-	-	-	Details of detour route are not available	It appears to be further changes take place
			Ganjkhwaja	-	-	-	Details of junction station is not available	It appears to be further changes take place
		Mughal Sarai	-	Shiuasgar-Khurmabad	-	-	Details of detour route/crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
				Bhabua-Durgauti	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
	Jeonathpur	-	Mughal Sarai	-	-	-	Details of junction station is not available	It appears to be further changes take place
2) Mirzapur			Jeonathpur	-	-	-	Details of junction station is not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
					Jeonathpur-Ahaura	-	Details the reconstruction of ROB are not available	Explanation of the extent of impacts to PAFs is not possible but field work is possible to carry out
				Kalilahat-Chunar	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
					Mirzapur-Jhingura	-	Details the reconstruction of ROB are not available	Explanation of the extent of impacts to PAFs is not possible but field work is possible to carry out
3) Allahabad				Vindhyachal	-	Tons	Details of crossing station/bridge are not available	It is in the parallel section and field work is possible to carried out
				Unchdih-Meja Rd	Unchdih-Meja Rd		Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
	Chheoki	-	-	-	-	Yamma	Details of the bridge are not available	It is in the parallel section and field work is possible to carried out
			Chheoki	-	-	-	Details of junction station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
		Allahabad	-	-	-	-	Details of detour route are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
	Manauri	-	-	-	Fatehpur-Ramwa	-	Details the reconstruction of ROB are not available	Explanation of the extent of impacts to PAFs is not possible but field work is possible to carry out
4) Kaushambi				Malwan-Gugauli	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
				S/Naraini-Rasulabad	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
5) Fatehpur				Shujatpur-Sirathu	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
				To be named	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
6) Kanpur Nagar	Prempur	-	Prempur	-	-	-	Details of junction station is not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
		Kanpur	-	-	-	-	Details of detour route are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
7) Kanpur Dehat			Bhaupur	-	-	-	Details of junction station is not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
	Bhaupur	-	-	-	-	-	Feasibility reports 1:50,000 maps for the parallel section are available	Field work is possible to carry out
8) Auraiya							Feasibility reports 1:50,000 maps for the parallel section are available	Field work is possible to carry out
9) Etawah	Ekdil	-	-	Pata-G.H.Achhalda	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
		Etawah	-	-	-	-	Details of detour route are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
				Etawah-Ekdil	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
	Saraibhopat	-	-	-	Jaswant Nagar - Saraibhopat	-	Details the reconstruction of ROB are not available	Explanation of the extent of impacts to PAFs is not possible but field work is possible to carry out
							Feasibility Report's 1:50,000 maps for the parallel section are available	Field work is possible to carry out
				Balrai-Bhadan	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images

Note: 1) Nearest station name
2) Relevance to topographic feature that are comprehensive to the local residents

Table 10-8 Available Data for ESIMMS (Eastern Corridor: Package 3) (2/2)

State/District	Parallel Section ¹⁾	Detour Routes	Junction Station	Crossing Station	ROB/Re-construction)	Important Bridge	Available Drawings/Plan ²⁾	Action Taken for ESIMMS
10) Firozabad	Hirangaon	-	-	Mipur-F/bad	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
		-	-	-	-	-	Details of crossing station is not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
		Tundla	Tundla	-	-	-	Details of detour routes/junction station is not available	Explanation to PAFs is not possible and details are subject to obtaining detailed satellite images
11) Agra		-	-	Barhan-Chamrola	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
	Mitawali	-	-	-	-	-	Feasibility Report's 1:50,000 maps for the parallel section are available	Field work is possible to carry out
12) Etah		-	-	-	-	-	Feasibility Report's 1:50,000 maps for the parallel section are available	Field work is possible to carry out
13) Hathras		-	-	-	-	-	Feasibility Report's 1:50,000 maps for the parallel section are available	Field work is possible to carry out
	Pora	-	-	-	-	-	Feasibility Report's 1:50,000 maps for the parallel section are available	Field work is possible to carry out
		Hathras	-	-	-	-	Details of detour routes are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
	Sashi	-	-	Hathras-Sasni	-	-	Details of crossing station are not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
14) Aligarh		-	-	-	-	-	Feasibility Report's 1:50,000 maps for the parallel section are available	Field work is possible to carry out
	Daud Khan	-	Daud Khan	-	-	-	Details of junction station is not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
		Aligarh	-	-	-	-	Details of detour routes are not available	Explanation to PAFs is not possible and details are subject to obtaining detailed satellite images
	Somna	-	-	-	-	-	Feasibility Report's 1:50,000 maps for the parallel section are available	Field work is possible to carry out
15) Bulandshahr		-	Khurja	-	-	-	Details of junction station is not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images
		-	-	-	-	-	Feasibility Report's 1:50,000 maps for the parallel section are available	Field work is possible to carry out
	Dadri	-	Dadri	-	-	-	Details of junction station is not available	Explanation to PAFs is not possible but approximate location is explained using "Google Earth TM" satellite images

Note: 1) Nearest station name
2) Relevance to topographic feature that are comprehensive to the local residents

10.1.4 Organization to Implement ESIMMS

(1) Environmental and Social Considerations Study Group of the JICA Study Team

Figure 10-2 shows the organizational structure of ESIMMS under the Study. The ESIMMS in 5 states were divided into 3 packages so that 3 teams of local consultants were procured to conduct the field survey simultaneously under the limited study period. As shown in Figure 10-3, the assigned task and allocation of experts were formed to fully cover the extensive project area.

- 1) An Environmental and Social Considerations Study Group of the JICA Study Team consists of various experts who are in charge of natural environment, social environment, pollution control, and stakeholder/public consultation meetings.
- 2) Three (3) local consultant teams were subcontracted under the JICA Study Team to conduct the ESIMMS. Field works of ESIMMS were conducted by the local consultants under supervision of the Environmental and Social Considerations Study Group of the JICA Study Team.
- 3) Experts of Stakeholder/Public Consultation Meeting and social environmental experts of the JICA Study Team coordinated the work to formulate the Resettlement and Rehabilitation Plan; and

- 4) Academic advisors of Environmental Working Group (EWG) members have carried out field inspections and observed sensitive areas with the local consultants. Academic advisors will review results of ESIMMS.

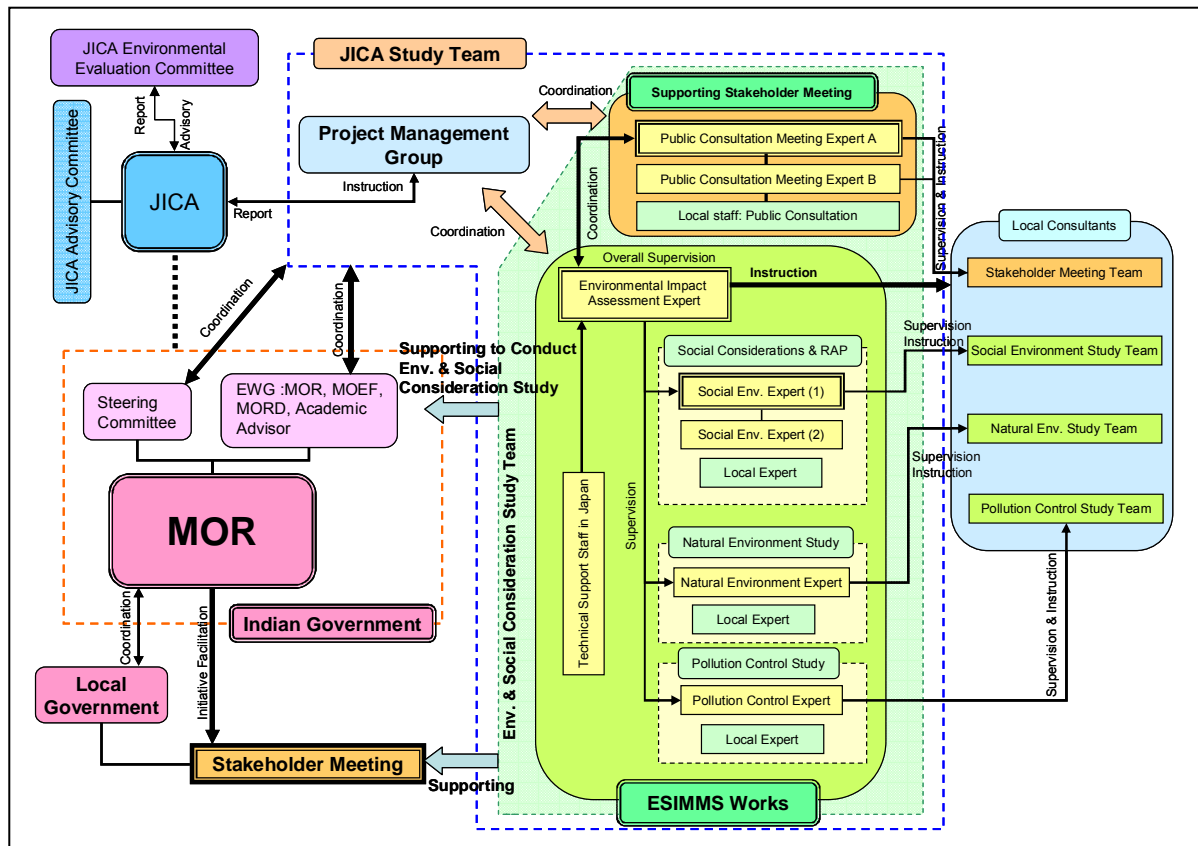


Figure 10-2 Organizational Structure of ESIMMS

(2) Local Consultants

Local consultants for 3 packages of ESIMMS have been selected and began mobilising their study teams in mid May. Because of limited study period for ESIMMS, the date and locations of stakeholder/public consultation meetings were arranged to minimise travel time of SHM facilitators and other team members. Moreover, due to the time limitation, more SHM/PC teams were mobilised for SHMs and Feed-back Meetings at affected villages as shown below.

- 1) Package 1: (Maharashtra and Gujarat: 13 districts)
 - Social Environment Study - 1 team
 - Natural Environment Study - 1 team
 - Stakeholder/public consultation meeting - 4 teams
 - Pollution Control Study - 1 team
- 2) Package 2: (Rajasthan and Haryana: 9 districts)
 - Social Environment Study - 1 team
 - Natural Environment Study - 1 team
 - Stakeholder/public consultation meeting - 2 teams
 - Pollution Control Study - 1 team

- 3) Package 3: (Uttar Pradesh: 15 districts)
- Social Environment - 1 team
 - Natural Environment Study - 1 team
 - Stakeholder/public consultation meeting - 4 teams
 - Pollution Control Study - 1 team

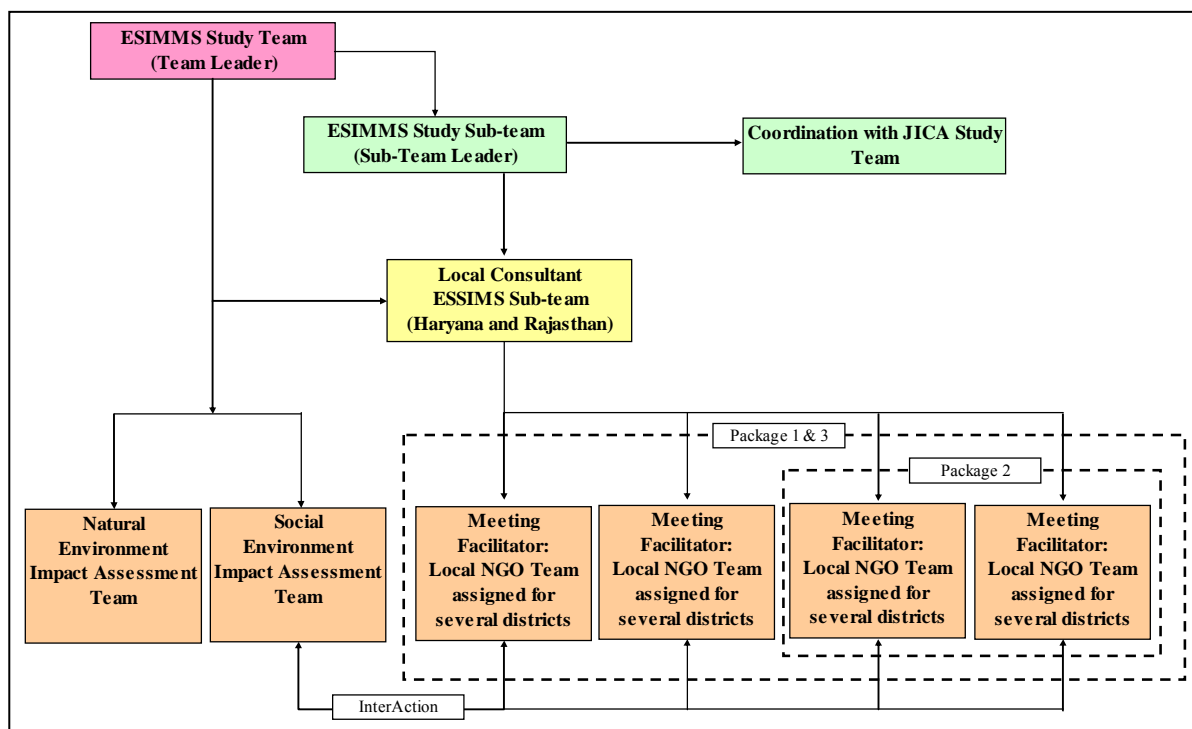


Figure 10-3 General Organization of the Local Consultants

(3) Schedule of ESIMMS

ESIMMS consists of following activities:

- 1) Stakeholder/Public Consultation Meeting
 - Following the 1st Stage SHMs, 2nd Stage SHMs at district level to be organised from mid-June to mid-July 2007;
 - After the 2nd Stage SHMs, feed-back meetings at village level to be held in July 2007; and
 - 3rd Stage SHMs at district level to be organised from August to September 2007.
- 2) Field Inspection of Academic Advisors

Academic advisors of EWG members were planned to visit sensitive areas during implementation of the ESIMMS. Their activities include the observation of sensitive areas such as Balaram Ambaji Wildlife Sanctuary, the parallel section in Ajmer and detour routes in Etawah and Kanpur.
- 3) Study on the Natural Environment of Balaram Ambaji Wildlife Sanctuary

Parallel section of the DFC Project goes through Balaram Ambaji Wildlife Sanctuary over 2.4 km. The location is at the western tip of the wildlife sanctuary. After the permission for research works is obtained, the study on fauna and flora was planned.

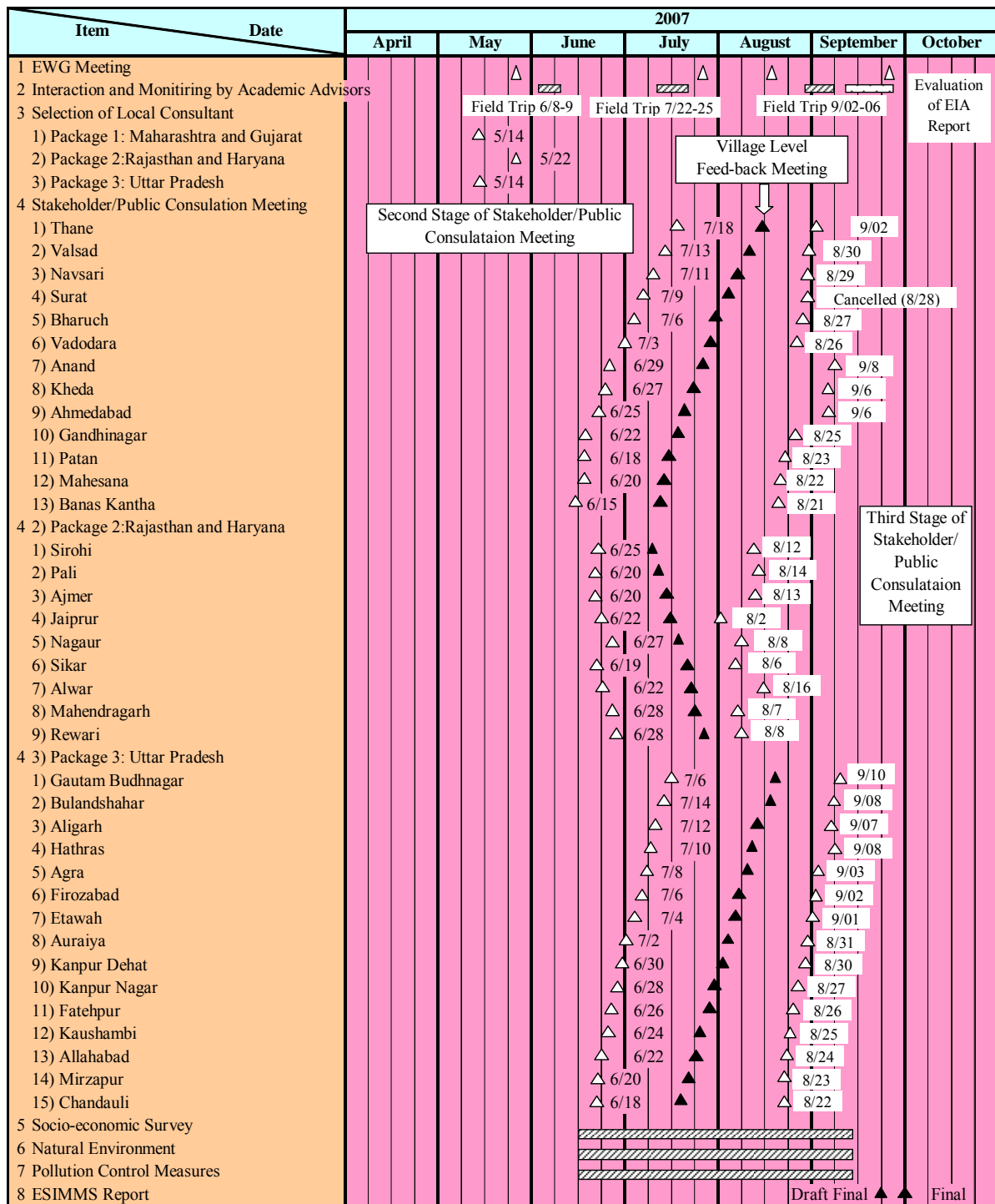


Figure 10-4 Schedule of ESIMMS

TOR for the ESIMMS is shown in “Volume 4: Technical Working Paper Task 2, 10-(1)”. The TOR was prepared based on the results of ESCS conducted in the first year of the Study. Contents of the TOR such as study method were adequately modified in the implementation of the ESIMMS.

10.2 PRESENT CONDITIONS OF STUDY AREA

10.2.1 Western Corridor

(1) Socio-economic Conditions

As shown in Table 10-9, the total number of the population within the districts directly affected by the DFC Project is estimated at approximately 65.4 million. The population of each district varies from 0.9 million for the district in Haryana to more than 10 million for that in Rajasthan, Gujarat and Maharashtra.

The affected area varies depending on the district location. The DFC Project passes through approximately 200 km in Pali District, where the DFC alignment is located across the district from northeast to southwest in Rajasthan. On the other hand, there is only 1 km of stretch passing through Alwar in Rajasthan or 7 km of stretch through Nagaur. Although the overall population size of these districts is relatively small, the urban population of these districts, which is approximately 15-21% of the total population, is concentrated mostly along the railway.

Ajmer is the only district where the DFC alignment passes through in the middle of the district. In Ajmer, the urban population is accounted for 40% of the total population, which shows higher population concentration in urban area.

On the other hand, in Gujarat, Ahmedabad, the former capital city, and Gandhinagar, the current capital city, are avoided by DFC alignment by detour. In addition, for other highly populated districts such as Vadodara, Surat and Bharuch, detours are designed for DFC alignment to avoid passing through the middle of these districts.

On average, it is estimated that DFC alignment passes through districts where the population is approximately 2-3 millions with the urban population ratio of 26-35% for approximately 30-80 km. Overall, DFC alignment goes through the districts where the average urban population ratio is 30% including Ahmedabad and Thane with more than 70% of the urban population ratio.

Table 10-9 Socio-economic Indicators of Districts Affected by DFC Project in Western Corridor (1)

Western Corridor : (Rewari - Vasai Rd. 1/6)

Section	State	District	Area and Population			Average annual growth in Population: 1991-2001 (%)			Proportion of SCs & STs in the total population: 2001 (%)		Per capita rural & urban income & market size: 2006 (Rs Crore)		
			Area (Sq. Km)	Population	Urban Population (%)	Rural	Urban	Total	Ratio of SCs to the total population	Ratio of STs to the total population	Market Size (Rs Crore)	Per capita income in urban areas (Rs)	Per capita income in rural areas (Rs)
Ahmedabad - Rewari	Haryana	Rewari	1,582	858,378	19	2	4	2	19	4	2,245	50,724	31,222
		Mehendragarh	1,859	886,283	14	2	3	2	16	2	1,943	43,902	25,880
		Sub-Total	3,441	1,744,661	-	-	-	-	-	-	4,188	94,626	57,102
	Rajasthan	Alwar	8,380	3,418,055	15	3	3	3	18	8	7,232	56,962	27,516
		Sikar	7,732	2,548,559	20	2	2	2	15	3	5,036	30,468	28,295
		Nagaur	17,718	3,153,641	18	2	3	3	20	0	6,134	34,178	26,754
		Jaipur	11,143	6,117,522	51	2	4	3	15	8	16,218	60,282	26,170
		Ajmer	8,481	2,450,013	40	2	2	2	18	2	6,002	44,644	33,776
		Pali	12,387	2,017,452	21	2	2	2	18	6	5,108	60,827	32,680
		Sirohi	5,136	969,718	17	3	2	3	19	25	1,851	50,299	23,738
		Sub-Total	70,977	20,674,960	-	-	-	-	-	-	47,581	337,660	198,929
	Gujarat	Banas Kantha	10,757	2,814,450	12	2	3	2	11	8	5,881	47,880	24,501
		Patan	5,730	1,263,414	20	1	1	1	10	1	3,231	57,977	27,843
		Mahesana	4,383	1,947,540	23	1	2	1	8	1	5,463	65,287	29,473
	Gandhinagar	2,163	1,493,301	38	1	4	2	9	1	6,649	98,331	42,061	
	Ahmedabad	8,087	6,555,762	81	1	3	2	11	1	25,976	62,897	34,050	
Mumbai - Ahmedabad		Kheda	4,219	2,151,572	20	1	1	1	5	2	5,443	59,986	26,920
		Anand	2,941	1,975,197	29	1	2	1	5	1	6,348	60,031	37,386
		Vadodara	7,550	3,988,646	46	2	2	2	6	27	15,218	88,854	25,457
		Bharuch	6,527	1,494,482	26	2	2	2	5	32	4,287	56,490	31,879
		Surat	7,657	6,140,589	65	2	6	4	3	28	21,192	56,972	34,407
		Navsari	2,209	1,309,702	27	1	1	1	3	48	4,668	71,489	41,101
		Valsad	3,035	1,623,151	31	2	5	3	3	55	4,722	67,833	27,651
		Sub-Total	65,258	32,757,806	-	-	-	-	-	-	109,078	794,027	382,729
	Maharashtra	Thane	9,558	10,210,113	76	2	2	2	3	29	5,848	36,975	42,823
		Sub-Total	9,558	10,210,113	-	-	-	-	-	-	5,848	36,975	42,823
		T O T A L	149,234	65,387,540	-	-	-	-	-	-	166,695	-	-

Source: 1) Haryana/Rajasthan/Gujarat/Maharashtra Development Report, Vol. 1 and 2, 2007, Planning Commission, India
2) "India at a Glance 2006-07, Performance, Facts, and Figures, Haryana/Rajasthan/Gujarat/Maharashtra", Dorling Kindersley (India), 2007
3) Census of India 2001, Registrar General and Census Commissioner, India

The average annual growth in population in any districts of the Western Corridor is approximately 2-3%, while other major cities such as Rewari, Jaipur, Ahmedabad, Gandhinagar, Surat and Valsad are showing a higher rate of population increase due to industrialisation.

There are relatively large number of Scheduled Castes (SCs) and Scheduled Tribes (STs) in the Western Corridor. In Haryana and Rajasthan, the ratio of SCs to the total population is twice as much as that of in Gujarat. However, in Sirohi District of Rajasthan, 25% of the total population is accounted for STs, which is the highest amongst the districts directly affected by DFC Project in the Western Corridor.

On the other hand, the ratio of STs becomes higher from the districts located in the south of Vadodara up to Maharashtra. As shown in Table 10-9, the ratio of SCs is increasing from Haryana to Maharashtra while that of ST is decreasing except Sirohi District. It is considered that more STs live in rural areas where forests and fertile agricultural land are available, while more SCs live in the urban areas and depend on the urban economy for their living. Therefore, an increase in the SC population in industrial areas is expected in the future.

The average per capita income of the urban area is twice as much as that of in rural area except Ajmer where urban population is dominant. However, the number of workers in the rural area is 6-10 times as large as that in urban areas overall except highly industrialised districts, such as Ahmedabad and Vadodara as shown in Table 10-10. In Ahmedabad, there is an exceptional trend; the number of workers in the urban area is larger than that in the rural area by 3 times. It is considered that in Ahmedabad, the capacity to accommodate urban workers almost reaches the maximum level as a whole.

**Table 10-10 Socio-economic Indicators of Districts Affected by DFC Project
in Western Corridor (2)**

Western Corridor : (Rewari - Vasai Rd. 2/6)

Section	State	District	Average annual growth in employment: 1991-2001 (%)			Work Participation rate: 2001 (%)			Work Participation rate: 2001 (%)		Number of workers (2001)		
			Rural	Urban	Total	Rural	Urban	Total	Male	Female	Rural	Urban	Total
Ahmedabad - Rewari	Haryana	Rewari	7	4	7	47	30	44	50	37	292,582	41,040	333,622
		Mehendragarh	5	4	5	45	31	43	48	38	317,652	34,212	351,864
		Sub-Total	-	-	-	-	-	-	-	-	610,234	75,252	685,486
	Rajasthan	Alwar	5	4	5	52	32	49	53	44	1,320,066	138,620	1,458,686
		Sikar	5	3	4	42	26	39	46	32	765,109	122,806	887,915
		Nagaur	3	3	3	44	27	41	48	33	999,978	129,536	1,129,514
		Jaipur	3	5	4	40	30	36	47	22	1,075,393	788,662	1,864,055
		Ajmer	2	2	2	46	30	39	50	28	597,576	259,233	856,809
		Pali	3	2	2	42	31	40	49	31	603,391	121,492	724,883
		Sirohi	3	2	3	43	31	40	50	30	297,621	46,284	343,905
		Sub-Total	-	-	-	-	-	-	-	-	5,659,134	1,606,633	7,265,767
	Gujarat	Banas Kantha	3	4	3	45	29	44	51	36	1,012,019	80,182	1,092,201
		Patan	2	2	2	48	32	45	53	36	456,129	76,949	533,078
		Mahesana	1	3	2	49	32	45	54	36	695,737	132,782	828,519
		Gandhinagar	2	5	3	47	31	42	53	29	409,703	144,633	554,336
	Ahmadabad	1	4	3	45	32	35	53	14	512,642	1,496,723	2,009,365	
	Kheda	2	2	2	48	32	45	55	34	778,796	129,384	908,180	
Mumbai - Ahmedabad		Anand	1	3	2	46	33	42	55	28	615,341	169,370	784,711
		Vadodara	2	3	2	50	32	42	56	26	988,459	530,386	1,518,845
		Bharuch	2	3	2	45	32	42	57	25	457,729	112,964	570,693
		Surat	2	7	4	52	39	44	61	23	1,029,427	1,153,082	2,182,509
		Navsari	1	1	1	48	35	44	57	32	426,483	118,732	545,215
		Valsad	2	7	2	49	37	46	57	34	507,655	142,602	650,257
		Sub-Total	-	-	-	-	-	-	-	-	7,890,120	4,287,789	12,177,909
	Maharashtra	Thane	1	4	3	45	32	35	53	14	267,620	512,840	780,460
		Sub-Total	-	-	-	-	-	-	-	-	267,620	512,840	780,460
		T O T A L	-	-	-	-	-	-	-	-	14,427,108	6,482,514	20,909,622

Source: 1) Haryana/Rajasthan/Gujarat/Maharashtra Development Report, Vol. 1 and 2, 2007, Planning Commission, India
2) "India at a Glance 2006-07, Performance, Facts, and Figures, Haryana/Rajasthan/Gujarat/Maharashtra", Dorling Kindersley (India), 2007
3) Censul of India 2001, Registrar General and Census Commissioner, India

As shown in Table 10-10, the growth of employment is higher in the rapidly industrialising districts, such as Surat, Valsad, and Rewari, in addition to Ahmedabad and Gandhinagar of major industrialised districts of Ahmedabad. Overall, more than 50% of the male population engages in employment while the female population engaging employment is around 30%. Comparing the population engaging agriculture and non-agricultural services at district level, the industrialised districts such as Surat, Ahmedabad and Gandhinagar shows lower work population ratio in the agricultural sector as shown in Table 10-11.

**Table 10-11 Socio-economic Indicators of Districts Affected by DFC Project
in Western Corridor (3)**

Western Corridor : (Rewari - Vasai Rd. 3/6)

Section	State	District	Workers in agriculture & non-agriculture sector: 2001(%)		Number of bank branches (2005)				Amount of deposits: 2005 (Rs. Lakh)			
			Agriculture Sector	Non Agriculture Sector	Rural	Semi-Urban	Urban	Metropolitan	Rural	Semi-Urban	Urban	Metropolitan
Ahmedabad - Rewari	Haryana	Rewari	58	42	41	23	n/a	n/a	36,281	60,146	n/a	n/a
		Mehendragarh	66	34	35	13	n/a	n/a	22,600	29,483	n/a	n/a
		Sub-Total	-	-	-	-	-	-	58,881	89,629	-	-
	Rajasthan	Alwar	71	29	108	28	32	n/a	62,852	38,495	66,587	n/a
		Sikar	66	34	66	33	21	n/a	31,862	60,057	40,491	n/a
		Nagaur	72	28	83	45	n/a	n/a	33,736	67,460	n/a	n/a
		Jaipur	41	59	114	37	n/a	308	67,330	56,616	n/a	1,048,302
		Ajmer	48	52	60	33	71	n/a	25,207	44,853	186,587	n/a
		Pali	57	43	78	24	16	n/a	47,881	31,476	20,263	n/a
		Sirohi	51	49	35	25	n/a	n/a	22,059	45,700	n/a	n/a
		Sub-Total	-	-	-	-	-	-	290,927	344,657	-	-
	Gujarat	Banas Kantha	66	34	59	32	n/a	n/a	26,306	58,868	n/a	n/a
		Patan	64	36	33	44	n/a	n/a	13,367	63,681	n/a	n/a
		Mahesana	48	52	56	57	n/a	n/a	30,773	103,651	n/a	n/a
	Gandhinagar	40	60	42	19	33	n/a	30,377	32,310	188,418	n/a	
	Ahmadabad	18	82	62	50	n/a	524	51,143	106,275	n/a	2,948,894	
Mumbai - Ahmedabad		Kheda	59	41	71	38	31	n/a	54,086	52,325	137,372	n/a
		Anand	56	44	69	66	33	n/a	100,389	204,222	227,888	n/a
		Vadodara	53	47	117	25	n/a	217	109,318	52,841	n/a	940,243
		Bharuch	55	45	75	25	26	n/a	62,940	49,868	82,021	n/a
		Surat	34	66	111	35	n/a	178	128,809	35,252	34,616	n/a
		Navsari	57	43	86	19	37	n/a	156,609	58,622	190,271	n/a
		Valsad	52	48	37	66	n/a	n/a	37,478	165,787	n/a	n/a
		Sub-Total	-	-	-	-	-	-	801,595	983,702	-	-
	Maharashtra	Thane	47	51	54	58	31	146	62,940	49,868	n/a	n/a
		Sub-Total	-	-	-	-	-	-	62,940	49,868	-	-
		TOTAL	-	-	-	-	-	-	1,214,343	1,467,856	-	-

Source: 1) Haryana/Rajasthan/Gujarat/Maharashtra Development Report, Vol. 1 and 2, 2007, Planning Commission, India
2) "India at a Glance 2006-07, Performance, Facts, and Figures, Haryana/Rajasthan/Gujarat/Maharashtra", Dorling Kindersley (India), 2007
3) Census of India 2001, Registrar General and Census Commissioner, India

Table 10-11 shows the number of banking branches and deposit in study area. In Gujarat, the number of bank branch offices and the total amount of deposit per branch office are much larger than Rajasthan and Haryana. These higher figures show that Gujarat is one of the rapidly growing industrialised states due to its advantageous location in the coastal area.

The above trend is also shown in Table 10-12 that if each household would use banking services. Comparing to Jaipur, the capital of Rajasthan, and Ahmedabad, the former capital city and industrial centre of Gujarat, the number of households using banking services is twice larger in Ahmedabad than that in Jaipur, while the size of population is approximately the same. Comparing the same data by package-wise, Rajasthan and Haryana shows 40% lower rate of using banking services than Gujarat and Maharashtra.

As is shown in Table 10-12, households using LPG for cooking would be another indicator of modernisation of the local economy. Comparing to Jaipur in Rajasthan, and Ahmedabad in Gujarat, LPG being used in Ahmedabad is twice larger than that in Jaipur, while population size is approximately the same. Within the study area, Haryana and Rajasthan shows 40% lower rate of the use of LPG than Gujarat and Maharashtra. The same trend is shown as electrification, and possession of capital goods, and it is concluded that Gujarat and Maharashtra are more economically active than that in Haryana and Rajasthan.

**Table 10-12 Socio-economic Indicators of Districts Affected by DFC Project
in Western Corridor (4)**

Western Corridor : (Rewari - Vasai Rd. 4/6)

Section	State	District	Penetration of banking services & use of LPG as cooking fuel in households (2001)		Penetration of electricity, TV & Phone in households: 2006 (%)			Penetration of two-wheelers & four-wheelers in households: 2006 (%)		Classification of houses by type of construction (2001)			
			Households using banking services	Household using LPG as fuel for cooking	Households having electricity	Household owning TV	Household owning phone	Household owning two-wheelers	Household owning four-wheelers	Permanent houses	Semi-permanent houses	Temporary houses	Unclassifiable houses
Ahmedabad - Rewari	Haryana	Rewari	78,578	35,103	92	65	20	23	3	122,475	5,110	3,278	1
		Mehendragarh	74,381	20,408	80	48	10	19	3	124,937	4,961	3,269	1
		Sub-Total	152,959	55,511	-	-	-	-	-	247,412	10,071	6,547	2
	Rajasthan	Alwar	160,869	60,624	73	35	14	18	2	380,555	23,793	56,722	10
		Sikar	113,213	54,355	72	39	16	10	4	299,607	11,328	27,880	269
		Nagaur	95,933	45,937	60	26	11	11	3	360,898	22,082	47,187	101
		Jaipur	268,720	284,234	83	61	27	36	7	652,876	45,896	86,191	67
		Ajmer	129,770	99,215	77	51	24	31	4	304,597	32,205	40,035	40
		Pali	108,336	36,894	74	32	21	20	3	250,430	83,788	19,707	15
		Sirohi	57,726	21,682	67	22	12	17	4	96,533	59,819	6,887	6
		Sub-Total	934,567	602,941	-	-	-	-	-	2,345,496	278,911	284,609	508
	Gujarat	Banas Kantha	135,925	37,516	75	18	14	7	3	209,099	164,747	50,381	88
		Patan	57,039	35,840	77	30	17	10	2	145,570	66,902	16,076	35
		Mahesana	148,544	89,961	87	45	26	21	4	270,948	76,388	15,725	92
	Gandhinagar	111,940	91,724	96	71	35	30	5	185,068	63,633	12,353	8	
	Ahmadabad	540,179	627,366	97	75	28	45	9	983,928	166,901	35,582	246	
	Kheda	123,159	68,413	77	30	15	15	2	174,967	198,387	21,504	204	
	Anand	135,984	103,466	83	46	22	21	4	189,905	152,862	12,773	32	
	Vadodara	330,351	272,457	83	52	23	38	7	469,814	212,019	50,778	498	
	Bharuch	103,074	70,150	88	40	18	27	4	151,029	122,109	7,200	71	
	Surat	329,285	420,910	95	61	27	31	5	665,519	308,704	27,644	211	
	Navsari	100,469	79,394	91	45	25	34	4	144,246	101,081	5,044	43	
	Valsad	104,031	76,514	87	47	19	28	4	149,474	124,674	7,458	37	
	Sub-Total	2,219,980	1,973,711	-	-	-	-	-	3,739,567	1,758,407	262,518	1,565	
Maharashtra	Thane	189,285	210,910	47	32	21	18	6	345,475	156,508	10,644	110	
	Sub-Total	189,285	210,910	-	-	-	-	-	345,475	156,508	10,644	110	
	T O T A L	3,496,791	2,843,073	-	-	-	-	-	6,677,950	2,203,897	564,318	2,185	

Source: 1) Haryana/Rajasthan/Gujarat/Maharashtra Development Report, Vol. 1 and 2, 2007, Planning Commission, India
2) "India at a Glance 2006-07, Performance, Facts, and Figures, Haryana/Rajasthan/Gujarat/Maharashtra", Dorling Kindersley (India), 2007
3) Census of India 2001, Registrar General and Census Commissioner, India

Table 10-12 shows semi-permanent houses and temporary houses existing in the district affected by DFC Project. In the Package 1 of Gujarat and Maharashtra, the total number of semi-permanent houses and temporary houses is five times larger than the Package 2 of Haryana and Rajasthan. It could indicate that there are more low income families in Gujarat and Maharashtra than Haryana and Rajasthan. It is considered that a large number of low-income families flow into the industrialised districts in Gujarat and Maharashtra due to active economy.

**Table 10-13 Socio-economic Indicators of Districts Affected by DFC Project
in Western Corridor (5)**

Western Corridor : (Rewari - Vasai Rd. 5/6)

Section	State	District	Classification of households by source of drinking water (2001)			Households with water closet/ latrine: 2001 (%)			Sex ratio (females per 1000 males): 2001			Literacy Rate : 2001 (%)		
			Households with access to drinking water	Households with drinking water outside premises	Households with drinking water within premises	Rural	Urban	Total	Within ST	Within SC	In Total Population	Rural	Urban	Total
Ahmedabad - Rewari	Haryana	Rewari	130,864	83,416	47,448	2	24	6	-	897	899	75	88	61
		Mehendragarh	133,168	100,822	32,346	1	15	3	-	916	918	70	85	54
		Sub-Total	264,032	184,238	79,794	-	-	-	-	-	-	-	-	-
	Rajasthan	Alwar	461,080	327,116	133,964	2	47	9	879	896	886	62	78	43
		Sikar	339,084	177,418	161,666	7	33	12	924	932	951	71	84	56
		Nagaur	430,268	277,287	152,981	5	28	8	855	937	948	57	74	40
		Jaipur	785,030	393,671	391,359	2	40	22	898	906	897	70	83	56
		Ajmer	376,877	241,450	135,427	4	51	22	925	943	931	65	79	49
		Pali	353,940	240,951	112,989	3	21	6	926	944	981	54	72	37
		Sirohi	163,245	108,484	54,761	3	35	9	953	918	943	54	70	37
	Sub-Total	2,909,524	1,766,377	1,143,147	-	-	-	-	-	-	-	-	-	
Gujarat	Banas Kantha	380,555	177,418	203,137	2	45	12	605	858	858	75	79	54	
	Patan	159,607	131,328	28,279	7	38	6	846	845	846	65	86	55	
	Mahesana	310,898	262,082	48,816	4	47	12	898	906	897	72	85	48	
	Gandhinagar	191,080	127,116	63,964	6	57	12	825	861	862	68	81	47	
	Ahmadabad	994,597	732,205	262,392	2	64	17	805	858	858	69	79	49	
Mumbai - Ahmedabad		Kheda	230,430	183,788	46,642	3	48	12	877	842	858	71	79	52
		Anand	196,533	159,819	36,714	1	47	12	856	835	856	77	83	51
		Vadodara	496,533	459,819	36,714	3	56	9	842	858	852	65	79	53
		Bharuch	196,533	159,819	36,714	7	49	14	835	856	858	67	78	55
		Surat	682,876	545,896	136,980	2	38	11	840	852	846	57	77	64
		Navsari	176,833	119,819	57,014	1	32	10	878	846	852	59	77	49
		Valsad	186,583	128,619	57,964	1	57	12	832	842	858	64	75	53
		Sub-Total	4,203,058	3,187,728	1,015,330	-	-	-	-	-	-	-	-	-
	Maharashtra	Thane	657,801	560,098	97,703	4	46	11	867	842	821	63	77	58
		Sub-Total	657,801	560,098	97,703	-	-	-	-	-	-	-	-	-
T O T A L			8,034,415	5,698,441	2,335,974	-	-	-	-	-	-	-	-	

Source: 1) Haryana/Rajasthan/Gujarat/Maharashtra Development Report, Vol. 1 and 2, 2007, Planning Commission, India
2) "India at a Glance 2006-07, Performance, Facts, and Figures, Haryana/Rajasthan/Gujarat/Maharashtra", Dorling Kindersley (India), 2007
3) Census of India 2001, Registrar General and Census Commissioner, India

Water supply system in the study area shows that there is no large difference between Jaipur, the capital city of Rajasthan and Ahmedabad, the industrial centre of Gujarat. As for the drinking water supply, the rate of households with water supply for Ahmedabad is 86% higher than Jaipur. The number of households without water supply system in Gujarat and Rajasthan is smaller than that of Haryana and Rajasthan by 10%. Although Haryana and Rajasthan are relatively dry areas with the low precipitation rate, the data shows that Gujarat and Maharashtra are the economically active area.

Table 10-13 and Table 10-14 show the rate of literacy, immunization, awareness of epidemics and there is no significant difference amongst the districts of the study area.

**Table 10-14 Socio-economic Indicators of Districts Affected by DFC Project
in Western Corridor (6)**

Western Corridor : (Rewari - Vasai Rd. 6/6)

Section	State	District	Gender gap in literacy rate: 2001 (%)			Immunisation of children aged 12-35 months (2003-04, %)		Classification of deliveries: 2003-04(%)			Awareness among women about RTI/STI & HIV/AIDS: 2003-04 (%)		Awareness and use of family planning methods: 2003-04 (%)	
			Rural	Urban	Total	Fully Immunised	Not received any immunisation	Govt. Institutions	Pvt. Institutions	Home	RTI/STI	HIV/AIDS	Women with knowledge of any modern family planning method	Women reporting current use of any family planning method
Ahmedabad - Rewari	Haryana	Rewari	17	30	28	68	6	14	32	54	70	67	100	69
		Mehendragarh	12	19	18	59	11	27	10	63	34	40	100	62
		Sub-Total	-	-	-	-	-	-	-	-	-	-	-	-
	Rajasthan	Alwar	20	37	35	25	22	17	8	74	93	29	100	51
		Sikar	26	29	28	21	22	21	14	65	72	41	100	46
		Nagaur	28	36	34	21	33	19	8	73	48	30	100	46
		Jaipur	19	35	27	33	26	31	25	42	93	49	100	62
		Ajmer	17	39	31	38	17	24	9	67	71	40	100	46
		Pali	30	37	36	35	27	18	16	66	52	36	100	43
		Sirohi	25	34	33	19	20	20	14	65	30	30	100	34
	Sub-Total	-	-	-	-	-	-	-	-	-	-	-	-	
Gujarat	Banas Kantha	20	35	26	24	30	9	45	46	18	35	96	41	
	Patan	16	34	25	24	37	7	46	47	51	45	100	55	
	Mahesana	15	35	23	28	39	10	65	25	26	47	99	58	
	Gandhinagar	16	29	21	29	36	22	52	26	43	66	100	57	
	Ahmadabad	14	25	30	34	31	11	61	28	37	60	100	56	
	Kheda	9	21	26	12	65	12	41	46	70	41	100	65	
	Anand	16	28	32	21	51	28	41	30	52	52	100	61	
	Vadodara	22	33	29	30	29	17	39	44	57	46	100	62	
	Bharuch	13	35	30	29	38	7	32	61	75	49	100	63	
	Surat	19	32	26	31	28	12	45	43	38	65	99	70	
	Navsari	17	39	31	26	39	16	56	28	67	57	100	69	
	Valsad	22	33	29	28	36	8	49	43	45	52	98	55	
	Sub-Total	-	-	-	-	-	-	-	-	-	-	-	-	
Mumbai - Ahmedabad	Maharashtra	Thane	16	32	36	32	34	17	49	38	43	53	98	89
	Sub-Total	-	-	-	-	-	-	-	-	-	-	-	-	
	TOTAL	-	-	-	-	-	-	-	-	-	-	-	-	

Source: 1) Haryana/Rajasthan/Gujarat/Maharashtra Development Report, Vol. 1 and 2, 2007, Planning Commission, India
2) "India at a Glance 2006-07, Performance, Facts, and Figures, Haryana/Rajasthan/Gujarat/Maharashtra", Dorling Kindersley (India), 2007
3) Censul of India 2001, Registrar General and Census Commissioner, India

(2) Natural Environment

The DFC alignment in the Western Corridor is designed to be constructed in the flat area of western coastal zone beside the western Ghart Range. From the state border between Maharashtra and Gujarat, the area becomes transitional between coastal zone and mountainous area. Near Ahmedabad, the DFC alignment runs through the western foot of Aravalli Range which is categorised one of the oldest mountains originated in the Pre-Cambrian era and located from Gujarat to Delhi lying south west to north east in northern part of India. The DFC runs through its main part of the Western Corridor from Gujarat to Rajasthan in this western foot up to Rewari District, Haryana. The number of districts to be passed by the DFC alignment is 1 district in Maharashtra, 12 districts in Gujarat, 7 districts in Rajasthan and 2 districts in Haryana.

The existing railway was established more than 100 years ago during the time of British reign. The railway was located in topographically flat or slightly sloped area passing the highest elevation of approximately 500 m Above Sea Level (ASL) in the middle of Rajasthan. The elevation of the study area is 10 m ASL in the coastal area, approximately 200 m ASL at the end point of the western railway in Delhi. The distinguished topographic feature associated with geology in Aravalli can be observed only a part of entire stretch near Ajmer where the railway crossing the Aravalli Range. In Ajmer, this is an old mining site of hard rocks such as metamorphic schists, quartzites, marbles and gneisses of the Pre-Cambrian age with associated acid and basic intrusive rocks according to Water Resource Department in Rajasthan.

The climate in the Western Corridor varies from the comparatively abundant rainfall in Konkhan region in Maharashtra to the semi-arid area in Rajasthan including partly arid area of extremely low rainfall area with less than 400 mm of annual rainfall. Also, the temperature in the Western Corridor varies from the constantly warm condition of Konkhan region to the region around Delhi where the seasonal temperature decline in the monthly

mean temperature is less than 10 degree. The mean annual rainfall between 1995 and 2004 in the Western Corridor is 2,370 mm in Konkhan area, 872 mm in Ahmedabad in Gujarat, 593mm in Jaipur in Rajasthan and 624 mm in South Haryana and Delhi. The entire area belongs to monsoon climate and has most annual rainfall within the monsoon season between August and September.

In the Western Corridor, the DFC alignment passes through agricultural land, and the general vegetation types are coastal swamp vegetation, tropical deciduous forest or tropical thorn forest in Maharashtra and tropical dry deciduous forest or tropical thorn forest in Gujarat, Rajasthan and Haryana.

Table 10-15 Natural Environment Features along the DFC Alignment in Western Corridor

State	Geomorphological Feature	Area along the DFC
Maharashtra	Maharashtra is located in the western part of India and covers from the west coast to central India having 308,000 km ² of land area. Topographically containing Dekan Plateau and adjacent the lower coastal area. Geologically lava originated rocky area.	The area is located at the north of Konkan area which developed along Western Ghart. The DFC alignment passes through 3districts. The area is comparatively flat and 11 important rivers flowing to Arabian sea.
Gujarat	Gujarat is located in the north western part of India bordering Pakistan and having 196,000 km ² of land area. The state has the longest coastal line among all states in India and its length is 1,596 km. The entire area is topographically flat. There are many big rivers such as Tapi River and Narmada River flows into the Arabian sea.	The area connects two regions, Aravalli Range and Konkan area along the western Ghart. DFC alignment passes through 12districts. From the border with Rajasthan, the elevation is decline toward Maharashtra.
Rajasthan	Rajasthan is located in the north west of Indo sub-continent having 342,239 km ² of land area. Aravalli range lies covering Mount Abu (1,722 m ASL) at south western border to Khetri at north eastern border in the state. Also, the Thar Desert is located in the area of the western to north western part of Rajasthan.	The DFC is planed to pass 7 districts at the western foot of Aravalli Range which originated in Pre-Cambrian Era. Rocky hilly area in dry climate. The alignment passes the highest place (approx.500m) in the entire corridor.
Haryana	Haryana is located in the northern part of India having the smallest land area of 44,210 km ² among all Indian states. Most of area is covered by alluvial plain and Shivalik Hills at the north western part of the state. The altitude of the plain is approximately 210-270 m and there is an international river flowing thorough Nepal and Bangladesh, Yamuna River at the east part of the state.	DFC alignment in the Western Corridor crosses the northern part of Aravalli Range with a tunnel. DFC alignment in the Eastern Corridor passes through 2 districts in the northern part of the river bank of Ganga River.

10.2.2 Eastern Corridor

(1) Socio-economic Conditions

As is shown in Table 10-16, the total population of the districts directly affected by DFC Project is approximately 35.3 million. The average population of each district is approximately 2.5 million and the average length of DFC railway line passes through each district is ranging from 25 km to 88 km. Compared with the Western Corridor, there is no large difference in terms of the length of DFC railway line within a district. In average, the DFC railway line length in a district is 55.8 km.

DFC railway line passes through the centre of the most districts in the Eastern Corridor. Amongst these districts, there are 4 districts with the higher urban population ratio, Kanpur Nagar, Agra, and Gautam Budh Nagar. Moreover, there are six districts showing more than 20% of urban population. The district showing the highest population growth is Gautam Budh Nagar located near Delhi, which is accounted for 4% while the population growth rate of the other districts is in the range of 2-3%.

Table 10-16 Socio-economic Indicators of Districts Affected by DFC Project in Eastern Corridor (1)

Eastern Corridor (Uttar Pradesh: 1/6)												
Section	District	Area and Population			Average annual growth in Population: 1991-2001 (%)			Proportion of SCs & STs in the total population: 2001 (%)		Per capita rural & urban income & market size: 2006 (Rs Crore)		
		Area (Sq. Km)	Population	Urban Population (%)	Rural	Urban	Total	Ratio of SCs to the total population	Ratio of STs to the total population	Market Size (Rs Crore)	Per capita income in urban areas (Rs)	Per capita income in rural areas (Rs)
Mughal Sarai - Kanpur	Gautama Bhudda Nagar	1,956	4,033,272	59.0	2.3	5.4	3.9	18	0.1	9,767	39,301	25,324
	Bulandshahr	3,718	3,222,216	23.6	1.9	2.4	1.7	20	0.1	5,745	33,954	19,974
	Aligarh	3,747	3,309,424	30.4	1.6	3.0	2.0	21	0.1	16,010	35,048	19,338
	Hathras	1,751	1,457,454	20.0	1.7	1.9	1.7	25	-	2,540	28,604	20,897
	Agra	4,027	4,161,113	44.7	2.3	3.4	2.7	22	0.2	7,870	31,062	20,503
	Firozabad	2,361	2,380,807	32.3	2.4	4.2	2.9	19	-	3,808	27,435	17,345
	Etawah	2,288	1,485,604	25.6	1.4	4.2	1.7	23	-	2,456	31,596	17,915
	Auraiya	2,052	1,265,969	15.2	1.2	2.6	1.7	28	-	1,662	24,885	14,916
	Kanpur Dehat	3,146	1,723,973	7.2	1.9	2.7	1.8	25	-	2,461	29,308	17,146
	Kanpur Nagar	3,030	4,711,261	68.6	1.5	2.9	2.5	17	-	10,860	38,267	17,885
Son Nagar - Mughal Sarai	Fatehpur	4,152	2,543,716	10.5	1.9	2.3	2.0	25	-	3,427	36,318	15,024
	Kaushambi	1,836	1,454,423	7.3	2.3	3.0	2.3	36	-	1,954	23,969	16,385
	Allahabad	5,425	5,565,443	24.5	2.4	2.4	2.4	22	-	8,675	47,216	13,072
	Mirzapur	4,522	2,394,559	13.4	2.5	2.3	2.4	27	-	2,653	24,983	12,455
	Chandauli	2,554	1,861,767	11.0	2.4	3.3	2.5	24	-	2,810	35,850	17,787
	Total	44,609	37,537,729	-	-	-	-	-	-	-	72,931	-

Source: 1) Uttar Pradesh Development Report, Vol. 1 and 2, 2007, Planning Commission, India
2) "India at a Glance 2006-07, Performance, Facts, and Figures, Uttar Pradesh", Dorling Kindersley (India), 2007
3) Census of India 2001, Registrar General and Census Commissioner, India

In the Eastern Corridor, there is no Scheduled Tribes (STs) in the area directly affected by the project. On the other hand, there are a number of districts where the population of Scheduled Castes (SCs) exceeding 20%. It indicates that STs generally live in the forest and agricultural areas while SCs live in the urban area.

Per capita income in the urban area such as Allahabad is comparatively high and is three times as large as that of the rural area. Moreover, in the other districts, per capita income in the urban area is 56-76% higher than that of the rural areas.

Growth in employment in the study area is shown in Table 10-17. Gautam Budh Nagar shows a rapid growth in employment. Bulandshahr shows the same trend. Both districts are in located near Delhi, where economic activities are much intensive. Male population engaging employment is more than 50% in most districts, while that for female is less than half of male population engaging employment. It is considered that these districts are generally agricultural society and the employment opportunities for female are limited. It is remarkable that Gautam Budh Nagar and Kanpur Nagar where the urban workforce is larger than rural workforce the female work participation rate is 20% of that for male.

In general, it is observed that female workforce engages more in the agricultural sector than the non-agricultural sector even in the industrialised areas where the total rate of work engagement in the non-agricultural sector is high. The trend is observed in the Western Corridor, such as Gujarat, Surat, Ahmedabad and Gandhinagar, the same trend is shown particularly in the Eastern Corridor.

Table 10-17 Socio-economic Indicator of Districts Affected by DFC Project in Eastern Corridor (2)

Eastern Corridor (Uttar Pradesh: 2/6)

Section	District	Average annual growth in employment: 1991-2001 (%)			Work Participation rate: 2001 (%)			Work Participation rate: 2001 (%)		Number of workers (2001)		
		Rural	Urban	Total	Rural	Urban	Total	Male	Female	Rural	Urban	Total
Mughal Sarai - Kanpur	Gautama Bhudda Nagar	2	5	4	31	27	29	46	9	451,506	486,745	938,251
	Bulandshahr	5	3	5	44	29	40	51	28	975,773	198,032	1,173,805
	Aligarh	2	3	2	28	26	27	46	13	695,501	220,797	916,298
	Hathras	2	2	2	30	27	29	46	10	321,951	70,019	391,970
	Agra	2	3	2	33	26	31	44	7	581,963	402,342	984,305
	Firozabad	2	4	3	28	27	27	45	7	393,614	165,327	558,941
	Etawah	1	4	2	28	25	28	46	6	291,024	77,585	368,609
	Auraiya	3	3	4	34	26	33	48	15	344,991	43,269	388,260
	Kanpur Dehat	3	4	3	33	27	33	48	15	484,870	28,341	513,211
Son Nagar - Mughal Sarai	Kanpur Nagar	3	4	3	34	28	30	47	10	471,560	776,273	1,247,833
	Fatehpur	2	2	2	39	26	38	49	26	807,190	62,422	869,612
	Kaushambi	2	4	2	40	31	39	47	30	478,647	28,086	506,733
	Allahabad	3	3	3	36	26	34	43	23	1,357,725	313,624	1,671,349
	Mirzapur	2	2	2	35	27	34	46	21	636,639	78,100	714,739
	Chandauli	2	3	2	33	25	32	44	19	485,114	42,519	527,633
	Total	-	-	-	-	-	-	-	-	-	8,326,562	2,506,736

Source: 1) Uttar Pradesh Development Report, Vol. 1 and 2, 2007, Planning Commission, India
2) "India at a Glance 2006-07, Performance, Facts, and Figures, Uttar Pradesh", Dorling Kindersley (India), 2007
3) Census of India 2001, Registrar General and Census Commissioner, India

Table 10-18 shows numbers of banking office branches as well as the total amount of deposit of each district in the study area. Comparing to the same data of those the Western Corridor, there is no large difference in terms of total number of banking office branches and the amount of deposit. However, the deposit amount in the semi-urban area of the Eastern Corridor is much smaller than that of the Western Corridor; that of the Western Corridor is 2.6 times as large as that of the Eastern Corridor.

Table 10-18 Socio-economic Indicators of Districts Affected by DFC Project in Eastern Corridor (3)

Eastern Corridor (Uttar Pradesh: 3/6)

Section	District	Workers in agriculture & non-agriculture sector: 2001(%)		Number of bank branches (2005)				Amount of deposits: 2005 (Rs. Lakh)			
		Agriculture Sector	Non Agriculture Sector	Rural	Semi-Urban	Urban	Metropolitan	Rural	Semi-Urban	Urban	Metropolitan
Mughal Sarai - Kanpur	Gautama Bhudda Nagar	25	75	62	22	153	-	87,413	105,233	-	-
	Bulandshahr	53	48	75	43	23	-	39,481	77,314	56,546	-
	Aligarh	52	48	77	22	63	-	44,639	27,223	194,291	-
	Hathras	58	42	34	16	20	-	17,868	19,428	29,990	-
	Agra	41	59	69	27	148	-	52,502	32,720	459,823	-
	Firozabad	46	55	41	23	20	-	17,839	40,562	50,103	-
	Etawah	66	34	41	8	17	-	18,760	13,580	42,264	-
	Auraiya	74	26	34	18	-	-	17,936	24,867	-	-
	Kanpur Dehat	76	24	99	22	-	-	48,487	31,541	-	-
Son Nagar - Mughal Sarai	Kanpur Nagar	30	70	24	5	-	318	22,018	5,758	-	911,949
	Fatehpur	77	23	81	13	9	-	39,437	15,239	31,925	-
	Kaushambi	79	22	43	5	-	-	33,480	7,428	-	-
	Allahabad	57	43	116	15	125	-	99,824	28,713	452,737	-
	Mirzapur	63	37	64	10	22	-	46,226	11,492	46,546	-
	Chandauli	65	36	42	15	-	-	31,928	42,816	-	-
	Total	-	-	-	840	242	447	318	530,425	378,681	1,364,225

Source: 1) Uttar Pradesh Development Report, Vol. 1 and 2, 2007, Planning Commission, India
2) "India at a Glance 2006-07, Performance, Facts, and Figures, Uttar Pradesh", Dorling Kindersley (India), 2007
3) Census of India 2001, Registrar General and Census Commissioner, India

As shown in Table 10-19 in terms of the use of banking services, the number of households in the Eastern Corridor is approximately the same in terms of the population ratio as that in the Western Corridor. Where the active economic areas near Delhi, such as Guatam Budh Nagar and Bukandshahr as well as Agra, Kanpur Nagar and Allahabad, the usage rate of banking services is relatively high.

The LPG use rate for cooking is high in the urban areas whereas rural districts like Auraiya, Kanpur Dehat and Kaushambi show very low rate of LPG use. It is observed that these districts are relatively less urbanized and their economy is less active comparing to the districts like Agra, Kanpur Nagar and Allahabad.

The population ratio of electrification and possession of capital goods in the districts of the Eastern Corridor shows relatively low comparing to the Western Corridor. It is considered that economic activities in the study area of the Eastern Corridor are not based the performance of the industrial sector.

Table 10-19 Socio-economic Indicators of Districts Affected by DFC Project in Eastern Corridor (4)

Eastern Corridor (Uttar Pradesh: 4/6)													
Section	District	Penetration of banking services & use of LPG as cooking fuel in households (2001)		Penetration of electricity, TV & Phone in households: 2006 (%)			Penetration of two-wheelers & four-wheelers in households: 2006 (%)		Classification of houses by type of construction (2001)				
		Households using banking services	Household using LPG as fuel for cooking	Households having electricity	Households owning TV	Households owning phone	Households owning two-wheelers	Households owning four-wheelers	Permanent houses	Semi-permanent houses	Temporary houses	Unclassifiable houses	
Mughal Surani - Kanpur	Gautama Bhudda Nagar	268,473	226,010	68	57	17	31	6	418,291	86,263	22,180	36	
	Bulandshahr	211,533	62,648	37	37	9	20	3	332,602	92,115	38,289	97	
	Aligarh	174,021	62,774	44	36	9	21	3	370,229	45,749	57,854	143	
	Hathras	79,449	25,074	38	39	6	17	2	169,833	15,408	28,097	8	
	Agra	214,593	150,352	73	52	10	32	4	458,143	24,325	53,266	61	
	Firozabad	90,983	44,133	55	33	5	15	2	228,041	30,263	49,220	11	
	Etawah	68,083	20,145	39	31	8	13	1	129,646	28,469	5,939	20	
	Auraiya	63,109	9,064	16	14	3	9	1	86,561	39,814	69,913	13	
	Kanpur Dehat	92,328	9,298	23	19	4	9	2	86,248	79,556	96,447	2	
Som Nagar - Mughal Surani	Kanpur Nagar	337,270	261,689	68	59	13	32	5	420,277	125,968	99,950	225	
	Fatehpur	134,078	15,165	15	18	3	9	1	119,436	107,244	171,804	3	
	Kaushambi	55,581	4,817	19	19	3	10	1	65,105	101,232	56,934	1	
	Allahabad	299,226	121,496	43	35	13	27	4	368,550	330,357	27,495	18	
	Mirzapur	97,204	18,883	21	23	7	14	2	134,687	163,057	11,087	2	
	Chandauli	84,419	10,793	41	43	12	14	2	110,766	112,856	14,555	100	
Total		2,001,877	816,331	-	-	-	-	-	3,080,124	1,296,413	780,850	704	

Source: 1) Uttar Pradesh Development Report, Vol. 1 and 2, 2007, Planning Commission, India
2) "India at a Glance 2006-07, Performance, Facts, and Figures, Uttar Pradesh", Dorling Kindersley (India), 2007
3) Censul of India 2001, Registrar General and Census Commissioner, India

As shown in Table 10-19, the total number of the semi-permanent houses and temporary houses is approximately the same population ratio, compared with that of the Western Corridor. The data shows that there is relatively large number of low-income families over the Eastern Corridor.

Table 10-20 shows the rate of the households with water supply system. The ratio of the households with water supply system is lower that of the Western Corridor by approximately 30%. Moreover, the ratio of the households with in-house water supply system in the Eastern Corridor is lower than that of the Western Corridor by 30%. It is considered that the lack of water supply system in the households is less problematic due to alternative water supply from Yamuna and Ganga Rivers.

As shown in Table 10-20 and Table 10-21, there is no significant difference in terms of the rate of literacy, immunisation and awareness of epidemics amongst the districts for Eastern and Western Corridors.

Table 10-20 Socio-economic Indicators of Districts Affected by DFC Project in Eastern Corridor (5)

Eastern Corridor (Uttar Pradesh: 5/6)

Section	District	Classification of households by source of drinking water (2001)			Households with water closet/latrine: 2001 (%)			Sex ratio (females per 1000 males): 2001			Literacy Rate : 2001 (%)			
		Households with access to drinking water	Households with drinking water outside premises	Households with drinking water within premises	Rural	Urban	Total	ST	SC	Total	Rural	Urban	Total	
Mughal Sarai - Kamrup	Gautama Bhudda Nagar	526,770	98,269	428,501	7	42	27	848	856	860	70	80	58	
	Bulandshahr	463,103	143,539	319,564	4	31	9	825	869	879	59	74	43	
	Aligarh	473,975	215,632	258,343	2	28	9	842	858	862	59	72	43	
	Hathras	213,346	127,986	85,360	2	28	7	835	856	858	63	76	46	
	Agra	535,795	328,241	207,554	1	24	11	840	852	846	63	75	48	
	Firozabad	307,535	216,491	91,044	1	36	11	856	846	852	65	76	51	
	Etawah	217,528	158,934	58,594	1	30	7	333	842	858	70	80	57	
	Auraiya	196,301	144,992	51,309	2	26	5	511	835	856	71	80	59	
	Kanpur Dehat	262,253	203,602	58,651	1	22	3	1,054	840	852	66	76	55	
	Kanpur Nagar	646,420	337,871	308,549	1	39	26	903	856	855	74	80	68	
Son Nagar - Mughal Sarai	Fatehpur	398,487	339,493	58,994	1	25	3	930	899	893	56	69	42	
	Kaushambi	223,272	205,882	17,390	1	9	1	830	911	895	47	62	30	
	Allahabad	726,420	494,483	231,937	1	36	9	828	898	879	62	76	46	
	Mirzapur	308,833	249,973	58,860	1	33	5	952	895	897	55	70	39	
	Chandauli	238,277	172,337	65,940	2	35	5	931	919	922	60	74	44	
	Total	5,738,315	3,437,725	2,300,590	-	-	-	-	-	-	-	-	-	-

Source: 1) Uttar Pradesh Development Report, Vol. 1 and 2, 2007, Planning Commission, India
2) "India at a Glance 2006-07, Performance, Facts, and Figures, Uttar Pradesh", Dorling Kindersley (India), 2007
3) Census of India 2001, Registrar General and Census Commissioner, India

Table 10-21 Socio-economic Indicators of Districts Affected by DFC Project in Eastern Corridor (6)

Eastern Corridor (Uttar Pradesh: 6/6)

Section	District	Gender gap in literacy rate: 2001 (%)			Immunisation of children aged 12-35 months (2003-04, %)		Classification of deliveries (2003-04, %)			Awareness among women about RTI/STI & HIV/AIDS (2003-04, %)		Awareness and use of family planning methods (2003-04, %)	
		Rural	Urban	Total	Fully Immunised	Not received any immunisation	Govt. Institutions	Pvt. Institutions	Home	RTI/STI	HIV/AIDS	Women with knowledge of any modern family planning method	Women reporting current use of any family planning method
Mughal Sarai - Kamrup	Gautama Bhudda Nagar	17	28	22	24	30	10	27	63	29	28	99	45
	Bulandshahr	20	35	32	24	37	7	17	77	23	36	99	42
	Aligarh	16	34	29	28	39	10	15	74	23	31	100	40
	Hathras	18	33	30	29	36	10	18	72	19	29	100	36
	Agra	15	35	26	26	44	12	21	67	4	25	100	38
	Firozabad	16	29	25	26	54	6	17	77	5	23	99	35
	Etawah	14	25	23	30	29	7	10	83	31	25	100	52
	Auraiya	13	23	21	29	38	5	6	89	30	31	99	46
	Kanpur Dehat	14	22	22	31	28	8	12	80	55	40	99	42
	Kanpur Nagar	9	21	13	48	19	12	24	62	58	63	100	48
Son Nagar - Mughal Sarai	Fatehpur	16	28	27	34	31	14	7	78	14	31	100	31
	Kaushambi	22	33	32	12	65	5	9	86	22	31	100	29
	Allahabad	13	35	29	21	51	4	16	80	36	40	100	41
	Mirzapur	19	32	30	23	38	8	13	79	9	28	99	38
	Chandauli	20	31	30	39	26	11	20	67	35	48	100	45
	Sub - Total	-	-	-	-	-	-	-	-	-	-	-	-

Source: 1) Uttar Pradesh Development Report, Vol. 1 and 2, 2007, Planning Commission, India
2) "India at a Glance 2006-07, Performance, Facts, and Figures, Uttar Pradesh", Dorling Kindersley (India), 2007
3) Census of India 2001, Registrar General and Census Commissioner, India

(2) Natural Environment

The DFC alignment between Mughal Sarai and Khurja passes through 15 districts. The most of the study area is the flat area of Indo-Gangatic Alluvium Plain. The alignment is expanded over Gangatic Basin along Ganga River flowing from the Himalayan Mountains at the northern India, and its elevation is approximately 200 m to 100 m ASL.

The average annual rainfall for 10 years between 1995 and 2004 is approximately 919 mm/year. The area is one of the important granaries in India where abundant water resources from the Ganga River and ample rainfall and fertile alluvium soil in the plain are available. The most annual precipitation is concentrated within the monsoon season between August and September. Vegetation types along the DFC alignment are tropical dry

deciduous forest, and very thick trees such as Sal (*Shorea robusta*) and Benyan trees (*Ficus bengalensis*) are easily found in the agricultural land along the existing railway.

Table 10-22 Natural Environment Features along the DFC Alignment in Eastern Corridor

State	Geomorphological Feature	Area along the DFC
Uttar Pradesh	Uttar Pradesh is located in Indo-Gangetic Plain at northern part of India having 294,000 km ² of land area. The state is divided into 4 regions, 1) Himalaya region 2) mountain foot region from Himalaya to the plain, 3) Ganga River and its plain region, and 4) southern plateau region.	The DFC alignment passes through the flat area of Indo-Ganga Plateau along the Ganga River. The alignment passes through two important rivers, Yamuna River at a detour section of Allahabad and Tons River at a parallel section.

10.3 SOCIAL ENVIRONMENTAL STUDY

10.3.1 Social Environmental Survey

To identify social environmental situation of PAFs, the socio-economic survey has been conducted. In this survey, relevant railway facilities including station quarters and control centres are excluded. Although some facilities are subject to resettlement, it is considered that those facilities are assets of the project owner.

(1) Survey Method

The survey method of the social environmental survey conducted by the local consultants is as follows:

- 1) Identify potentially affected villages and structures to be resettled, record the locations and take photographs;
- 2) Record the longitude and latitude of the starting/end points of the detours and points connected with major roads of the detours;
- 3) Prepare sketches of the survey locations where structures to be resettled, Sensitive Receptors, stations, roads, public facilities;
- 4) Identify the number of potentially affected structures as PAFs in the parallel sections and the detour sections by the field survey; and
- 5) Conduct the socio-economic questionnaire at 10% of identified PAFs in the field by using the on-site sampling method, process and analyse the obtained data.

(2) Components of the Socio-economic Questionnaire

The questionnaire consisting of the questions on socio-economic environment of PAFs was conducted as described in the previous section. Specific questions for squatters and the replacement of ROBs were also included. Major questions are as follows:

- 1) Occupation, household members, education level, religion, social categories of the PAF;
- 2) House type and land ownership of PAFs;
- 3) Income source, assets including livestock, agricultural equipment, household goods, savings and loans;
- 4) Crop types and employment type if farmers;

- 5) Problems on livelihoods;
- 6) Access to public facilities, markets, farmland, and religious buildings;
- 7) Access to basic infrastructures; and
- 8) Comments on the expected social impacts on residents, resettlement and compensation of the DFC Project

10.3.2 Survey on Other Social Environmental Issues

In addition to involuntary resettlement, other social environmental impacts to be examined are listed below. Regarding the below-listed subjects, impacts during pre-construction, construction and operation were evaluated based on the results of the social environmental survey and outcomes of the SHM.

- 1) Changes and disturbances in agricultural activities;
- 2) Social impacts caused by increased transportation to new stations in the detour sections;
- 3) Disturbance/improved convenience in access to public facilities and farmland; local community severance; and decrease in/or loss of cultural and economic activities;
- 4) Social impacts on Non-motorized Vehicles (NMV) due to re-construction of ROBs;
- 5) Social impacts on public safety due to a large number of new construction worker flowing into the community during construction and a current sanitation condition due to construction waste and waste water;
- 6) Impacts on cultural and religious activities in the parallel sections and the detour sections;
- 7) Impacts of tree-cutting in the parallel sections and detour sections.
- 8) Social impacts of solid waste from new stations and relevant facilities in operation;
- 9) Social impacts of resettlement on the vulnerable, such as the poor, SCs, STs and squatters;
- 10) Social impacts of noise, vibration and radio disturbance caused by passing trains

10.3.3 Section-Wise Social Impacts in the Western Corridor

(1) Vasai Road – Vadodara

1) Vasai Road - Surat Parallel Section

The following social impacts in the parallel section between Vasai Road and Surat are noted during the ESIMMS works. This parallel section includes Palghar Station, Boisar Station and Malori Station where a considerable number of squatters are intensively clustered and there would be large-scale involuntary resettlement activities. The details of the survey outcomes are summarised below in the order starting from Vasai Road to Rewari. The number of PAFs including illegal occupancies is identified by a visual observation method in the field survey. More accurate number of PAFs of the Study was obtained by the local consultants through the field survey of the whole study area. The results are shown in “Volume 4: Technical Working Paper Task 2, 10-(2)”.

- Vasai Road Station: On the other side of the road parallel to eastern platform of the station, there is an area of 150-m long residential area that contains 7 units of

- 3-6 storey apartment blocks. Approximately 70 households would be affected by the DFC Project. There are 10 shop buildings with sleeping quarters that could be permanent residences along the north of the eastern platform. All of them will be affected by the project. In addition, there is a loading and unloading facility of Indian Oil Company in the north of the station. Those facilities may be also affected.
- Nara Sopara Station: On the other side of the road parallel to the eastern platform of the station, there is an area of 200-m long residential area that contains 17 units of 3-6 storey apartment blocks. Some 170 households would be affected by the project. Alongside the eastern platform, there exists an approximately 70-m long area occupied by 22 kiosks. There are also 10 sleeping quarters that appear to be permanent residences in the middle section. All of them will be subject to resettlement. A large-scale office building with some commercial quarters is being constructed alongside the north of the eastern platform of the station and it appears that this will be affected.
 - Virar Station: There is an approximately 100-m long residential area and it contains 30 houses including 2-3 story building that will be affected by the project. There are 80 illegally occupying kiosks near the north of the eastern platform of station. These kiosks are also inside the affected area if the nearby ROB would be re-constructed.
 - Palghar Station: There is a slum area near the station that contains approximately 150 units of low-income families that seem to be squatters. They are subject to resettlement. There are 10 residential buildings containing approximately 80 houses across the eastern platform of the station and they are subject to resettlement.
 - Boisar Station: There is a slum area of 200-m long and approximately 80 units of squatters across the eastern platform of the station subject to resettlement. There is also a 50-m long area containing 10 houses across the north of the eastern platform and they are subject to resettlement.
 - Vangaon Station: There are 12 general households and 9 units of squatters' temporary shelters across the eastern platform of the station. They are clustered in an approximately 250-m long residential area, all of which would be affected by the Project.
 - Dahane Road Station: In the western side of the station, there is a built-up and clustered residential area including illegally occupying kiosks along the road in front of the station. The eastern side of the station is basically loading and unloading spaces of the freight trains. There is a 3-storey house and an ordinary house in the area across the station. All of them are subject to resettlement.
 - Gholvad Station area: Although it is an unmanned station, there is a squatter at the north of the eastern platform of the station subject to resettlement.
 - Bordi Road Station: No PAFs have been found in the eastern side of the station.
 - Umbargaon Station: Around the eastern side of the level crossing which is located to the south of the station, there is an approximately 50-m long area containing 10 houses of squatters. There are also 7 temporary units in the same area. All of them are subject to resettlement. A part of a large-scale residential complex with commercial facilities located in the south of the eastern platform of station is also inside the right of way.
 - Bhilad Station: In the north of the eastern platform, some low/middle-rise apartment blocks and general households are scattered. These residential blocks are on the border of ROW (Right of Way). Also, there are some 10 units of squatters selling fruits and vegetables near the north edge of the eastern platform.
 - Vapi Station: The south-eastern area of the station is a vast freight yard, and there are a

couple of kiosks inside the railway yard. There are 10 illegally occupying kiosks that are clustered on the side line of ROB located in the north of the station. They all appear to be subject to resettlement.

- Udvada Station: There is an approximately 50-m long area including 25 temporary shelters, which would be affected by the Project. In the area across the eastern platform of the station, there also exist a couple of general households that are subject to resettlement.
- Pardi Station: In the area across north edge of the eastern platform of the station, there is an approximately 30-m long area occupied by 12 temporary shelters. They appear to belong to seasonal construction workers and are inside the ROW. An ordinary house near the middle of the station might also be affected.
- Valsad Station: There is a workshop that belongs to the Western Railway and the crossing point of the sideline connecting to the workshop to the main line would be the problem area for appropriate connection. No significant social environment is expected to take place in this area.
- Dungri Station: There are 12 units of multiple story apartment blocks on the border of the ROW. They are affected by the project.
- Jora Vasan Station: Around the south of the eastern platform of the station, there are a couple of squatter's temporary shelters which would be affected by the project.
- Bilimora Station: There are 10 units of apartment complexes with shop buildings on the lower level, several medium-scale apartment blocks and a petrol station across the road in front of the station. These buildings would be affected by the project. In the space of the northern part of the station between the main line and the side line, there is a 20-m long area occupied by 12 units of temporary shelters that would be subject to resettlement.
- Amalsad Station: Three temples of Jain, Darga and Hindu religion, one Islamic cemetery of 10-15 m wide and 60 m long and a four-story apartment complex as well as two-story residential buildings are in the right of way. The estimated total number of PAFs is 35 households.
- Ancheli Station: Although the station is an unmanned station, there are 2 shelters belonging to squatters across the eastern platform of the station.
- Vedchha Station: There are a couple of kiosks which would be affected by the project in the area around the south of the eastern platform of the station.
- Navsari Station: In the area around the south of the eastern platform of the station, there are 5 general households and 3 units of four-story apartment blocks. They are affected by the project. The area in the south of eastern side of the platform of the station is a vast freight yard, and there are 6 units of permanent structures that belong to squatters. The occupants are working for the steel factory located nearby in the further south of the freight yard. Those squatters are located on the border of ROW and are very likely to be affected by the project.
- Maroli Station: There is an approximately 150-m long area occupied by the squatters forming a relatively large community consisting of 50 units of temporary shelters. They appear to be permanent residences, and the whole community will be affected by the project. Further in the north, there is a residential area with 25 houses that would be affected by the project. In the area across the eastern platform of the station, there are 13 general households on the other side of the road. There are also 12 shop buildings and 20 sleeping quarters of squatters that are all affected by the project.
- Sachem Station: There are 10 general households that are scattered from the north to

the centre of the area across the eastern platform of the station. They may all be affected by the project.

2) Replacement of Existing ROBs

There are 9 existing ROBs subject to reconstruction within the parallel section between Vasai Road and the detour of Surat. The following social impacts are noted:

- Vasai Road: There is a possibility that there are about 20 units of single- and double-story houses in the western side of the ROB. Depending on the selected construction method, they are subject to resettlement. In addition to these affected houses, unloading facilities of the Indian Oil Company might be also affected in the south-eastern side of the ROB. There would be no resettlement in the north-eastern side of the ROB.
- Nara Sopara: Both sides of the existing ROB are built-up areas filled up with shop buildings, sleeping quarters, 2-3 story apartment blocks, office buildings, warehouses, etc. The area close to the north-east of the existing ROB is congested with kiosks which seem to be illegally occupying the area. It is very likely that some 20 structures are affected by the reconstruction of the ROB, depending on the selected construction method.
- Virar: A new ROB is presently under construction. In the case the ROB is reconstructed for the DFC Project, a considerable number of the local residents are subject to resettlement. The number of the shop buildings, kiosks with sleeping quarters attached to them, and other temporary structures illegally occupying the area are subject to further study.
- Saphale: The existing ROB is located in the swampy area, and there would be no significant social impacts caused by the replacement of existing ROB.
- Palghar: The existing ROB is located on the outskirts of Palghar. There would be no resettlement involved even if the reconstruction of the existing ROB is carried out. The social impacts might only be limited to traffic controls and traffic jams during the construction works.
- Boisar: The existing ROB is located in the area south of Boisar Station which is an urbanized area facing an industrial zone in the western side of the ROB. In the eastern side of the ROB, general households and 2-3 story apartment blocks are occupying the area. Tarapur Industrial Area occupies the area to the west of ROB. About 50 meters from the pier of the western side of the ROB is a small community with 20 units of temporary shelters. They are subject to resettlement.
- Dahanu Road: The existing ROB is located in the semi-urbanized area. In the western side of the ROB, there exists a middle-rise residential area including 3 apartments in both sides of the western part of the ROB which would be affected by the construction works depending on the selected method of construction works.
- Vapi: Alongside the existing ROB near Vapi Station, there are several 2-4 story apartment blocks, hotels, office buildings and religious facilities. The area in the eastern side of the approaching road of the ROB is a built-up area including a lot of local shop buildings with sleeping quarters while a large-scale residential complex is being developed on the western side of the approaching road. Thus, there would be a considerable scale of social impacts upon reconstruction of the ROB as more than 100 families will be adversely affected.
- Valsad: Since the ROB in the south of Valsad Station is located on the outskirts of the town, social impacts would be limited to traffic disturbance and traffic jams during the construction works.

3) Detour in Surat

As is shown in Figure 10-5, the alignment of the detour route of Surat has been reviewed with the objective of minimising the number of PAFs and shifted to further northwestern. By the review, most potential resettlement was avoided. However, these are some connecting points with the existing railway lines and roads which require attention.

- Although most areas of the southern detours and connecting points with the existing line are farmland, there is a Special Economic Zone (SEZ) of Surat nearby. Due to the SEZ and urbanisation, the farmland is being converted to the residential area. Since the reviewed alignment passes through the area, this detour section needs to be studied again in the field at the Detailed Design stage.
- Due to rapid urbanisation in the area connected with the National Highways No.8 and No.6, this section needs to be examined again in the field at the design stage.
- The rapidly expanding urban area which is connected to a state road runs from Surat City to the northeast needs to be studied at the Detailed Design stage.

The total length of the Surat detour route has been increased by approximately 16 km as a result of reviewing the alignment. There is also a connecting line to Gothangam Junction Station. These would require further acquisition of land for about 50 ha. It is very likely that the land acquisition might result in the additional 20-25 affected farming families who will lose a half or more than three quarters of their farmland.

Because the DFC alignment passed the urban area spread along the National Highway No. 6, the detour was reviewed and decided to pass the farmland in the east side of agricultural land as shown in Figure 10-5. Due to the review, the number of structures to be relocated is eliminated. The urbanisation around Tapi River is rapidly developing toward to the east in an unexpected pace. It should be further noted that the number of structures as well as the price of land might increase in the near future.

Moreover, the detour would reach the point where the DFC alignment coming up from Vasai Road shifts from the eastern side to western side of the existing line. In the northern part of the detour in Surat, DFC alignment would shift to the western side of the existing railway; however, the design is not yet prepared. Therefore, JICA Study Team proposed a connecting line shown in red in the following figure.

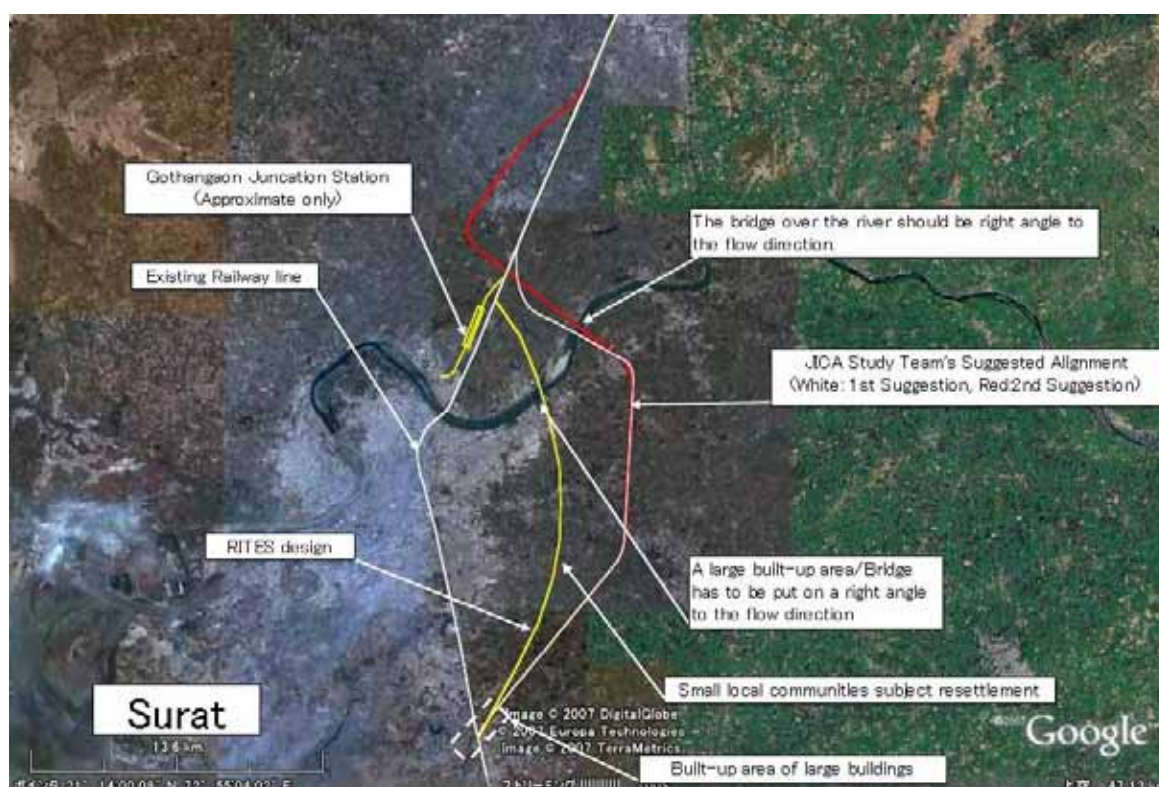


Figure 10-5 Reviewed Detour Route of Surat

4) Gothangam Junction Station

Gothangam Junction Station is being designed in the south of the existing Sayan station as one of the junction stations of the DFC Project. This junction station is composed of a connecting line and the railway yard, for which an area of about 100-m wide and 2,300-m long is required. It is in the middle of an agricultural area. However, there would be no significant resettlement involved in the process of project implementation. On the other hand, the acquisition of 16 ha of farmland might affect 10-15 households which may lose more than three quarters of their farmland.

5) Surat – Bharuch Parallel Section

In the parallel section between Surat–Bharuch, DFC railway line shifts from the eastern side to western side of the existing railway line at the south of Sayan Station. The following social impacts are expected to take place in this section:

- Sayan Station: The western side of the Sayan station is a built-up area with houses and shop buildings across the road in front of the station. There are 4 houses which are 2-3 story building with shop buildings on the ground floor, a 4-storey private hospital, 4 office buildings, a warehouse of agricultural training institution, and 4 general households that would be affected by the Project.
- Kim Station : Except for the facilities and building in the station area alongside the centre to the south of the western platform of the station, there are approximately 10 households which might be subject to resettlement.
- Kosamba Station : Except for facilities and houses in the station colony, there are 5 households which would be affected by the Project alongside the centre to the south of the western platform of the station.

6) Detour in Bharuch

As is shown in Figure 10-6, the alignment has been reviewed and shifted further outward to the north-western area of the city to minimise resettlement along the north-western part of the detour route of Bharuch. Due to the review, the number of resettlement was eliminated; however, the following social impacts are noted at the points where the detour crosses roads:

- The current alignment intersects with the National Highway No.8, stretching toward the western part of Bharuch. It passes through an industrialised area which is expected to be further urbanized in near future. Thus the situation should be monitored during the detailed design stage; and
- Although the detour route passes through the south bank of Narmada River which is currently not heavily urbanized, there is a possibility that the existing rural community might be more urbanised in the near future Thus a close monitoring of the area during the detailed design stage should be carried out.

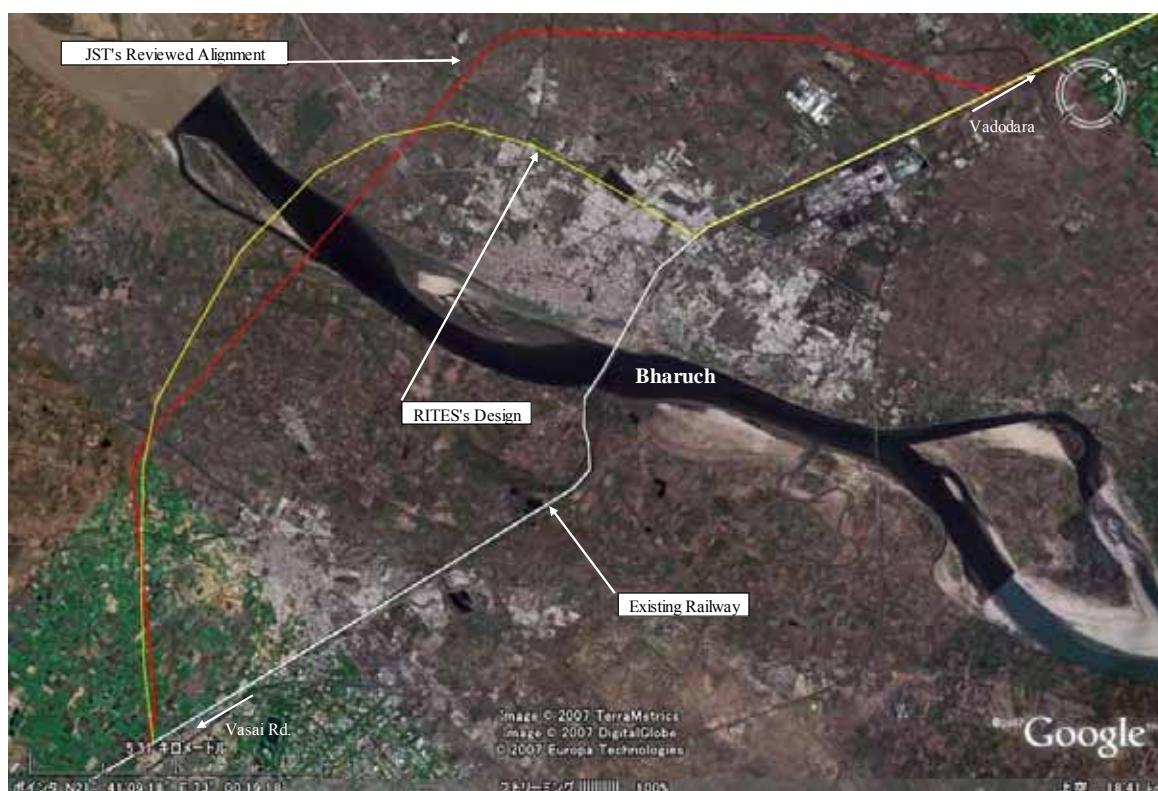


Figure 10-6 Reviewed Detour Route of Bharuch

7) Bharuch – Vadodara Parallel Section

In the parallel section between Bharuch and Vadodara, the following social impacts are noted:

- Parej Station : There are 25 kiosks with sleeping quarters across the road parallel to the western platform of the station. In the area north of the western side of the station, 2 illegally occupying kiosks are subject to resettlement.
- Miyagam Karjan Junction Station : There are 10 households scattered from the centre to the south of the western platform of the station along which there are 35 illegal structures.

- Itola Station : There are 10 households from the centre to the south of the area along the western platform of the station.

8) Makarpura Junction Station

Makarupura Junction Station is constructed at the southern end of Vadodara-Mahesana detour route. It includes a connecting line to the existing railway and station yard with platforms and structures necessary for freight trains. The land required is approximately 100-m wide and 2,300-m long. The area is in the middle of farmland without major structures and there would be no significant social impacts. However, the acquisition of approximately 23 ha of farmland might affect 15-20 farming households who would have to lose a half to three quarters of their land.

(2) Vadodara – Ahmedabad

1) Vadodara – Ahmedabad Detour Section

As shown in Figure 10-7, the original alignment of the detour route in Vadodara has been changed to avoid the residential area and industrial area. Moreover, replacement of a ROB was not required in Valsad. Therefore, the social environmental impact was greatly minimised.

In addition to connecting Vadodara and Ahmedabad detours, the alignment was shifted out to northwest. Thus, social environmental impacts were minimised comparing to the previous alignment which passed through the residential areas and industrial areas. Due to the review, social environmental impact was reduced to 50 households.

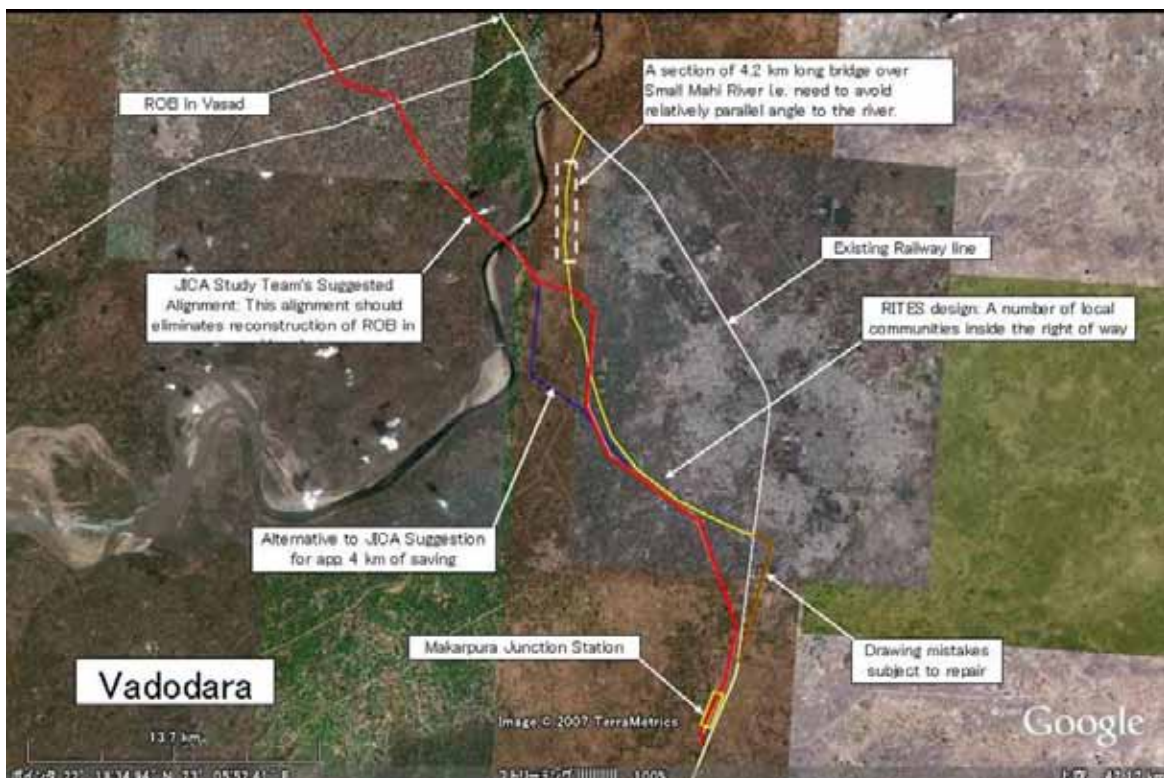


Figure 10-7 Reviewed Detour Route of Vadodara

However, there are several areas in the consolidated detour route where local areas are affected by the project as follows:

- The Southern Part of the Detour Section: The area between Vadodara and Ahmedabad is not heavily populated, and the alignment passes near a village. There is a possibility for the village to grow or urbanised, so it needs to be reviewed in Detailed Design stage.
- Middle of the Detour Section: DFC alignment passes through an industrial area in the western Ahmedabad. There are structures to be resettled, such as factories at the point the detour and state roads or National Highway 8A are connected.
- Northern Part of the Detour Section: There are structures to be affected which are located in parallel to National Highway 8 with a distance of 300 to 500 m, such as Gujarat State power supply company, a theme park, and a water tower of residential complex .

The detour route between Vadodara to Ahmedabad was shortened by 4 km, and the required farmland was also reduced. The detour of Ahmedabad has been extended to Mahesana after PETS-II Reports. Due to the review, the required farmland is increased in Mahesana, and the number of structures to be relocated was decreased in the parallel section. The total number of houses to be resettled is estimated to be 50 units. Additionally, approximately 916 ha of farmland are required. Therefore, 490-530 families would be lose their land, assuming approximately 2 km/farmer.

Vadodara detour shown in Figure 10-7 has not changed after PETS II Report. Since the original alignment passed through residential area, commercial area from the southern Vadodara to western Vadodara and industrial area and Small Mahi River in the northwestern Vadodara, the detour alignment was reviewed by considering the below issues:

- Because Makarpuna Junction Station is located in the southern part of the Vadodara Detour, the location of Junction Station should be reviewed together with the detour to avoid the residential area.
- Community severance by the railway line
- Cross Small Mahi River vertically
- Avoid the industrial area where petrochemical factories are located
- Avoid replacement of existing ROBs due to connecting with the Ahmedabad detour
- Connect the Vadodara and Ahmedabad detours and decrease the distance of the alignment by 4 km

By considering the above-mentioned targets, the social impact such as resettlement was minimised by connecting individual detours of Ahmedabad and Vadodara as shown in the following figures.



Figure 10-8 Reviewed Detour Route Near Sabarmati Jn. Stn

(3) Ahmedabad – Palanpur

1) Detour Route of Ahmedabad to Mahesana

This section is a northern part of the detour route of 207 km long from Vadodara to Ahmedabad to Mahesana. Following social impacts are noted:

- Northern part of the Detour Route: the section is parallel to the National Highway No.8 with a distance of 300 to 500 m. The section generally passes through agricultural area and no resettlement of local population is involved.
- The detour section between Valsad and Kalol given by PETS-II Report has been extended to which it passes through western side of Mahesana in order to avoid built-up area. There is no resettlement involved in this section.

The area of land acquisition in this section is approximately 410 ha of farmland would have to be acquired; there is a possibility that more than 300 farmers would lose a half to three quarters of their land.

2) Parallel Section between Mahesana-Palanpur

There are 110 squatters in the area around Siddhpur station and 65 general households subject to resettlement. A unit of 4 story apartment complex and a structure of bus station are subject to demolition.

3) Re-construction of ROB

In the south side of the Siddhpur Station, there is an existing ROB which is being jacked up for replacement. This would cause limited adverse social impacts such as unavailability of bypasses and inward flow of traffic to the city centre due to prohibition of traffic.

4) Detour Route in Palanpur

Previously there was a parallel section to the north of Palanpur where 2.4 km long existing railway line passes through Balaram Ambaji Wildlife Reserve. This section was requested to detour by MOR during the 5th Steering Committee Meeting. JICA Study team reviewed the section as is shown in Figure 10-9.

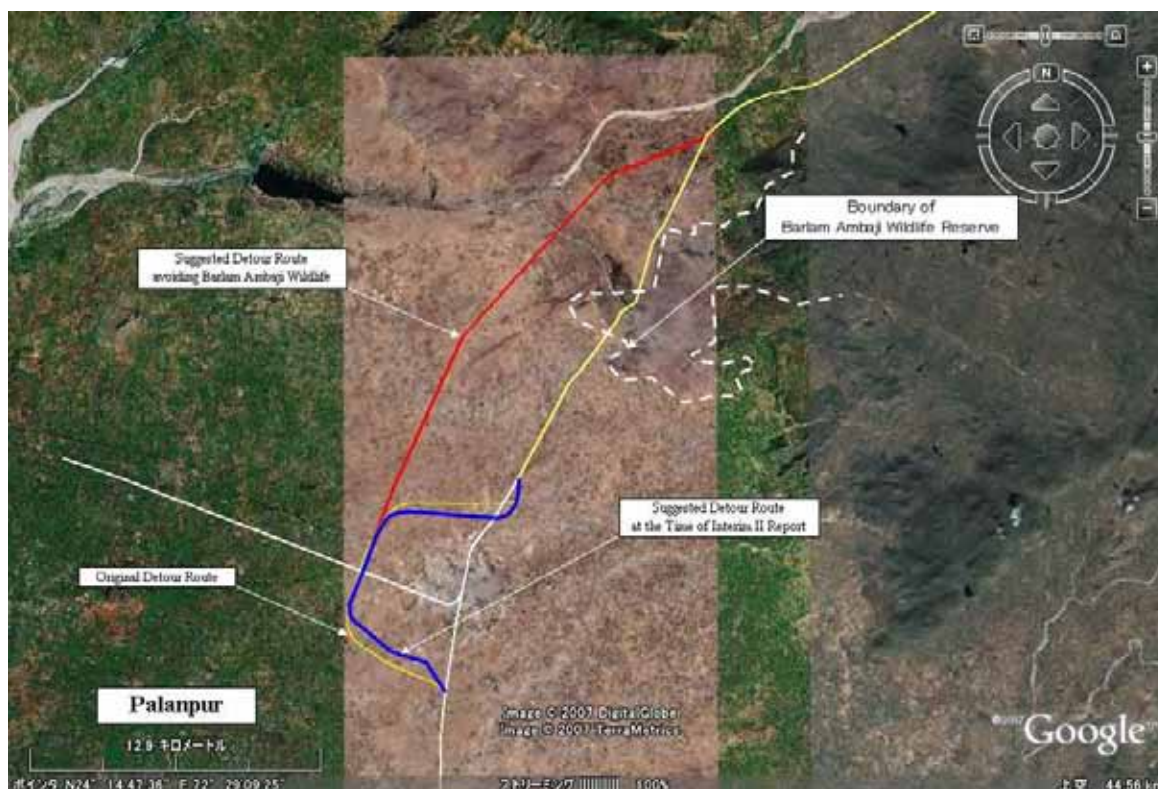


Figure 10-9 Reviewed Detour Route of Palanpur to Balaram Ambaji Wildlife Reserve

However, the farmland of approximately 150 ha would be required for the 36 km detour route and more than 120 farmers are expected to lose a half to three quarters of their farming area.

5) Palanpur Junction Station

Palanpur Junction Station is planned to be constructed in the middle of the detour route alongside the existing branch of Kutch from Palanpur. The junction station is located near National Highway No.14.

The station will consist of a 100 m wide and 2,300 m long railway yard and a connecting line 1.5 km long with 30-50 m width of embankment. The required area is mainly farmland but no structure of the local population is subject to resettlement. There is no community that will be bisected by DFC Project's railway line. The total required land will be 23 ha, and there would be 15-20 families who would lose a half to three quarters of land.

(4) Palanpur – Ajmer

1) Parallel Section between Palanpur and Ajmer

At the time of PETS-II Report, there was a detour route in Ajmer. It was cancelled after the report was put out. Thus parallel section became from Palanpur to Kishangarh. Length of this section is approximately 720 km.

2) Replacement of an Existing ROB

The ROB needs to be replaced in Amarpura in order to add new railway lines for the DFC Project as it is located on the single-track railway. Social impacts would be limited to restriction of traffic during construction since it is an open area with no settlement.

(5) Ajmer – Rewari

1) Parallel Section between Ajmer and Kishangarh

In the parallel section between Ajmer and Kishangarh, there would be 17 houses subject to resettlement in the area around Ladpura.

2) Detour Route in Kishangarh

As is shown in Figure 10-10, the detour route of Kishangarh is planned to divert from the east side to the west side of the existing railway line with a ROB at the both end of the detour section. There is no PAF observed in this section of detour route.

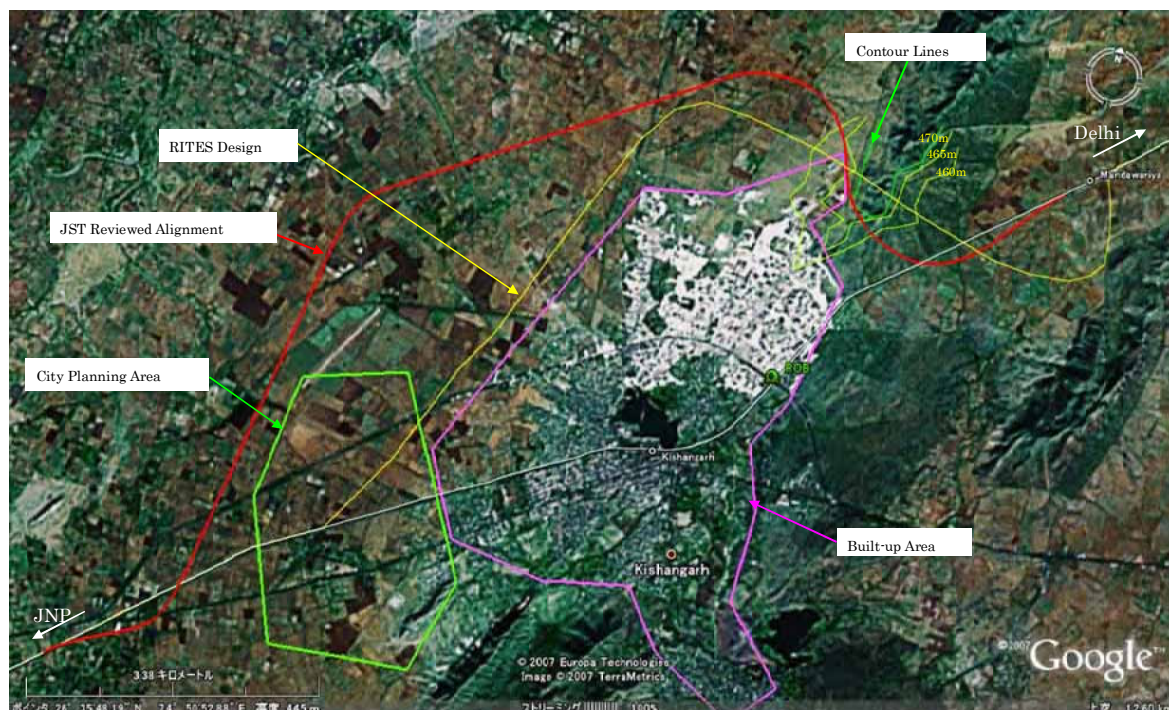


Figure 10-10 Reviewed Detour Route of Kishangarh

3) Parallel Section between Kishangarh and Phurela

There is no household involved in the resettlement.

4) Detour Route in Phurela

The detour route and junction station in Phurela passes through a dray agricultural land. As a result of review by JICA Study Team, there is no household involved in the resettlement.

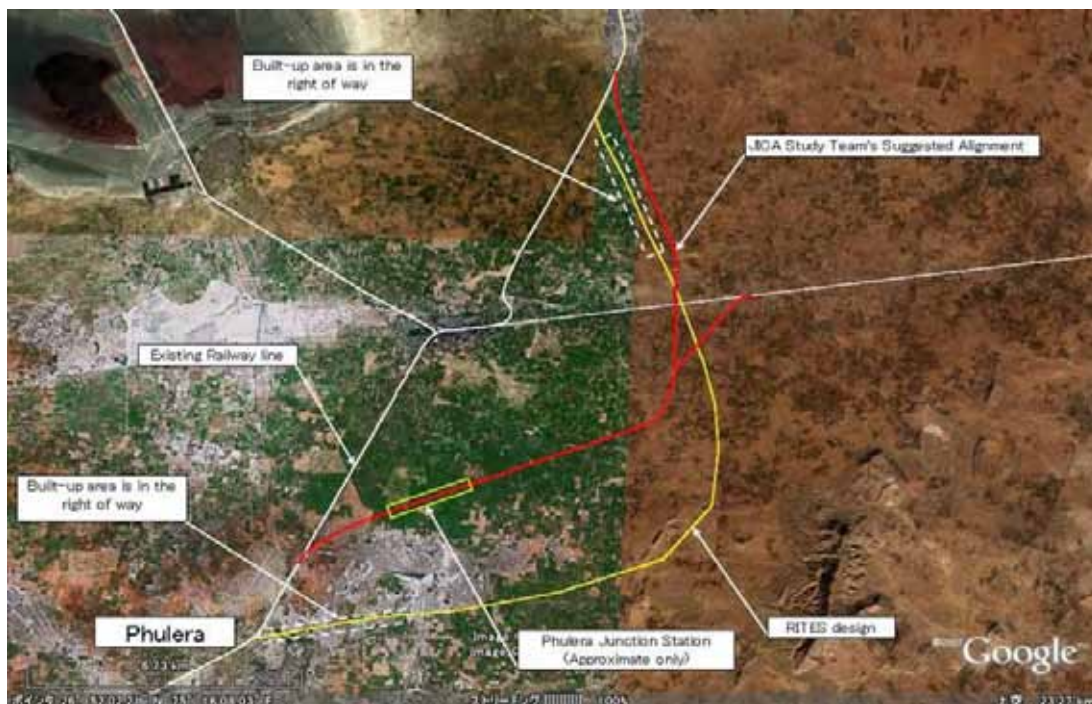


Figure 10-11 Reviewed Detour Route of Phurela

5) Detour Route in Ringas

Originally the detour route as shown in yellow line in Figure 10-12 was relatively large and more than 30 households were subject to resettlement. As a result of review, it has been reduced to five households due to reduction in the length of the detour route. With the review, ROB to the north of Ringas station has been eliminated from DFC Project.

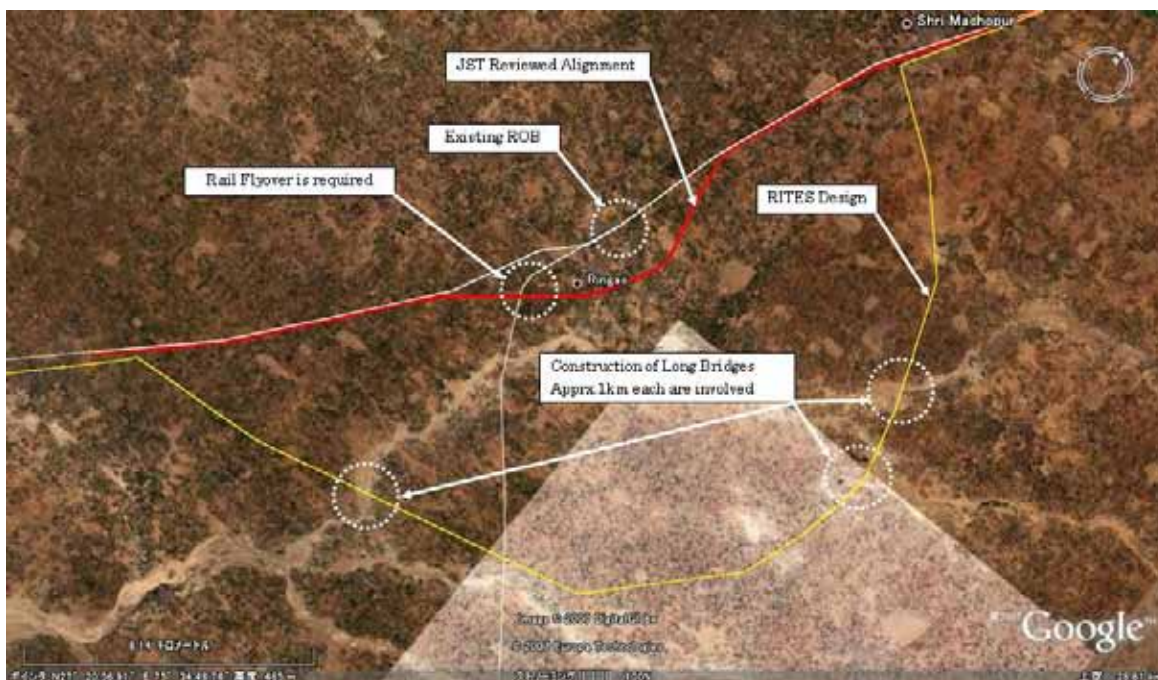


Figure 10-12 Reviewed Detour Route of Ringas

7) Parallel Section between Ringas and Rewari

There are a number of households subject to resettlement in the parallel section between Ringas and Rewari as follows:

- Sri Madhopur 36
- Mawanda Kalan 20
- Narnaul 103
- Unida 14

8) Detour Route in Rewari

The detour route in Rewari is originally considered as the detour of a new railway line toward Dadri. However, a detailed geo-physical survey is required due to its tunnel section and it would take two years to complete the study. Therefore the detour route has been excluded from DFC study this year. Instead, it is necessary to secure alternative railway line from Rewari to Tuglakabad via Gurgaon for transportation of containers.

Thus a new detour route of Rewari as shown in Figure 10-13 has been designed in conjunction with a junction station on the south side of the existing railway line in the area to the east of Khori Station. The new detour line further passes through an agricultural area and will cross over the existing railway lines with ROB avoiding heavily built-up area of Rewari.

DFC Project's railway line further crosses over two existing railway lines with ROB and then connect to the existing railway line leading to Gurgaon. The following are considered to be the major social impacts:

- Layout of junction station involves resettlement of local infrastructures such as school, and a temple as well as approximately 115 households between Kholi and Rewari Station; and
- Squatters located in the area of the starting point of detour section are subject to

resettlement.



Figure 10-13 Detour Route of Rewari

As a result of the 3rd Stage SHM, there has been a request from the participants that the DFC Project's railway line should not pass through the town planning area of Rewari. It is therefore further realignment of the detour route is necessary to design.

(6) Other Socio-economic Issues

In addition to involuntary resettlement, the socio-economic environment of the Western Corridor will be adversely affected by the DFC Project as follows:

- 1) Significant changes and disturbances in agricultural activities in the area where detour routes are constructed. It is particularly significant if the local farmers sell whole of their farming land. Upon sale of their farming area, they lose their identity and social status as farmer and it is not possible to continue to be a farmer unless otherwise they maintain their farming area as "Certificate of Farming";
- 2) Significant changes and disturbances of accessibility to schools and other public facilities as well as to neighbours by the construction of detour routes;
- 3) Disruption to cultural and economic activities in the area where detour routes are constructed;
- 4) Impacts on non-motorised vehicles due to the re-construction of ROB;
- 5) Disturbances to religious activities where the planned alignment passes near religious facilities in detour and parallel sections;
- 6) Adverse impacts on landscape caused by the embankment of DFC Project's railway line;
- 7) Disturbances to radio/TV signals caused by passing trains near the residential areas.

- 8) Increased risk of public safety due to the increase of workers during construction period; and
- 9) Adverse impacts on sanitation caused by solid waste and wastewater from construction sites.

10.3.4 Section-Wise Social Impacts in the Eastern Corridor

(1) Mughal Sarai - Kanpur

1) Detour Route in Mughal Sarai

This detour route has been revised several times in the past, and the alignment became complicated and not finalised to date. Thus it has been excluded from the scope of study. However, an S-shape detour route that connects to the existing railway line in the western part of Jeonathpur Station is included in JICA Study. There would be 3-4 houses to be resettled in this section.

2) Parallel Section between Mughal Sarai and Allahabad

- As for the parallel sections up to Allahabad, at Kailahat Station, there is 1 brick factory in the right of way.
- At Mirzapur Station, there are 1 factory structure and 5 small shop buildings on the west side of the station.
- At Jigna Station, there are 6 small shop buildings and 2 small houses on the southern side of the railway station. There are other 10 houses which would be affected by the DFC Project railway line in the farming area near Jigna Station.
- At Manda Road Station, there are 10 small shop buildings and 1 temple to be affected. They are located in the south of the existing railway.
- Chunar Station has enough land to accommodate new railway lines, and there is no structure to be resettled on the southern side of the railway lines.

3) Replacement of Existing ROBs between Mughal Sarai and Kanpur

- There is an ROB near Ahraura Road Station. There would be 2-3 houses subject to resettlement in the north western side of the ROB.
- For the ROB near Mirzapur Station, there are 2-3 houses subject to resettlement in the north side of ROB.
- Near Meha Road Station, there is an ROB under construction. As the DFC Project's railway line is in parallel to the existing railway line, it would pass over a pond and 5 houses would be subject to resettlement.

4) Detour Route in Allahabad

The detour route in Allahabad as shown in Figure 10-14 has been revised several times. As a result of JICA Study Team's review, the number of PAFs has been reduced to approximately 25 houses. There are other structures affected by the DFC Project's railway line such as temple, brick factory, edible oil factory and school under construction. The alignment also passes through the south edge of a military facility where Chheoki Junction Station is planned to construct. However, the layout of junction station is subject to further study as the area is a heavily congested area.



Figure 10-14 Reviewed Detour Route of Allahabad

Depending on the final location of Chheoki Junction Station which might be constructed in the middle of heavily congested area, a full scale resettlement and rehabilitation plan would have to be formulated.

5) Parallel Section between Allahabad and Kanpur

There is an ROB near Fatehpur Station but it is not required of re-construction. The areas where resettlement of the local population is involved and the number of affected families and structures are as follows:

- Bharwari Station: There are 44 households, 10 shop buildings with residential unit, 3 shop buildings, 2 temples, one facility for physically-challenged people and one illegally encroaching shop are subject to resettlement;
- Sirathu Station: There are 14 households, 42 shop buildings with residential unit, 8 shop buildings, 2 temples and one clinic that are subject to resettlement;
- Khaga Station: There are 18 households, 3 shop buildings with residential unit, 10 shop buildings that are subject to resettlement;
- Fatehpur Station: There are 33 households, 2 shop buildings with residential unit, 1 squatter and 32 kiosks that are subject to resettlement.

6) Replacement of an Existing ROB in Fatehpur

No PAFs have been observed around the ROB in Fatehpur.

7) Detour Route in Kanpur

As shown in Figure 10-15, the alignment of detour route at Kanpur has been reviewed. As a result, the number of PAFs decreased to 10 houses from the original alignment shown in PETS-II Report. However, the length of the detour would have to be extended by

approximately 3 km. Due to this change, the land area subject to acquisition would be increased by approximately 11 ha, which implies that the number of farmers who would lose a quarter to a half of their land could increase by 5 to 10 houses. In total, 208 ha of land are subject to acquisition. This would cause 150-180 local farmers lose their land of about a half to three quarters of land.

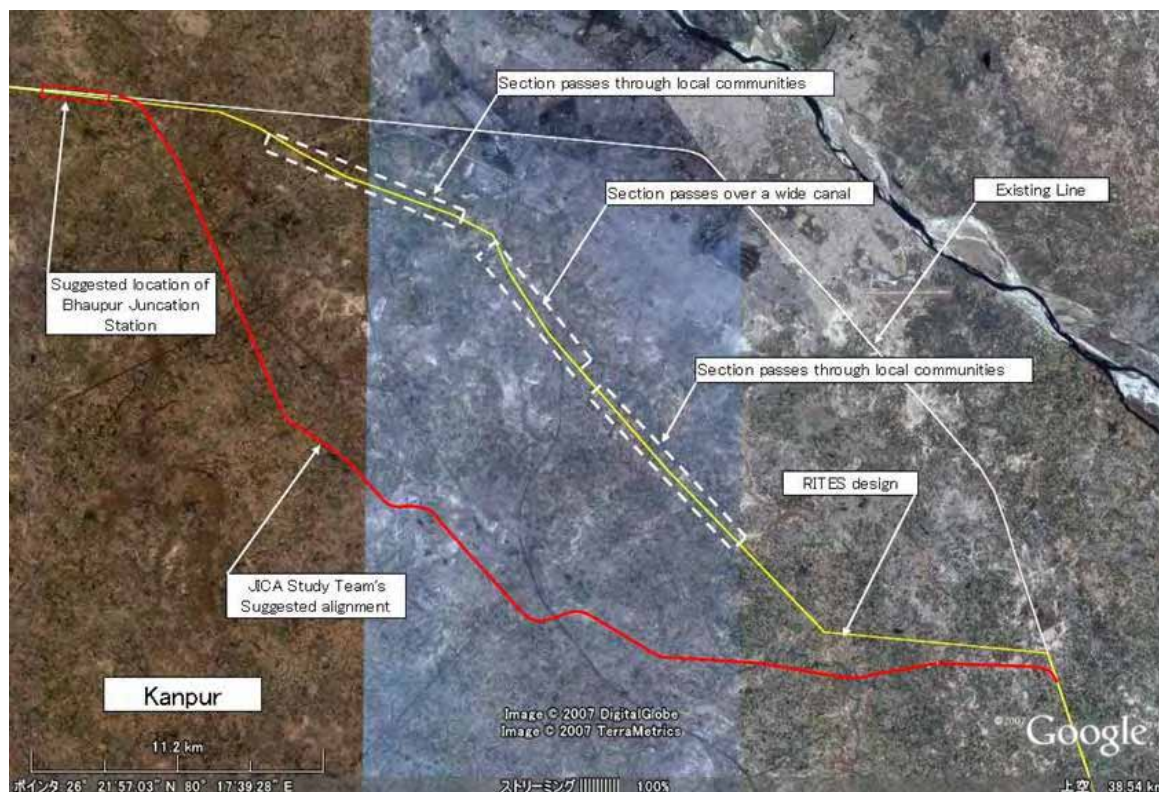


Figure 10-15 Reviewed Detour Route of Kanpur

(2) Kanpur - Khurja

1) Parallel Section between Kanpur and Phaphund

- At Jhinjhak Station, most of the area southern side of the railway line is farmland. There is one rice factory whose land could be affected for about 2-3 m wide and 50 m long by DFC Project.
- Rura Station: There are 1 household, 13 shop buildings with residential unit, 1 shop building, 1 temple subject to resettlement.
- Jinhak Station: There is 1 rice mill whose land is partially affected by the Project. There are also 6 households with residential units subject to resettlement.

2) Detour Route in Phaphund

As shown in Figure 10-16, a small detour route was inserted after PETS-II Report was finalised. However, the DFC Project's railway line is planned to construct on the southern side of the existing railway, and the detour route has to cross over the existing railway at two locations with ROBs if the detour route is inserted. This small detour route is not feasible in terms of safe operation of trains. Therefore, the section is recommended to be change to the parallel section.

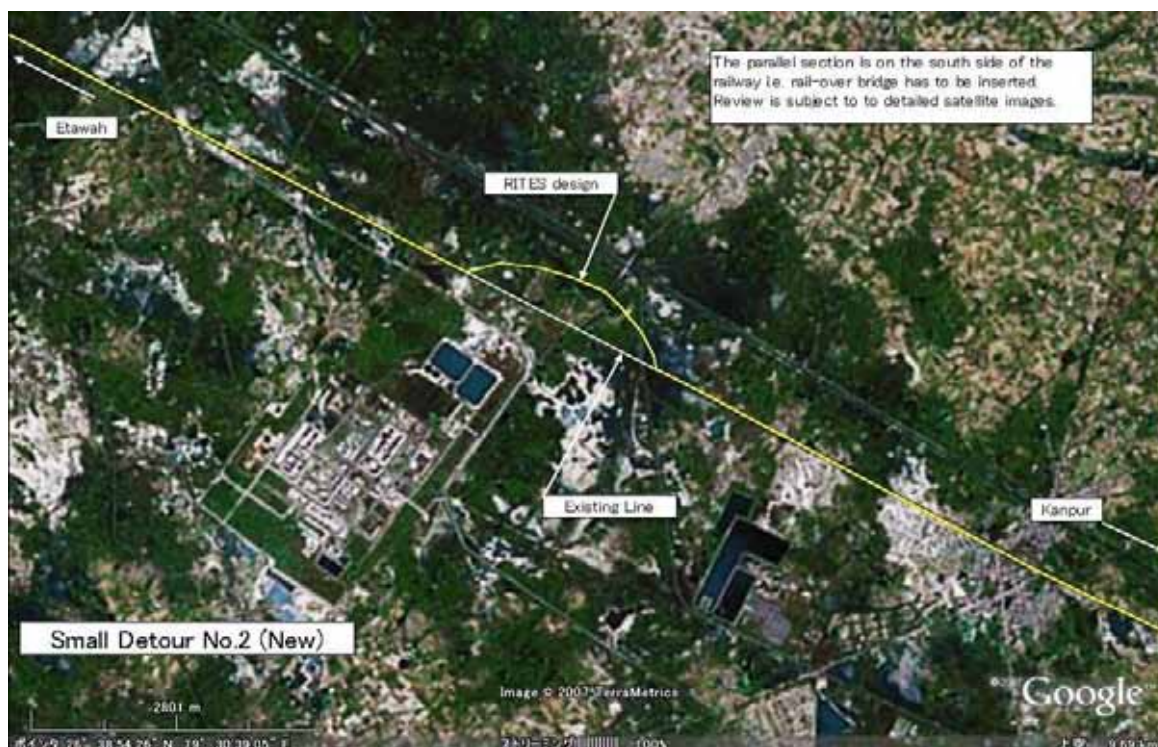


Figure 10-16 Additional Detour in Phaphund

3) Parallel Section between Phaphund and Etawah

- Achalda Station: There are 22 households, 6 shop buildings with residential unit, 1 temple are subject to resettlement.
- Bharthana Station: There are 34 households, 47 shop buildings with residential unit, 1 shop building 2 temples and 1 school subject to resettlement.

4) Detour Route in Etawah

The detour route passes over a sewage treatment plant constructed under the programme of Yamuna Action Plan by Yen-Loan. It will affect efficiency of the sewage plant if the DFC Project's railway line passes over it with a bridge. The sewage treatment plant is based on Waste Stabilisation Pond System of 10.5 million litres/day (MLD). The plant will be adversely affected by the hindrance of sunlight if the railway is build over the pond. Thus further review of the detour route is necessary. The JICA Study Team reviewed the route that it passes through the residential area to the north of sewage plant. Thereby 8 households are subject to resettlement.

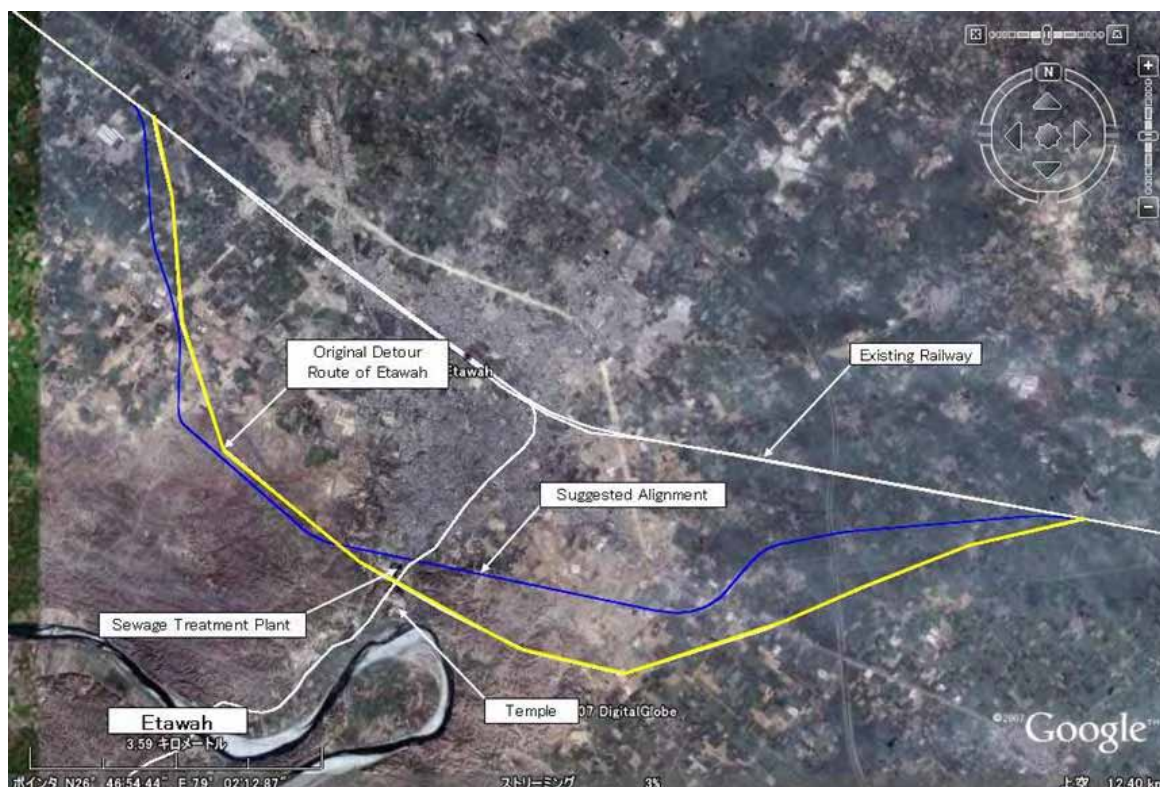


Figure 10-17 Reviewed Detour Route of Etawah

5) Parallel Section between Etawah and Tundla

The area around Firozabad Station is surrounded by commercial and residential areas. Further study is on-going if commercial and residential areas will be adversely affected by the DFC Project.

- Shikohabad Station: There is 1 factory building, not in operation is in the right of way.
- Firozabad Station: There are 110 households, 17 shop buildings with residential unit, 11 shop buildings, and 1 cemetery are subject to resettlement.
- Hirangaon Station: In the area near the level crossing, there are 22 households subject to resettlement.

6) Replacement of the Existing ROB near Sarai Bhopat

There is no PAF around the ROB near Sarai Bhopat Station that is subject to resettlement. Since the ROB is surrounded by farmland and there is ample area of land along the existing railway line for reconstruction works.

7) Detour Route in Tundla

There have a number of revisions for this detour route since the PETS-II Report was put out. In the northern part of detour, a brick factory but not in operation at the time of filed work is affected. In the southern area of detour, the section is passing through agricultural area. Thus no resettlement of local population is involved.

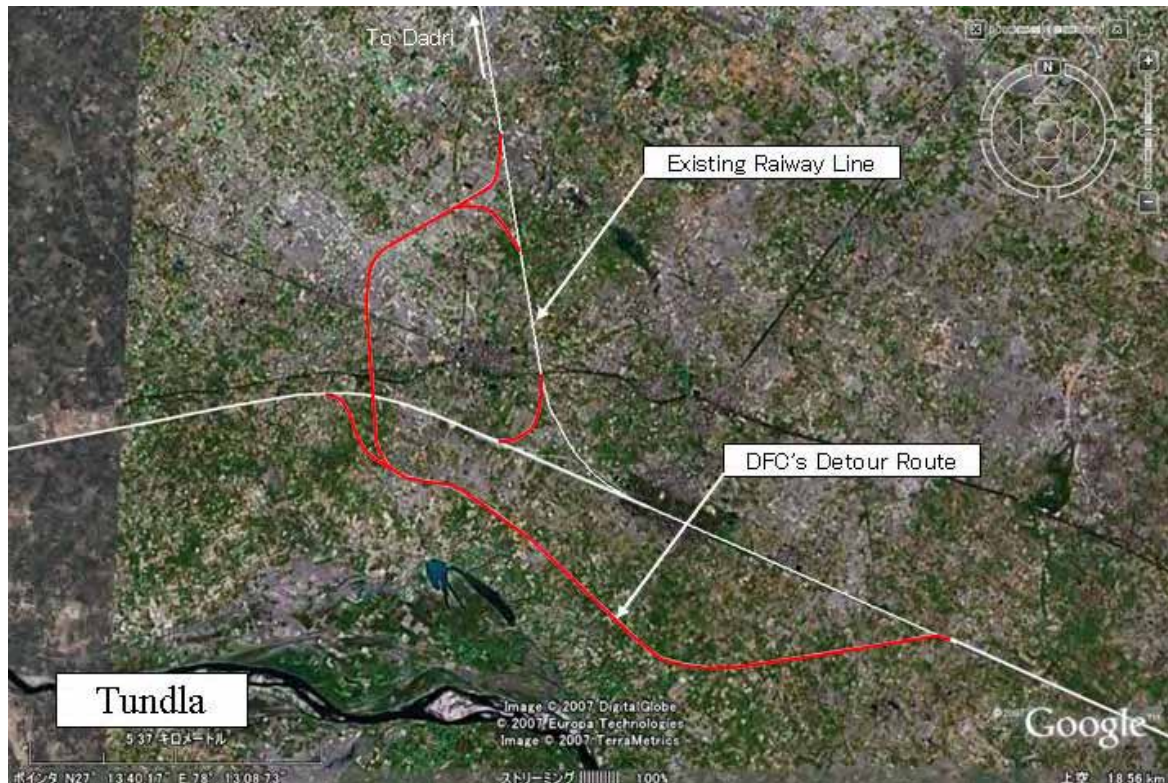


Figure 10-18 Detour Route of Tundla

8) Parallel Section between Tundla and Hathras

There is no local population involved in resettlement.

9) Detour Route in Hathras

The detour passes through mainly farmland. There are 3 houses to be resettled. No review works of the alignment is required for this detour section.

10) Parallel Section between Hathras and Mandrak

There is no local population involved in resettlement.

11) Detour Route in Mandrak

The detour route in Mandrak has been suggested to insert by RITES after PETS-II Report was finalised. However, the size of detour is very small, and safe operation of train is not assured. Therefore, the detour route is suggested to cancel and that the section should be changed to the parallel section. There is no significant impact on the natural and social impacts if there was a parallel section.



Figure 10-19 Small Detour Route of Mandrak

12) Parallel Sections between Aligarh and Daud Khan

Some 20 houses are subject to resettlement at a level crossing near the Daud Khan Station.

13) Detour Route in Aligarh

As shown in Figure 10-20, originally suggested DFC line passes through agricultural area at the detour route from the north end to the middle section of the detour route of Aligarh. There is a house and a milk factory identified in the right of way. The southern area of detour route passes through very congested residential area. Thus southern half of the detour route has been reviewed. The number of PAFs is reduced to approximately 45 houses with the reviewed detour line.

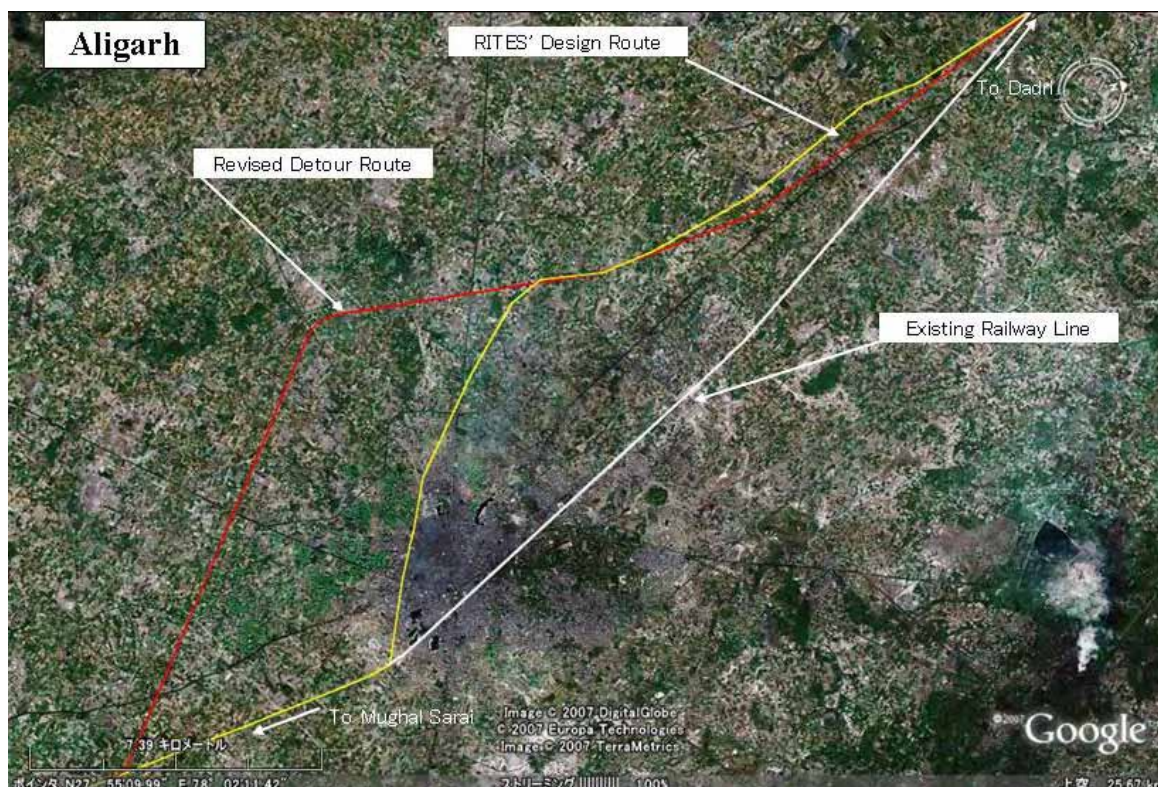


Figure 10-20 Revised Detour Route of Aligarh

14) Parallel Section between Aligarh and Khurja

- In the parallel section near Khurja Station, there are 4 houses and 1 agricultural facility subject to resettlement.
- Khurja Junction Station of DFC Project and the connecting line to the existing railway line will be constructed through an agricultural area. Further study is required to consider impacts of a small detour route after obtaining the satellite images of QuickBird.

(3) **Khurja – Dadri**

- This is a parallel section of the Eastern Corridor linking to the Western Corridor. The following area is affected by DFC Project:
- In the area to the south of Ajaipur station, community road along the existing railway is subject to reconstruction. As a result, 12 households are adversely affected.

(4) **Other Socio-economic Issues**

In addition to involuntary resettlement, the socio-economic environment of the Eastern Corridor shall be adversely affected by the DFC Project as follows:

- 1) Significant changes and disturbances in agricultural activities, both in positive and negative, in the area where detour routes are constructed. It is particularly significant if the local farmers sell whole of their farming land. Upon sale of their farming area, they lose their identity and social status as farmer and it is not possible to continue to be a farmer unless otherwise they maintain their farming area as “Certificate of Farming”;

- 2) Significant changes and disturbances, both in positive and negative, of accessibility to schools and other public facilities as well as to neighbours by the construction of detour routes;
- 3) Disruption to cultural and economic activities in the area where detour routes are constructed as well as the parallel section where temples and cemeteries are subject to resettlement;
- 4) Impacts on non-motorised vehicles due to the reconstruction of ROB;
- 5) Disturbances to religious activities where the planned alignment passes near religious facilities in detour and parallel sections;
- 6) Adverse impacts on landscape caused by the embankment of DFC Project's railway line;
- 7) Disturbances to radio/TV signals caused by passing trains near the residential areas.
- 8) Increased risk of public safety due to the increase of workers during construction period; and
- 9) Adverse impacts on sanitation caused by solid waste and wastewater from construction sites.

10.3.5 Summary of the Social Environmental Survey

Table 10-23 shows villages in which DFC Alignment passes through and the length of the parallel section and the detour section.

Table 10-23 DFC Alignment in Affected Districts

State	District	Villages DFC Alignment Passes through	Length of the Parallel Section (km)	Length of the Detour Section (km)	Total Length (km)
Western Corridor					
Haryana	Rewari	24	0.0	28.0	28.0
	Mehendragarh	26	48.0	0.0	48.0
Rajasthan	Alwar	2	1.0	0.0	1.0
	Sikar	42	75.0	11.0	86.0
	Nagaur	4	7.0	0.0	7.0
	Jaipur	43	64.0	19.0	83.0
	Ajmer	35	87.0	14.0	101.0
	Pali	57	200.0	0.0	200.0
	Sirohi	37	60.0	0.0	60.0
Gujarat	Banas Kantha	35	57.0	18.0	75.0
	Patan	4	10.0	0.0	10.0
	Mahesana	17	21.0	59.0	80.0
	Gandhinagar	2	0.0	20.0	20.0
	Ahmedabad	11	0.0	30.0	30.0
	Kheda	13	0.0	24.0	24.0
	Anand	11	0.0	56.0	56.0
	Vadodara	28	49.0	21.0	70.0
	Bharuch	26	36.0	19.0	55.0
	Surat	33	7.0	35.0	42.0
	Navsari	20	41.0	0.0	41.0
	Valsad	46	70.0	0.0	70.0
	Maharashtra	Thane	46	140.0	0.0
Sub-total		562	973.0	354.0	1,327.0
Eastern Corridor					
Uttar Pradesh	Chandauri	9	40.1	0.3	40.4
	Mizapur	103	81.4	4.6	86.0
	Allahabad	55	46.5	26.3	72.8
	Kaushambi	62	54.4	0.0	54.4
	Fatehpur	66	88.3	0.0	88.3
	Kanpur Nagar	38	11.6	44.8	56.4
	Kanpur Dehat	37	49.6	2.9	52.5
	Auraiya	22	33.3	0.0	33.3
	Etawah	47	49.4	16.3	65.7
	Firizabad	54	56.4	9.7	66.1
	Agra	12	16.0	9.2	25.2
	Hatras	41	30.5	10.2	40.7
	Aligarh	36	21.1	25.9	47.0
	Bulandsharh	29	61.4	0.0	61.4
Gautam Buddha Nagar	10	46.0	0.0	46.0	
Sub-total		621	686.0	150.2	836.2
Total		1,183	1,659	504.2	2,163.2

The land area to be acquired for both parallel and detour sections are shown in the following table.

Table 10-24 Land Area to be Acquired for Both Parallel and Detour Sections

[Western Corridor]

State	District	Total Length (Parallel & Detour): (km)	Total Land Area: (ha)	Parallel: (km)	Land Area at Parallel Section: (ha)	Detour: (km)	Land Area at Detour Section: (ha)
Haryana	Rewari	28.0	121.8	0.0	0.0	28.0	121.8
	Mehendragarh	108.0	60.0	48.0	60.0	0.0	0.0
Rajasthan	Alwar	2.3	1.3	1.0	1.3	0.0	0.0
	Sikar	182.8	154.7	75.0	93.8	14.0	60.9
	Nagaur	15.8	8.8	7.0	8.8	0.0	0.0
	Jaipur	160.0	149.6	64.0	80.0	16.0	69.6
	Ajmer	205.8	186.4	83.0	103.8	19.0	82.7
	Pali	450.0	250.0	200.0	250.0	0.0	0.0
	Sirohi	135.0	75.0	60.0	75.0	0.0	0.0
Gujarat	Banas Kantha	121.5	204.1	38.0	47.5	36.0	156.6
	Patan	29.3	16.3	13.0	16.3	0.0	0.0
	Mahesana	116.8	277.4	27.0	33.8	56.0	243.6
	Gandhinagar	20.0	87.0	0.0	0.0	20.0	87.0
	Ahmedabad	43.3	145.5	5.0	6.3	32.0	139.2
	Kheda	25.0	108.8	0.0	0.0	25.0	108.8
	Anand	56.0	243.6	0.0	0.0	56.0	243.6
	Vadodara	131.3	152.6	49.0	61.3	21.0	91.4
	Bharuch	104.5	164.3	34.0	42.5	28.0	121.8
	Surat	53.8	174.1	7.0	8.8	38.0	165.3
	Navsari	92.3	51.3	41.0	51.3	0.0	0.0
	Valsad	157.5	87.5	70.0	87.5	0.0	0.0
	Maharashtra	Thane	140.0	175.0	140.0	175.0	0.0
Total		2,378.5	2,894.7	962.0	1,202.5	389.0	1,692.2

Note: The above areas are estimated for 12.5 m for the parallel sections and 43.5 m for the detour sections.

[Eastern Corridor]

State	District	Total Length (Parallel & Detour): (km)	Total Land Area: (ha)	Parallel: (km)	Land Area at Parallel Section: (ha)	Detour: (km)	Land Area at Detour Section: (ha)
Uttar Pradesh	Chandauri	40.4	51.2	40.1	49.7	0.3	1.5
	Mirzapur	86.0	120.9	81.4	101.0	4.6	19.9
	Allahabad	72.8	172.0	46.5	57.7	26.3	114.3
	Kaushambi	54.4	67.4	54.4	67.4	0.0	0.0
	Fatehpur	88.3	109.5	88.3	109.5	0.0	0.0
	Kanpur Nagar	56.4	209.4	11.6	14.4	44.8	195.0
	Kanpur Dehat	52.5	74.1	49.6	61.5	2.9	12.6
	Auraiya	33.3	41.3	33.3	41.3	0.0	0.0
	Etawah	65.7	132.0	49.4	61.3	16.3	70.8
	Firozabad	66.1	112.1	56.4	70.0	9.7	42.1
	Agra	25.2	59.9	16.0	19.8	9.2	40.1
	Hathras	40.8	82.4	30.5	37.8	10.2	44.5
	Aligarh	47.0	139.0	21.1	26.2	25.9	112.8
	Bulandsharh	61.4	76.2	61.4	76.2	0.0	0.0
	Gotam Budh Nagar	46.0	57.0	46.0	57.0	0.0	0.0
Total		836.3	1,504.3	686.1	850.8	150.2	653.5

Note: The above areas are estimated for 12.5 m for the parallel sections and 43.5 m for the detour sections.

The number of structures to be relocated and the number of illegal occupants is shown in the following table.

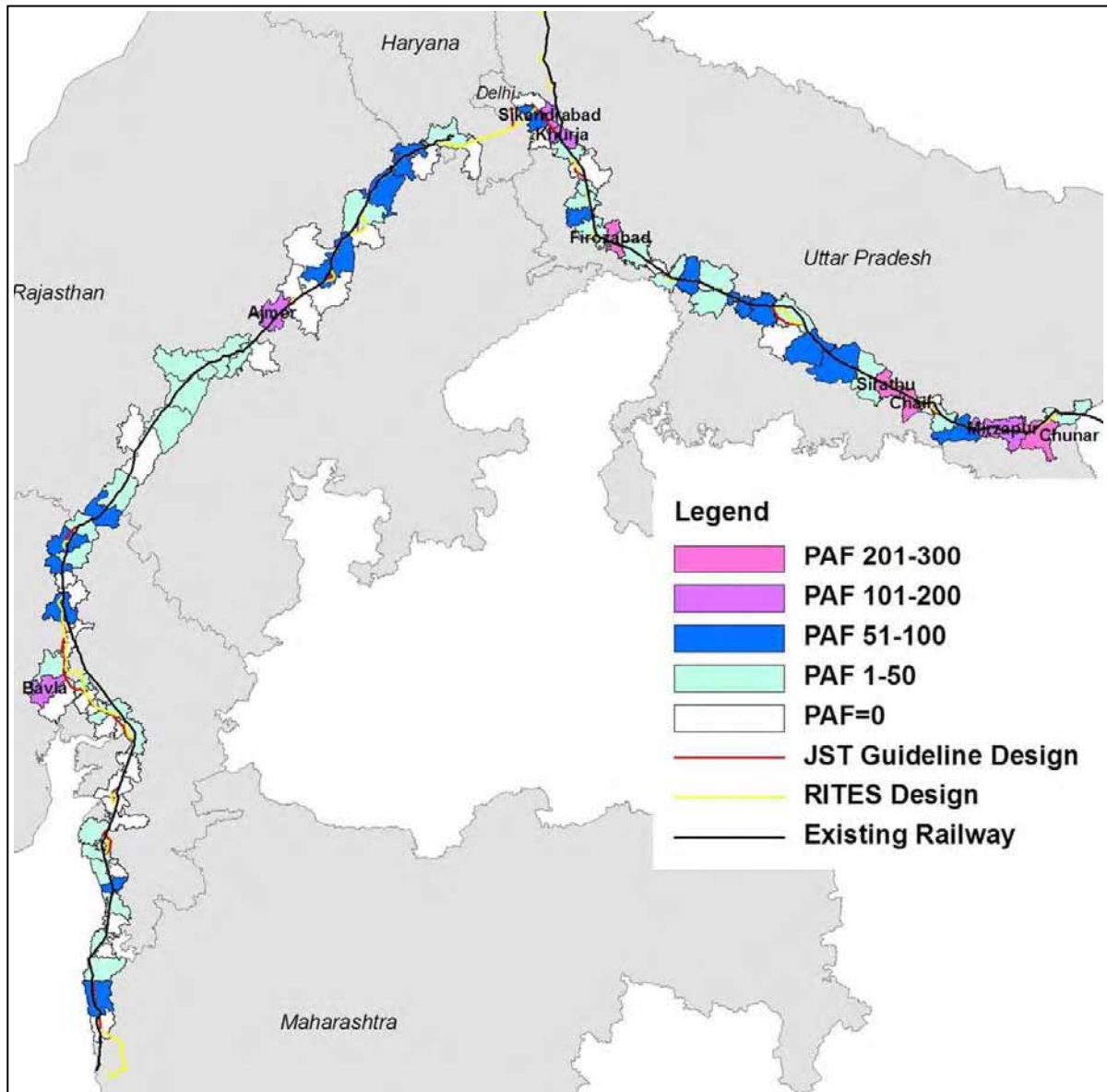
Table 10-25 Number of Structures and of Illegal Occupants to be Relocated

State	District	Structures to be Relocated ¹⁾ (Number of Structures)	Illegal Occupants to be Relocated (Number of People)
Western Corridor			
Haryana	Rewari	120	20
	Mehendragarh	117	0
Rajasthan	Alwar	0	0
	Sikar	61	0
	Nagaur	0	0
	Jaipur	36	0
	Ajmer	185	0
	Pali	51	0
	Sirohi	149	0
Gujarat	Banas Kantha	22	0
	Patan	87	110
	Mahesana	15	0
	Gandhinagar	10	0
	Ahmedabad	15	0
	Kheda	10	0
	Anand	0	0
	Vadodara	10	0
	Bharuch	33	15
	Surat	59	30
	Navsari	64	105
	Valsad	20	41
Maharashtra	Thane	376	371
Sub-total		1,440	692
Eastern Corridor			
Uttar Pradesh	Chandauri	5	0
	Mizapur	391	185
	Allahabad	108	2
	Kaushambi	510	0
	Fatehpur	136	33
	Kanpur Nagar	17	0
	Kanpur Dehat	152	0
	Auraiya	69	0
	Etawah	98	0
	Firizabad	244	0
	Agra	40	0
	Hatras	110	0
	Aligarh	48	0
	Bulandsharh	317	0
Gautam Buddha Nagar	78	0	
Sub-total		2,323	220
Total		3,763	912

Note: 1) The number of structures to be relocated includes residential buildings, commercial buildings, residential/commercial buildings, and illegal occupants.

2) Above data was summarized based on the field survey as of August 2007.

Figure 10-1 shows sub-district-wise distribution of structures to be relocated. There are some sub-districts which do not have any structures to be relocated, on the other hand, there are many sub-districts where less than 50 or less than 100 structures to be relocated. Additionally, at the village level, 20% of 1,200 affected villages, approximately 200 villages, will be likely to be relocated.



Note: The number of PAFs includes houses, small-scale shops, and small shops cum houses

Figure 10-21 Sub-district-wise Distribution of Number of PAFs to be Relocated

Impact Matrix of Social Impacts for Whole Study Area is shown below. Impact Matrices of Social Impacts for each district are shown in the 37 district-wise ESIMMS Reports.

Table 10-26 Impact Matrix of Social Impacts for Whole Study Area

No.	Items of the Environment Subject to	Project Activities																									
		Pre-construction	Construction Stage										Post-construction Stage														
		Overall Evaluation on the Project	Surveying of Planned Areas and Sites	Selection of the Project Location and Sites	Land Acquisition and Resettlement	Excavation of Building Materials (stones, aggregates, sand, soil, etc.) at Quarries and Borrow Areas	Earth Moving, Cutting and Filling of the Construction Works	Preparation of Construction Plants, and Warehouses, Work Camps, etc.	Operation of Construction Plants, Machine and Vehicles for Construction Works	Installation of Related Facilities (gas tanks, milk, etc.)	Construction Works for Railway Lines and related structures	Construction Works for ROBs and RUIBs	Construction Works for Stations (Platform, Junction and Crossing)	Construction Works for ROBs and RUIBs	Construction Works for Bridges	Construction Works for Tunnels	Localized Employment Opportunities of the Construction Works	Localized Business Opportunities Related to the Construction Works	Traffic Conditions of Passenger Freight Trains	Logistics Condition of Goods, Raw Materials, Agricultural and Industrial Products	Traffic Condition of Roads	Operation and Maintenance of Railway Lines and Related Structures	Employment Opportunities (whole country/local level)	Freight-oriented Business Opportunities	Passenger Oriented Business Opportunities	Promoting Development of Surrounding Area	Increase in Settlers and Visitors to the Project Area
1	Involuntary Resettlement																										
	a. General People	B-	E	E	B-	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
	b. Socially and Physically Disadvantaged	B-	E	E	B-	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
	c. Minorities and Scheduled Caste/Tribes	B-	E	E	B-	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
2	Local Economy such as Employment and Livelihood etc.	B+	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
3	Land Use and Utilization of Local Resources	B-	E	E	E	B-	B-	C-	E	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-
4	Social Institutions, Social Infrastructures and Local Decision-making Process	B-	E	E	B-	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
5	Existing Infrastructures and Services	B+	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
6	Vulnerable Social Groups such as the Poor and Indigenous People																										
	a. Households below the Poverty Line	B-	E	E	A-	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
	b. Scheduled Castes and Tribes	B-	E	E	A-	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
7	Gender	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
8	Children's Rights	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
9	Distribution of Benefits and Losses and Equality in the Development Process	B+	E	E	B-	E	E	E	E	E	E	E	E	E	E	B+	B+	E	E	E	E	E	B+	E	E	E	
10	Local Conflict of Interests	C-	E	E	E	C-	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
11	Cultural Property and Heritage	D-	E	E	E	D-	D-	E	E	E	D-	D-	D-	D-	E	E	E	E	E	E	E	E	E	E	E	E	E
12	Public Health Conditions																										
	a. Infectious Disease (including HIV/AIDS)	C-	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
	b. Other Health Problems	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
13	Water Rights/Rights of Common Land	C-	E	E	C-	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
14	Hazards and Risk																										
	a. Traffic Accidents	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
	b. Natural Hazards	C-	E	E	E	C-	C-	C-	E	E	E	E	E	C-	E	E	E	E	E	E	E	E	E	E	E	E	E

Note: A - Very significant impact, B - Relatively significant impact, C - Insignificant impact, D - Neglectable impact, E - No impact, + - Positive, - - Negative

10.4 NATURAL ENVIRONMENTAL STUDY

10.4.1 The Scope of the Natural Environmental Study

Following the basic concept for the DFC Project that the new DFC railway will be constructed along with the existing railway and the scoping at the result of the ESCS (IEE level study), the impacts to the wildlife sanctuaries and recorded forests such as protected and reserved forests which directly affected by the project were identified as the main study components of this natural environmental study. The details of this study regarding the locations of wildlife sanctuaries and recorded forests are described in "Volume 4 Technical Working Paper Task 2, 10-(3)".

10.4.2 Summary of Results of the Natural Environment Survey

Location of wildlife sanctuaries along the DFC project area, distribution of reserved and protected forests along the DFC project, and number of trees to be butted by DFC project are shown in Figure 10-22, Figure 10-23, and Figure 10-24, respectively. In addition, areas required forest clearance and trees removal outside of designated forests are shown in Table 10-27 and Table 10-28, respectively.

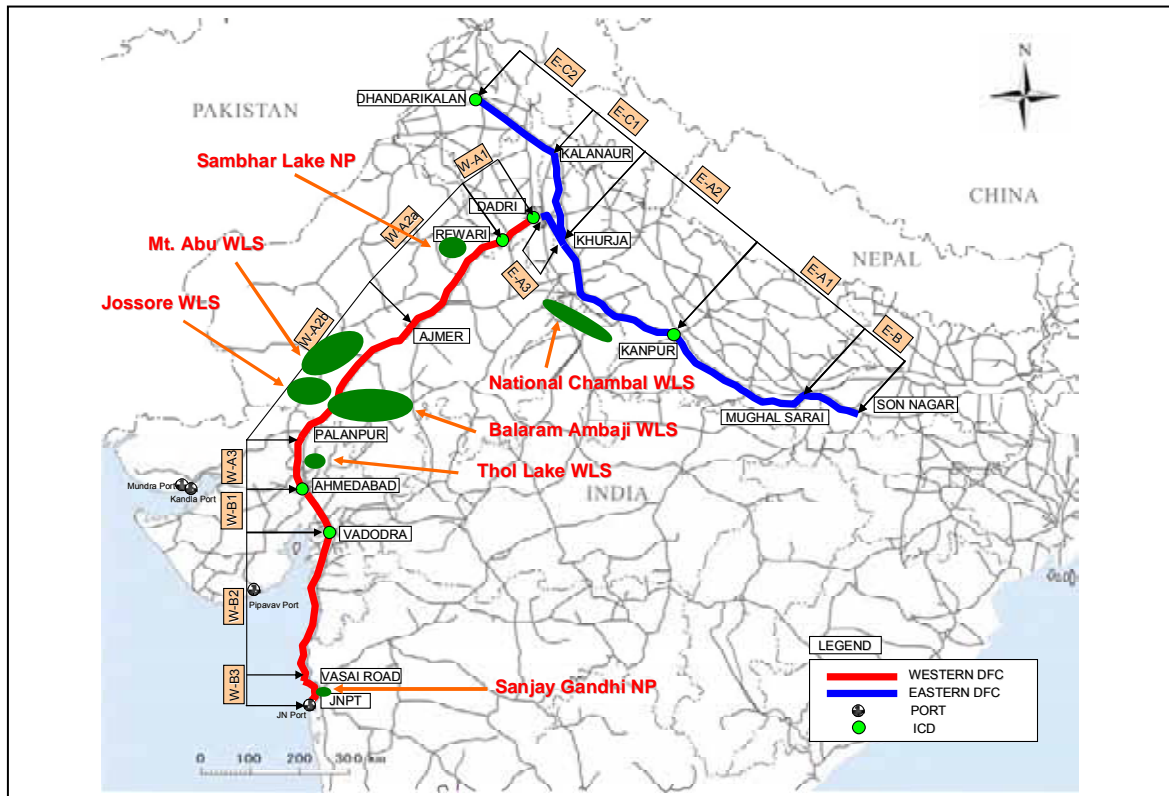


Figure 10-22 Location of Wildlife Sanctuaries along the DFC Project Area

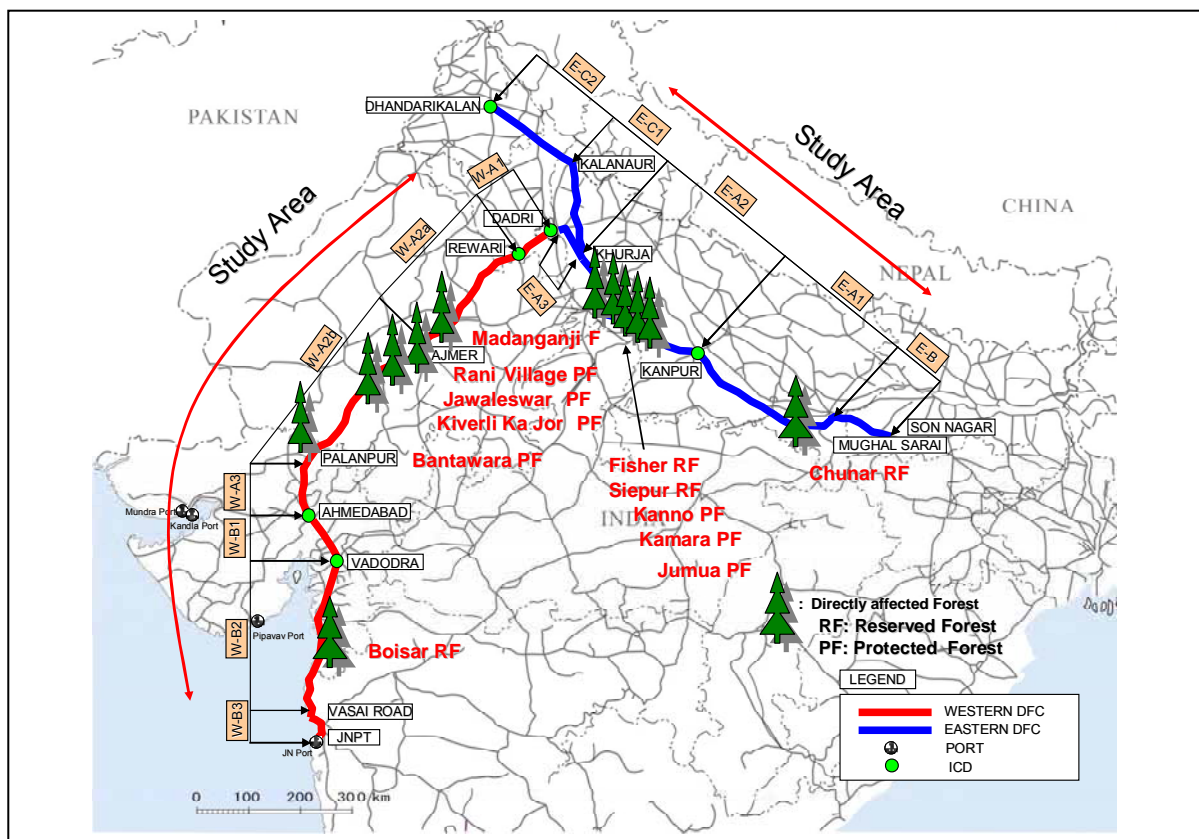


Figure 10-23 Distribution of Reserved and Protected Forests along the DFC Project

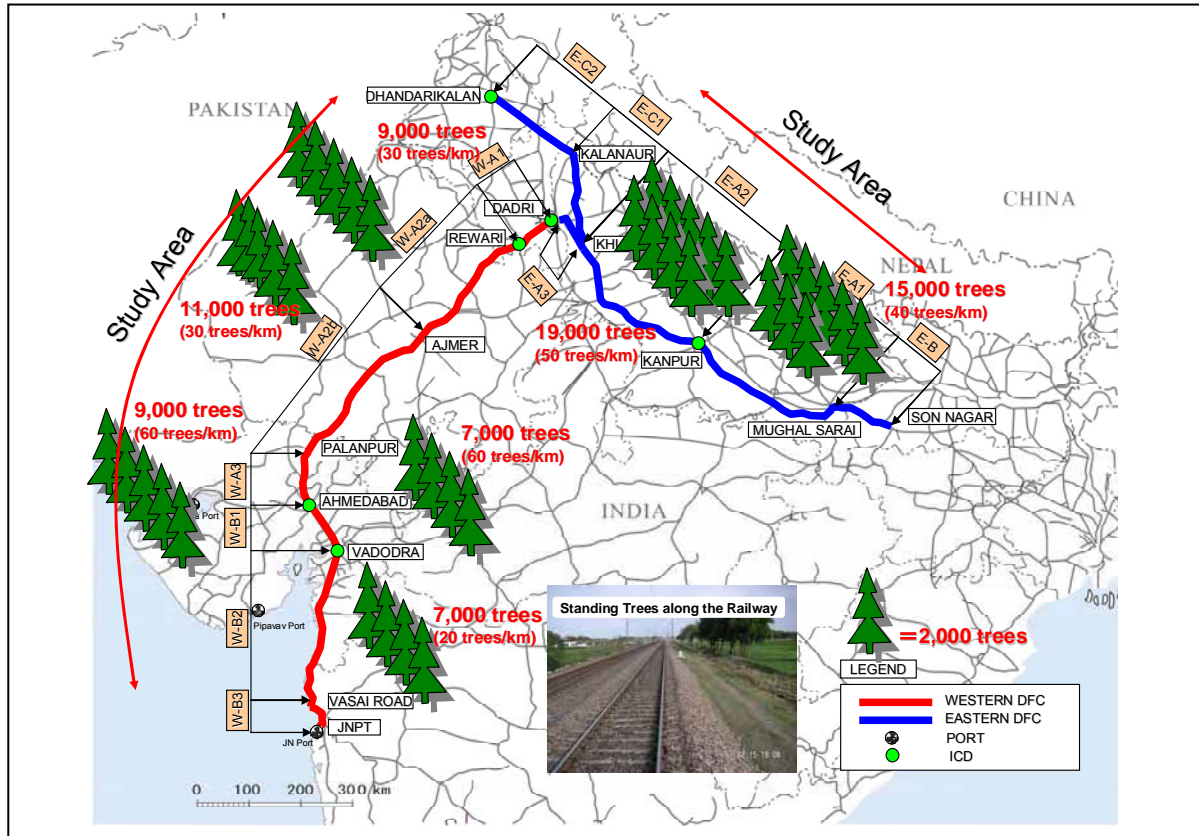


Figure 10-24 Number of Trees to be Cutted by DFC Project

Table 10-27 Areas Required Forest Clearance (Reserved and Protected Forests)

1) Western Corridor (Vasai Road-Rewari)

No	Section	District	Name of Forest where DFC railway passes through	Forest type	Major spp.	Approx length along the rly(km)	Approx affected area in ha	Remark
Protected forest								
1	Palanpur	Ajmer	Sirohi, Rajasthan	Kivarli ka Jor Open forest (Near Kivarli R.S.)	Tropical thorn forest	<i>Acacia</i> spp.	0.75	1 Parallel
2	Palanpur	Ajmer	Pali, Rajasthan	Rani village Open forest	Tropical thorn forest	<i>Acacia</i> spp.	2.75	4 Parallel
3	Palanpur	Ajmer	Pali, Rajasthan	Jawaleaswar Open forest	Tropical thorn forest	<i>Acacia</i> spp.	4	5 Parallel
4	Ajmer	Rewari	Ajmer, Rajasthan	Madanganji Protected forest (Kishangar)	Tropical thorn forest	<i>Acacia</i> spp.	3.35	15 Detour
			Sub-total			10.85	24	

No	Section	District	Name of Forest where DFC railway passes through	Forest type	Major spp.	Approx length along the rly(km)	Approx affected area in ha	Remark
Protected forest								
1	Palanpur	Ajmer	Banas kantham Gujarat	Bantawara Unclassified forest	Tropical thorn forest	<i>Acacia</i> spp.	1	4 Detour
2	Palanpur	Ajmer	Banas Kantha, Gujarat	Jethi Reserved forest	Tropical thorn forest	<i>Acacia</i> spp.	1.58	2 Detour
3	Palanpur	Ajmer	Banas Kantha, Gujarat	Malana Reserved forest	Tropical thorn forest	<i>Acacia</i> spp.	0.39	1 Detour
			Sub-total			2.97	7	
Reserved forest								
1	Vasai road	Vadodara	Thane, Maharashtra	Boisar Reserve forest	Tropical deciduous forest	<i>Carissa carandas</i> , <i>Butea monosperma</i>	8.5	11 Parallel
			Sub-total			8.5	11	
			G-total in Maharashtra & Gujarat			11.47		
			G-total in Western corridor			22.32	18	

2) Eastern Corridor (Mughal Sarai-Dadri)

No	Section	District	Name of Forest where DFC railway passes through	Forest type	Major Spp.	Approx length along the rly(km)	Approx affected area in ha	Remark
Protected forest								
1	Kanpur	Khurja	Auraiya, UP	Kanno Protected Forest,	Tropical deciduous forest (under rehabilitation)	<i>Prosopis juliflora</i>	3	3.90 Paralell
2	Kanpur	Khurja	Auraiya, UP	Kamara Protected Forest	Tropical deciduous forest (under rehabilitation)	<i>Prosopis juliflora</i>	0.32	0.42 Paralell
3	Kanpur	Khurja	Etawah	Jumua Protected Forest, Kanna	Tropical deciduous forest (under rehabilitation)	<i>Prosopis juliflora</i>	0.8	1.04 Paralell
			Sub-total			4.12	5.36	
Reserved forest								
1	Mughal Sarai	Kanpur	Mirzapur	Chunar Reserved Forest	Dry deciduous forest	<i>Terminaria arjuna</i>	0.06	0.08 Parallel
2	Kanpur	Khurja	Etawah	Fisher Reserved Forest	Dry deciduous forest (under rehabilitation)	<i>Prosopis juliflora</i>	3	13.05 Detour
3	Kanpur	Khurja	Etawah	Siehpur reserved Forest	Tropical deciduous forest (under rehabilitation)	<i>Prosopis juliflora</i>	0.1	0.13 Parallel
			Sub-total			3.16	13	

Table 10-28 Trees Removal outside of Designated Forests

1) Western Corridor (Vasai Road-Rewari)

Section		No. of trees at detour section		No. of trees at parallel section	
From	to	Length (km)	Trees in Agricultural land ¹⁾ (No./km)	Length (km)	Trees in Agricultural land (No./km)
Dadri	Rewari	74	4,000 trees 54 trees/km	12	200 trees 17 trees/km
Rewari	Ajmer	32	1,700 trees 53 trees/km	278	7,700 trees 28 trees/km
Ajmer	Palanpur	18	600 trees 33 trees/km	352	10,300 trees 29 trees/km
Palanpur	Ah. bad	74	4,500 trees 61 trees/km	61	1,700 trees 28 trees/km
Ahmedabad	Vadodara	139	8,500 trees 61 trees/km	0	0 trees 0 trees/km
Vadodara	Vasai Rd.	54	2,700 trees 50 trees/km	285	4,300 trees 15 trees/km
Vasai Rd.	JNPT	0	0 trees 0 trees/km	92	1400 trees 15 trees/km
	Total	391	22,000 trees	1,080	25,600 trees
		-	56 trees/km	-	24 trees/km

2) Eastern Corridor (Mughal Sarai-Dadri)

Section		No. of trees at detour section		No. of trees at parallel section	
From	to	Length (km)	Trees in Agricultural land ¹⁾ (No./km)	Length (km)	Trees in Agricultural land (No./km)
M. Sarai	Kanpur	26	1,400 trees 54 trees/km	321	13,900 trees 43 trees/km
Kanpur	Khurja	117	6,300 trees 54 trees/km	233	12,400 trees 53 trees/km
Khurja	Dadri	0	0 tree 0 trees/km	46	700 trees 15 trees/km
S. Nagar	M. Sarai	0	0 tree 0 trees/km	107	1,700 trees 16 trees/km
Khurja	Kalanauru	49	2,600 trees 53 trees/km	182	2,900 trees 16 trees/km
Kalanaru	Dh.Kalan	72	3,900 trees 54 trees/km	105	1,700 trees 16 trees/km
	Total	264	14,200 trees	994	33,300 trees
		-	54 trees/km	-	34 trees/km

Note : Widths of the land acquisition are assumed as 13 m in parallel section and 43.5 m in detour section.

¹⁾ Number of trees are estimated based on the estimated land acquisition area and No. of trees per ha of arable Non-Forest Area

10.4.3 Natural Environmentally Affected Areas in the Western Corridor

(1) Vasai Road – Vadodara

1) Parallel Section

- The DFC alignment runs generally alongside the existing railway line on the western coast of India and there is no direct and significant impacts caused by the Project to the geography and geology of the section.

- The DFC alignment passes through the Boisar Reserved Forest which is located between Boisar and Vangaon Stations at the parallel section in Maharashtra. Dominant species in the forest are *Carrisa carandua*, *Batua monosperma*, and those are affected approximately 8.5 km of length and 11 ha in the area by assuming the widths of land acquisition is 13 m. Any individuals and field sign of endangered species were not found near the existing railway as a result of the field survey as well as no record of the endangered species in the Divisional Office which manage the Wildlife Sanctuary. Also, no tree is required to be felled due to the area is open condition at present and *Acacia auriculiformis*, *Eucalyptus spp*, *Tectona grandis* are found near the existing railway .
 - There are approximately 4,300 trees alongside of the existing track by assuming the acquisition land is agricultural land and the width of the land acquisition is 13 m. The trees will be affected and be removed.
- 2) Detour Section
- There is no significant impact topographically in the detour section in Surat and Bharuch. The area is topographically flat, and the area is mostly used as agricultural land.
 - Further study on the alignment and impact assessment on Sanjay Gandhi National Park are required for near new Vasai Road Jn. Station, which is under consideration.
 - The new detour route between Vasai Road and Vadodara is passing through the foot of the hilly area and require relatively long cuttings. Thus, the adequate soil erosion prevention such as greening will be required at the construction stage.
- 3) Reconstruction of ROB
- There no any particular expected impact.
- 4) Bridges over Important Rivers
- Between Vasai Road and Vadodara, there are 2 planned bridges which cross over 2 important rivers in the parallel section in Thane District, Maharashtra: South Vaitarna and North Vaitarna. There are 8 planned important bridges to cross important rivers in Valsad, Gujarat: Daman Ganga, Par; Auranga, South Kaveri, North Kaveri, Ambika, N.Poorna and Mindhola. These 10 bridges will be constructed by widening the existing bridges. The construction work to widen the existing bridges is in progress. During construction, some adverse impacts are expected such as temporarily increased turbidity of river water and impacts on aquatic organisms during the construction period.
 - There are 2 important river bridges cross over 2 important rivers: Tapi River in the Surat detour section and Narmada River in the Bharuch detour section. During construction, some adverse impacts are expected, such as temporarily increased turbidity of river water and impacts on aquatic organisms during the construction period.

Impact matrix for the concerned section is shown below.

Table 10-29 Impact Matrix (Vasai Road-Vadodara)

No.	Items of the Environment Subject to	Project Activities																							
		Pre-construction						Construction Stage						Post-construction Stage											
		Overall Evaluation on the Project						Construction Works for railway line and related structures						Construction Works for related facilities											
		Surveying of Planned Areas and Sites	Selection of the Project Location and Sites	Land Acquisition and Resettlement	Extraction of Building Materials (stones, aggregates, sand, soil, etc.)	Earth Moving: Cutting and Filling of the Construction Works	Preparation of Construction Plants and Warehouses, Work Camps, etc.	Operation of Construction Plants, Bussines and Vendors for Construction Works	(A) Construction Works for Railway Lines and Installation of Related Facilities (signals, rails, etc.)	(B) Construction Works for ICDBs and Freight Logistic Parks	(C) Construction Works for Stations (Terminal, Junction and Crossing)	(D) Construction Works for ROBs and RUBs	(E) Construction Works for Bridges	(F) Construction Works for Tunnels	Localized Employment Opportunities in the Construction Works	Localized Business Opportunities Related to the Construction Works	Traffic Conditions of Passenger/Freight Trains	Logistic Condition of Goods, Raw Materials, Agricultural and Industrial Products	Traffic Condition of Roads	Operation and Maintenance of Railway Lines and Related Structures	Employment Opportunities (whole country/local level)	Freight-oriented Business Opportunities	Passenger Oriented Business Opportunities	Promoting Development of Surrounding Area	Increase in Settlers and Visitors to the Project Area
15	Topography and Geology	C	C	C	E	C	D	C	C	C	C	C	C	E	-	-	-	-	D	-	-	-	-	D	
16	Soil Erosion	B	C	C	E	C	D	C	C	C	C	C	C	E	-	-	-	-	D	-	-	-	-	D	
17	Groundwater	C	D	D	E	C	C	C	D	C	C	C	C	E	-	-	-	-	D	-	-	-	-	D	
18	Hydrological Conditions (Rivers, Lakes, etc.)	B	D	D	E	C	C	C	D	C	C	C	C	E	-	-	-	-	D	-	-	-	-	D	
19	Coastal and Marine Environment	C	C	C	E	C	C	C	D	C	C	C	C	E	-	-	-	-	D	-	-	-	-	D	
20	Fauna, Flora and Biodiversity	B	B	C	E	C	C	B	B	C	B	C	E	-	-	-	-	D	-	-	-	-	C		
21	Protected Areas, Natural/ecological Reserves and Sanctuaries	A	A	A	E	C	A	A	C	A	C	C	E	-	-	-	-	A	-	-	-	-	B		
22	Landscape	C	D	D	E	C	C	C	C	C	C	C	E	-	-	-	-	D	D	-	-	-	C		
23	Local Meteorological Conditions	C	D	D	E	C	C	C	C	C	C	C	D	E	-	-	-	-	D	D	-	-	-	C	
24	Global Warming	C	C	C	E	C	C	C	C	C	C	D	E	-	-	-	-	C+	C	-	-	-	-	D	

Note: A - Very significant impact, B - Relatively significant impact, C - Insignificant impact, D - Neglectable impact, E - No impact, +- Positive, - - Negative

(2) Vadodara - Ahmedabad

There is only detour section between Vadodara and Ahmedabad.

1) Detour Section

- The DFC alignment was designed to avoid major cities along the existing railway. The area is generally transition area between the coastal flat area at Arabian Sea Coast and the hilly area of the Aravalli Range. The DFC alignment passes through partly an erosive river terrace of Mahi River. There is no major impact of the project topographically, though some earth works such as cutting and embankment are planned which would cause soil erosion.
- There are no other protection areas for endangered species and/or fragile ecosystem directly affected by the project.
- There is one protected reptile species: Indian softshell turtle (*Aspideretes gangeticus*), one of terrapins, around Mahi River in Vadodara and Kheda districts. The terrapin inhabits in near the Mahi River and use the river for coupling during the monsoon season. The species is protected by Indian law, as a species in Appendix-1 in Wildlife Protection Act 1972 and its trades are generally prohibited. Also, it is listed as one of vulnerable species in the Red list of International Union for Conservation of Nature and Natural Resources (IUCN). It is considered that the reason for its declined population is illegal extraction by human for edible use.
- Approximately 8,500 trees would be removed at detour section between Vadodara and Ahmedabad by assuming the width of the new construction which will be 43.5 m in the detour section and the mean number of trees in the agricultural land is 14.1 trees/ha.

2) Reconstruction of ROB

- There no any particular expected impact.

3) Bridges over Important Rivers

- Two important rivers, Mahi and Siri Rivers are crossed by the DFC alignment in the detour section. During construction, some adverse impacts are expected, such as temporarily increased turbidity of river water and impacts on aquatic organisms. The construction during the monsoon season should be avoided not to disturb wild animal propagation.

Impact matrix for the concerned section is shown below.

Table 10-30 Impact Matrix (Vadodara-Ahmedabad)

No.	Items of the Environment Subject to Project Activities	Pre-construction												Construction Stage												Post-construction Stage					
		Overall Evaluation on the Project												Construction Works for railway line and related structures																	
		Surveying of Planned Areas and Sites	Selection of the Project Location and Sites	Land Acquisition and Resettlement	Excavation of Building Materials (stone, brick, sand, etc.)	Earth Moving, Coffering and Filling of the Construction Works	Preparation of Construction Plans, and Warehouses, Work Camps, etc.	Operation of Construction Plants, Machines and Vehicles for Construction Works	A) Construction Works for Railway Lines and Installation of Related Facilities (signals, etc.)	B) Construction Works for CDBs and Freight Logistic Parks	C) Construction Works for Stations (Terminal, Junction and Crossing)	D) Construction Works for ROB and RUBs	E) Construction Works for Bridges	F) Construction Works for Tunnels	Localized Employment Opportunities of the Construction Works	Localized Business Opportunities Related to the Construction Works	Traffic Conditions of Passenger/Freight Trains	Logistic Condition of Goods, Raw Materials, Agricultural and Industrial Products	Traffic Condition of Roads	Operation and Maintenance of Railway Line and Related Structures	Employment Opportunities (whole country level level)	Fresh-vented Business Opportunities	Passenger Oriented Business Opportunities	Promoting Development of Surrounding Area	Increase in Settlers and Visitors to the Project Area						
Natural Environment	15 Topography and Geology	C-	D-	D-	D-	C-	C-	D-	C-	C-	C-	C-	C-	-	-	-	-	-	-	-	-	-	-	-							
	16 Soil Erosion	B-	C-	D-	D-	C-	C-	D-	C-	B-	B-	B-	B-	-	-	-	-	-	-	-	-	-	-	-							
	17 Groundwater	C-	D-	D-	D-	C-	C-	C-	C-	C-	C-	C-	C-	-	-	-	-	-	-	-	-	-	-	-							
	18 Hydrological Conditions (Rivers, Lakes, etc.)	B-	D-	D-	D-	C-	C-	D-	C-	C-	C-	C-	B-	-	-	-	-	-	-	-	-	-	-	-							
	19 Coastal and Marine Environment	B-	C-	D-	D-	C-	C-	D-	C-	C-	C-	C-	B-	-	-	-	-	-	-	-	-	-	-	-							
	20 Fauna, Flora and Biodiversity	C-	C-	D-	D-	C-	C-	C-	C-	C-	C-	C-	C-	-	-	-	C+	C+	D-	-	-	-	-	-							
	21 Protected Areas, Natural/ecological Reserves and Sanctuaries	D-	D-	D-	D-	D-	D-	D-	D-	D-	D-	D-	D-	-	-	-	-	-	-	D-	-	-	-	-							
	22 Landscape	C-	D-	D-	D-	C-	C-	C-	C-	C-	C-	C-	C-	-	-	-	-	-	-	D-	-	-	-	-							
	23 Local Meteorological Conditions	D-	D-	D-	D-	C-	D-	D-	D-	D-	D-	D-	D-	-	-	-	-	-	-	-	-	-	-	-							
	24 Global Warming	D-	D-	D-	D-	D-	D-	D-	D-	D-	D-	D-	D-	-	-	-	-	-	-	C+	-	C+	D-	-							

Note: A - Very significant impact, B - Relatively significant impact, C - Insignificant impact, D - Neglectable impact, E - No impact, +- Positive, - - Negative

(3) Ahmedabad-Palanpur

1) Parallel Section

- From the northern part of Mahesana District, the DFC alignment was planned to be constructed in parallel to the existing railway. The area is the transition area between a coastal flat area at Arabian Sea Coast and hilly area of the Aravalli Range. Thus, there is no major impact topographically.
- There are no other protection areas for endangered species and/or fragile ecosystem directly affected by the project.
- Approximately 1,700 trees will be removed in the parallel section between Sunheripura in Mahesana District and Chahapi in Banas Kantha District. Planted *Acacia spp.* and *Azadirachta spp.* are likely to be removed.

2) Detour Section

- Some 4,500 trees will be removed in agricultural area at detour section between Ahmedabad and Mahesana by assuming the width of the new construction will be 43.5 m for the detour section and the mean number of trees in the agricultural land is 14.1 trees/ha.
- There is a small scale wildlife sanctuary, Thol Lake Wildlife Sanctuary (Bird sanctuary), in Kadi sub-district, Mahesana District approximately 200 m from the DFC alignment. The detour route was designed to avoid the sanctuary. Further study on indirect impacts is required at the Detailed Design stage.

3) Reconstruction of ROB

- There is no particular expected impact.

4) Bridges over Important Rivers

- The DFC alignment crosses 2 important rivers of Sabarmati River in the detour section and Saraswati River in the parallel section from the north of Mahesana District. The locations of the bridges were selected to ensure enough water flow after construction. During construction, some adverse impacts are expected, such as temporarily increased turbidity of river water and impacts on aquatic organisms.

Impact matrix for the concerned section is shown below.

is 43.5 m). Tree inventory survey will be required at the detail design stage.

- In Banas Kantha district, the new detour alignment is passing through the Jethi Reserved Forest, approximately 1.6 km of the length. *Acacia spp.* dominated forest is likely to be affected. Tree inventory survey will be required at the detail design stage.
 - In Banas Kantha district, the new detour alignment is passing through the Malana Reserved Forest approximately 0.4 km of the length. *Acacia spp.* dominated forest is likely to be affected. Tree inventory survey will be required at the detail design stage.
- 3) Reconstruction of ROB
- There is no particular impact.
- 4) Bridges over Important Rivers
- There is no important river at the section.

Impact matrix for the concerned section is shown below.

Table 10-32 Impact Matrix (Palanpur-Ajmer)

No.	Items of the Environment Subject to Project Activities	Construction Stage																								
		Pre-construction				Construction Works for railway line and related structures								Post-construction Stage												
Overall Evaluation on the Project		Surveying of Planned Areas and Sites	Selection of the Project Location and Sites	Land Acquisition and Resettlement	Excavation of Building Materials (Gravel, Sand, etc.)	Earth Moving, Cutting and Filling of the Construction Works	Preparation of Construction Plans, and Warehouses, Work Camp, etc.	Operation of Construction Plants, Machines and Vehicle for Construction Works	A) Construction Works for Railway Lines and Installation of Related Facilities (signals, units, etc.)	B) Construction Works for ICDS and Freight Logistic Parks	C) Construction Works for Stations Terminal, Junction and Crossing	D) Construction Works for ROBs and RUBs	E) Construction Works for Bridges	F) Construction Works for Tunnels	Localized Employment Opportunities of the Construction Works	Localized Business Opportunities Related to the Construction Works	Traffic Condition of Passenger Freight Trains	Logistic Condition of Goods, Raw Materials, Agricultural and Industrial Products	Traffic Condition of Roads	Operation and Maintenance of Railway Lines and Related Structures	Employment Opportunities (whole country/lead level)	Freight-oriented Business Opportunities	Passenger Oriented Business Opportunities	Promoting Development of Surrounding Area	Increase in Settlers and Visitors to the Project Area	
Natural Environment	15 Topography and Geology	C	D	E	C	C	D	D	D	C	C	D	C	C												
	16 Soil Erosion	C	D	D	C	D	D	D	D	C	C	D	C	C												
	17 Groundwater	C	D	D	C	D	D	D	D	C	C	D	C	C												
	18 Hydrological Conditions (Rivers, Lakes, etc.)	C	D	D	C	C	D	C	D	C	C	D	C	C												
	19 Coastal and Marine Environment	C	D	D	C	C	D	D	D	C	C	D	C	C												
	20 Fauna, Flora and Biodiversity	B	C	C	C	C	C	B	C	C	C	C	C	C										C	C	
	21 Protected Areas, Natural/Ecological Reserves and Sanctuaries	C	C	C	C	C	C	C	C	C	C	C	C	C												
	22 Landscape	C	D	D	C	D	D	D	D	C	D	D	D	D												
	23 Local Meteorological Conditions	D	D	D	D	D	D	D	D	C	D	D	D	D												
24 Global Warming	C	D	D	D	D	D	D	D	D	C	C	C	C													

Note: A - Very significant impact, B - Relatively significant impact, C - Insignificant impact, D - Neglectable impact, E - No impact, +- Positive, — - Negative

(5) Ajmer - Rewari

- 1) Parallel section
- The DFC new railway will be constructed mainly alongside the existing railway which passes through the area of western foot of Aravalli Range. The existing railway passes through rocky and hilly area. Associate with the ground construction work such as rock cutting, some disturbances to wildlife is anticipated in surroundings.
 - Approximately 4,400 trees, mainly *Acacia spp.*, would be removed in parallel section in Ajmer, Nagaur, Jaipur, Sikar and Alwar Districts in Rajasthan based on the sampling survey.
 - Approximately 3,200 trees, mainly *Acacia spp.*, would be removed in the parallel section at Mahendragarh and Rewari Districts based on the sampling survey.
- 2) Detour section
- The DFC alignment passes through Madanganji Protected Forest in the detour section in Kishangarh, Rajasthan. The forest where *Prosopis cineraia*, *Acacia arabica*, and *Tecomella undulata* are dominant is likely to be affected for approximately 3.4 km, and the trees are likely to be removed.
 - Approximately 1,700 trees of *Acacia spp.* grown in the agricultural land would be removed in Rewari detour section by assuming the width of the new construction will

be 43.5 m at detour section and the mean number of trees in the agricultural land is 12.3 trees/ha.

- 3) Reconstruction of ROB
 - There is no particular impact.
- 4) Bridges over Important Rivers
 - There is no important river in the section.

Impact matrix for the concerned section is shown below.

Table 10-33 Impact Matrix (Ajmer-Rewari)

No.	Items of the Environment Subject to	Project Activities																		
		Overall Evaluation on the Project																		
		Pre-construction																		
		Construction Stage																		
		Construction Works for railway line and related structures																		
		Post-construction Stage																		
		Construction Works for Stations (Terminal, Junction and Crossing)																		
		Construction Works for ROBs and RUBs																		
		Construction Works for Bridges																		
		Construction Works for Tunnels																		
		Localized Employment Opportunities of the Construction Works																		
		Localized Business Opportunities Related to the Construction Works																		
		Traffic: Conditions of Passenger/Freight Trains																		
		Logistic Condition of Goods, Raw Materials, Agricultural and Industrial Products																		
		Traffic Condition of Roads																		
		Operation and Maintenance of Existing and Proposed Structures																		
		Employment Opportunities (whole country/local level)																		
		Freight-oriented Business Opportunities																		
		Passenger Oriented Business Opportunities																		
		Promoting Development of Surrounding Area																		
		Increase in Settlers and Visitors to the Project Area																		
15	Topography and Geology	B-	C-	C-	D-	D-	B-	C-	D-	D-	D-	C-	C-	-	-	-	-	-	-	-
16	Soil Erosion	C-	-	-	C-	C-	D-	D-	-	-	C-	C-	C-	-	-	-	-	-	-	-
17	Groundwater	C-	-	-	C-	C-	D-	C-	-	-	C-	C-	C-	-	-	-	-	-	-	-
18	Hydrological Conditions (Rivers, Lakes, etc.)	C-	-	-	C-	C-	D-	-	-	-	C-	C-	C-	-	-	-	-	-	-	-
19	Coastal and Marine Environment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	Fauna, Flora and Biodiversity	B-	C-	C-	B-	C-	C-	C-	C-	C-	C-	C-	C-	-	-	-	-	-	-	-
21	Protected Areas, Natural/ecological Reserves and Sanctuaries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	Landscape	C-	-	-	C-	C-	D-	D-	C-	D-	C-	C-	C-	-	-	-	-	-	-	-
23	Local Meteorological Conditions	D-	-	-	D-	D-	D-	D-	D-	D-	-	-	-	-	-	-	-	-	-	-
24	Global Warming	D-	-	-	D-	D-	D-	D-	D-	D-	-	-	-	-	-	-	-	-	-	-

Note: A - Very significant impact, B - Relatively significant impact, C - Insignificant impact, D - Neglectable impact, E - No impact, +- Positive, - - Negative

10.4.4 Natural Environmentally Affected Area in the Eastern Corridor

(1) Mughal Sarai - Kanpur

1) Parallel Section

- DFC Project's railway line runs along the existing railway line which is located on the flat plain at Ganga River Basin. Topographical and geological impacts to the existing environment are minor.
- There is no direct impact on protected areas such as a national park, wildlife sanctuary and wet land which are vulnerable and unique.
- In the parallel section, Mirzapur District, the DFC alignment passes through the area of Chunar Reserve Forest, where dominant species are *Terminalia arjuna*, *Mangifera indica*. The land for approximately 60 m will be affected.
- In the parallel section, Mirzapur District, any individual or field sign of endangered species were not found based on the field survey.
- Approximately 13,900 trees which were planted along the railway are likely to be removed in the parallel section based on the sampling survey.

2) Detour Section

- Approximately 1,400 trees are likely to be removed in the detour section of Kanpur. The estimation was made by assuming the width of the new construction will be 43.5 m in the detour section, and the mean number of trees in the agricultural land is 12.3 trees/ha.

- 3) Reconstruction of ROB
 - There is no particular expected impact.
- 4) Bridges over Important Rivers
 - In the parallel section between Mughal Sarai and Allahabad, the DFC alignment passes through an important river, Tonse River. There is no record on the habitats of important protected species in the area.
 - In the detour section of Allahabad, the DFC alignment passes through an important river, Yamuna River. There is no record on the habitats of important protected species in the area.

Impact Matrix for the concerned section is shown below.

Table 10-34 Impact Matrix (Mughal Sarai-Kanpur)

No.	Items of the Environment Subject to	Project Activities																																		
		Pre-construction									Construction Stage										Post-construction Stage															
		Overall Evaluation on the Project	Surveying of Planned Areas and Sites	Selection of the Project Location and Sites	Land Acquisition and Resettlement	Excavation of Building Materials (except for Gravel and Barren Areas)	Earth Moving, Grading and Filling of the Construction Works	Preparation of Construction Plants, and Warehouses, Work Camps, etc.	Operation of Construction Plants, Machines and Vehicles for Construction Works	Construction Works for railway line and related structures	(A) Construction Works for Railway Lines and Installations of Related Facilities (signal, rails, etc.)	(B) Construction Works for IC/Us and Freight Logistic Parks	(C) Construction Works for Stations (Terminal, Junction and Crossing)	(D) Construction Works for ROBs and RUBs	(E) Construction Works for Bridges	(F) Construction Works for Tunnels	Localized Employment Opportunities of the Construction Works	Localized Business Opportunities Related to the Construction Works	Traffic Conditions of Passenger/Freight Trains	Logistic Condition of Goods, Raw Materials, Agricultural and Industrial Products	Traffic Condition of Roads	Operational Maintenance of Existing Infrastructure/Structures	Employment Opportunities (week-countr/local level)	Freight-oriented Business Opportunities	Passenger-oriented Business Opportunities	Promoting Development of Surrounding Area	Increase in Settlers and Visitors to the Project Area									
15	Topography and Geology	C	D	-	-	C	C	D	D	-	D	D	D	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	Soil Erosion	C	D	-	-	C	C	D	D	-	D	D	D	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
17	Groundwater	C	D	-	-	C	C	C	D	-	C	C	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
18	Hydrological Conditions (Rivers, Lakes, etc.)	C	D	-	-	C	C	C	C	-	C	C	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
19	Coastal and Marine Environment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	Fauna, Flora and Biodiversity	C	C	-	-	C	C	C	C	C	C	C	C	C	-	-	-	-	-	-	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C
21	Protected Areas, Natural/ecological Reserves and Sanctuaries	D	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	Landscape	D	D	-	-	-	-	-	-	-	-	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	Local Meteorological Conditions	D	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	Global Warming	C	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: A - Very significant impact, B - Relatively significant impact, C - Insignificant impact, D - Neglectable impact, E - No impact, + - Positive, - - Negative

(2) Kanpur - Khurja

- 1) Parallel Section
 - DFC Project’s railway line runs along the existing railway line which is located on the flat plain at Ganga River Basin. Topographical and geological impacts to the existing environment are minor.
 - There are no other protection areas for endangered species and/or fragile ecosystem directly affected by the project.
 - DFC Project alignment passes through the area of Shiepur Reserved Forest in the parallel section of Etawah for approximately 100 m, and the trees, mainly *Prosopis juliflora*, are likely to be cut off.
 - In the parallel section of Etawah, Auraiya, any endangered species and protected species were found based on the field survey.
 - Approximately 12,400 trees, which were estimated by the sampling survey, would be removed in the parallel section between Kanpur and Khurja.
- 2) Detour Section
 - Approximately 6,300 trees are likely to be removed in the agricultural land of the detour section in Etawah and Aligarh. The number of removed tree was estimated by assuming that the width of the new construction will be 43.5 m in the detour section and that the mean number of trees in the agricultural land is 12.3 trees/ha.
 - The DFC alignment passes through Fisher Reserved Forest in the detour section of Etawah for 3 km. The forest with *Prosopis juliflora* of approximately 13 ha is likely to

- be removed.
- 3) Reconstruction of ROB
 - There is no particular expected impact.
 - 4) Bridges over Important River
 - There is no important river in the section.

Impact matrix for the concerned section is shown below.

Table 10-35 Impact Matrix (Kanpur-Khurja)

No.	Items of the Environment Subject to	Project Activities																							
		Pre-construction				Construction Stage						Post-construction Stage													
		Overall Evaluation on the Project				Construction Works for railway line and related structures																			
		Surveying of Planned Areas and Sites	Selection of the Project Location and Sites	Land Acquisition and Resettlement	Excavation of Building Materials (bricks, aggregates, sand, soil, etc.) and other Building Materials	Shifting, Cutting and Filling of the Construction Works	Preparation of Construction Plans, and Warehouses, Work Camps, etc.	Operation of Construction Plants, Machine and Vehicles for Construction Works	(A) Construction Works for Railway Lines and Installation of Related Facilities (signals, rails, etc.)	(B) Construction Works for ICDS and Freight Logistic Parks	(C) Construction Works for Stations (Terminal, Junction and Crossing)	(D) Construction Works for ROB and RUBs	(E) Construction Works for Bridges	(F) Construction Works for Tunnels	Localized Employment Opportunities of the Construction Works	Localized Business Opportunities Related to the Construction Works	Traffic Conditions of Passenger/Freight Trains	Logistic Condition of Goods, Raw Materials, Agricultural and Industrial Products	Traffic Condition of Roads	Operation and Maintenance of Railway Line and Related Business	Employment Opportunities (whole country/local level)	Fresh-oriented Business Opportunities	Passenger Oriented Business Opportunities	Promoting Development of Surrounding Area	Increase in Settlers and Visitors to the Project Area
Natural Environment	15 Topography and Geology	C-	E-	E-	E-	C-	C-	C-	C-	C-	C-	C-	C-	-	-	-	-	-	-	-	-	-	-	-	
	16 Soil Erosion	C-	E-	E-	E-	C-	C-	C-	C-	C-	C-	C-	C-	-	-	-	-	-	-	-	-	-	-	-	
	17 Groundwater	C-	E-	E-	E-	C-	C-	C-	C-	C-	C-	C-	C-	-	-	-	-	-	-	-	-	-	-	-	
	18 Hydrological Conditions (Rivers, Lakes, etc.)	C-	E-	E-	E-	C-	C-	C-	C-	C-	C-	C-	C-	-	-	-	-	-	-	-	-	-	-	-	
	19 Coastal and Marine Environment	E-	E-	E-	E-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	20 Fauna, Flora and Biodiversity	C-	C-	E-	E-	C-	C-	C-	C-	C-	C-	C-	C-	-	-	-	-	-	-	-	-	-	-	-	-
	21 Protected Areas, Natural/ecological Reserves and Sanctuaries	B-	C-	C-	B-	E-	B-	C-	C-	B-	E-	E-	E-	-	-	-	-	-	-	-	-	-	-	-	E-
	22 Landscape	D-	E-	E-	E-	D-	D-	D-	D-	D-	D-	D-	D-	-	-	-	-	-	-	-	-	-	-	-	-
	23 Local Meteorological Conditions	D-	E-	E-	E-	E-	D-	D-	D-	D-	D-	D-	D-	-	-	-	-	-	-	-	-	-	-	-	-
	24 Global Warming	D-	E-	E-	E-	E-	D-	D-	D-	D-	D-	D-	D-	-	-	-	-	-	-	-	-	-	-	-	-

Note: A - Very significant impact, B - Relatively significant impact, C - Insignificant impact, D - Neglectable impact, E - No impact, +- Positive, - - Negative

10.4.5 Legislation Related to Natural Environment

(1) Legislation Related to Wildlife (National Park and Wildlife Sanctuary)

The notification of national parks and wildlife sanctuaries is provided by the Environment (Protection) Act and Rule. Regarding the approval for the land use which is presently managed by Ministry of Environment and Forests (MoEF), the Draft Guidelines for Diversion/Denotification of Forest Land from National Parks/Sanctuaries for Non-forestry Purposes in 2004 has been processed under evaluation as of 2007.

At present, the application for the land use in the area is made based on the proforma for national parks by Wildlife Division of MoEF. The contents of the proforma are as follows:

- PART-I: the application form on the brief project description to be filled by the applicant of the Proposal for Investigation and Survey in the National Park/Sanctuary;
- PART-II: the application form on the project details. The form shall be submitted with the research report, project general plan and location map (If the area exceeds 50 ha, it should be attached with a biodiversity impact assessment report);
- PART-III: the report form on impact assessment by the officer in charge of the sanctuary to be submitted to the Chief Wild Life Warden or any other officer authorized together with the recommendation letter. The procedure shall be completed 30 days after the receipt of PART-II.
- PART-IV: the form on the Chief Wildlife Warden's recommendation and comments. The procedure shall be completed within 15 days after the receipt of PART-II and III; and
- PART-V: the form on the recommendation and comments of the Department in Charge

of Forestry and Wild Life in consultation with the State Board for Wildlife. The procedure shall be completed within 30 days of the receipt of PART–II, III and IV.

The ESIMMS involved the field survey which required the submission of the Application Form of PART-I to Forest Department, Gujarat State through MOR. The Field survey was permitted by the State Government at the date of 10 July 2007, approximately one month after the application.

(2) Legislation Related to Recorded Forest (Forest Clearance)

Use of the forest land for non-forest purpose is provided by the Indian Forest (Conservation) Act of 1980 (Amendment 1988). Any development activity which associate with tree removal is required a compensatory afforestation. The removal of 1 tree shall be compensated by planting 2 trees; however, the number of compensation should be followed the instruction of the state forest authorities. Additionally, the land for the area shall be procured adjacent/near the site for the alternative land.

Alternative land should be acquired by the applicant. The land of the same area should be compensated at adjacent area of the forest under the responsibility of the applicant. In case of Uttar Pradesh, the application shall be submitted to the state authority, Forest Department. The application shall be forwarded to the Supreme Court with the official comments by the state. The application will be verified by the Central Empowerment Committee in the Supreme Court, and required compensatory afforestation and alternative land will be informed to the applicant.

Although EIA clearance is not required for railway development project, compensatory afforestation and alternative land compensation should be conducted when the Supreme Court requires. However, in case of a national railway development, it is possible that the land title remains within the government. In that case, the compensatory afforestation cost shall be borne by MOR. For instance, in Uttar Pradesh, the cost for compensatory afforestation is estimated approximately 920,000 Rs./ha based on the Supreme Court Orders dated 30th October 2002 which prescribed the fund from 580,000 Rs./ha to 920,000 Rs./ha. Moreover, according to the Rajasthan Forest Authority, if MOR owns any planted land which is not recorded forest along the existing railway line, there is a possible case that the land may be exchanged for compensation afforestation.

(3) Legislation Related to Eco-sensitive Area in Aravalli

The Aravalli Hills passes through Haryana, Rajasthan and Gujarat. The hills provide important water resources utilised for farming because it shuts out winds blowing from the Western Indian Desert. The MOEF has regulated the possible activities in the hill by the Notification of 7th May 1992 because of recent degradation of water resource in Aravalli Hills by deforestation and mining. The limited activities are as follows:

- 1) Location of any industry including expansion of modernisation;
- 2) Mining activities (new mining operations including renewals of mining leases; existing mining leases in a sanctuary/national park and areas covered under the Project Tiger and/or mining is being done without the permission of the competent authority;
- 3) Cutting trees;
- 4) Construction of any clusters of dwelling units, farms houses, sheds, community centres, information centres and any other activity connected with such construction including roads and a part of any infrastructure relating thereto; and
- 5) Electrification (laying of new transmission lines).

The areas covered by this notification are:

All preserved forests, protected forests or any other areas specified as forest in the land records maintained by the state government as on the date of this notification in relation to Gurgaon District of the State of Haryana and Alwar District of the State of Rajasthan.

- 1) All areas not cultivable shown as:
 - Mountain (Gair Mumkin Pahar)
 - Valleys (Gair Mumkin Rada)
 - Village grass lands for cattle breeding (Gair Mumkin Behed)
 - Wasteland (Banjad Beed)
 - Desert (Rundh)

In the land records maintained by the State Government as on the date of this notification in relation to Gurgaon District of the State of Haryana and the Alwar District of the State of Rajasthan;

- 2) All areas covered by the notification issued under section 4 and 5 of the Punjab Land Preservation Act (1900), as applicable to the State of Haryana in the District of Gurgaon up to the date of this notification;
- 3) All areas of Sariska National Park and Sariska Sanctuary notified under the Wildlife (Protection) Act, 1972 (53 of 1972).

Those who desires to undertake any item specified in this notification shall submit an application to MOEF, in the attached application form of the Notification.

The patches of the Aravalli Ranges were spread out all over the two districts, Alwar in Rajasthan state and Gurgaon in Haryana. The construction activities in the area requires for application attached with EIA study. With the final location survey, the detail land titles should be identified and adequate study should be conducted.

(4) Further Study and Instruction for the Construction Stage

Regarding the Vasai Road-Vadodara section, since the section is under the 1-b section which was not subject to the Guideline Design of the Study, there is possibility to change the railway alignment. In the case of the change of the alignment, detailed study should be conducted by the Indian side in accordance with the ESIMMS conducted in the Study.

Further site-specific impact assessment such as possible large scale cuttings and embankments with long slopes, borrow pits and waste soil disposal areas shall be examined in the Detailed Design stage.

In addition, there are abundant indigenous faunas along the corridor such as Peafowl, Buluebull, and Sarus Crane. The species are easily found in the study area even they are listed in the Appendix of Wildlife Protection Act and in the IUCN Red List as a threatened species or others. The necessary instructions and training for their conservation shall be provided to construction workers.

10.5 POLLUTION CONTROL STUDY

10.5.1 Outline of the Pollution Control Study

Regarding the noise and vibration amongst pollution components, the primary data was obtained in addition to the secondary data since the direct impacts of noise and vibration were considered significant as well as lack of data related to the railway. Both railway and ambient noise and vibration levels along the DFC alignment were measured at selected sites.

The impact prediction and evaluation were conducted on components which were identified as significant based on the baseline data and the conditions of the DFC design. As for the rest of pollution components, the current status and likely impacts were summarised and analysed based on the secondary data obtained in ESCS and ESIMMS.

(1) Existing Status of Pollution

In this section, existing status of major pollution components such as air, river water and ambient noise is summarised.

1) Air Pollution

Table 10-36, Table 10-37 and Table 10-38 show the status of air quality in major cities within the DFC Project area. Among air pollutants, higher levels of SPM and RSPM, which is equivalent to PM10, are observed in Ahmedabad and Surat of Gujarat, Jaipur of Rajasthan, and Kanpur and Agra of Uttar Pradesh in the study area. Moreover, NO₂ is significantly higher in Agra.

Table 10-36 Status of Air Pollution in Major Cities (Gujarat and Maharashtra)

State	City	Location	Type of Area (1)	Levels of Air Pollutants			
				SO ₂	NO ₂	RSPM (PM ₁₀)	SPM
Gujarat	Ahmedabad	Naroda GIDC	I	L	L	H	M
		Shardaben Hospital	I	—	—	—	—
		Cadilla Bridge, Narol	R	L	L	C	C
		L. D. Engineering College	R	L	L	C	C
		R. C. High school	R	—	—	—	—
	Vadodara	AZL Behrampur	R	—	—	—	—
		CETP Nandesari	I	L	L	H	M
		GPCB Office, Geri Vasahat	R	L	L	H	H
	Surat	City Dandia Bazar	R	L	M	C	C
		Udhna	I	L	L	H	M
		SVR Engg. College	R	L	L	C	H
	Rajkot	Near Air India Office	R	L	L	C	H
		Sardhara Industrial Corporation	I	L	L	C	M
	Ankaleshwar	Regional Office	R	—	—	—	—
		Rallis India Ltd	I	L	L	H	M
	Vapi	Durga Traders	R	L	L	C	H
GEB GIDC		I	L	M	H	M	
Jamnagar	Vapi Nagar Palika	R	L	M	C	H	
	Fisheries Office	R	L	L	C	C	
Maharashtra	Mumbai	Parel	I	L	L	M	M
		Worli	R	L	L	H	C
		Kalbadevi	R	L	L	H	C
	Solapur	WIT Campus	I	L	L	M	M
		Chitale Clinic	R	L	M	C	C
	Thane	Balkum/Kolshet	I	L	L	—	—
		Kopri	R	L	L	—	—
	Naupada	R	L	L	—	—	

Note: Abbreviations are defined as follows:

1. Area Type: R-Residential, I-Industrial, S-Sensitive Receptors including religious places, hospitals, schools, etc.

2. Air Quality Categories:

The air quality is caegoriesed into 4 broad categories based on an Exceedence Factor (the ration of annual mean concentration of a pollutant with that f a respective standard: EF) The EF is defined as below:

EF=Observed annual mean concentration of criteria pollutant/annual standard for the respective pollutant and area class. Four air quality categories are as follow:

- Critical pollution (C): when EF is more than 1.5;
- High pollution (H): when the EF is between 1.0-1.5;
- Moderate pollution (M): when the EF between 0.5-1.0; and
- Low pollution (L): when the EF is less than 0.5.

3. “—” - Not Available

Source: National Ambient Air Quality Status 2005, Central Pollution Control Board, 2007

Table 10-37 Status of Air Pollution in Major Cities (Rajasthan and Haryana)

State	City	Location	Type of Area (1)	Levels of Air Pollutants			
				SO ₂	NO ₂	RSPM	SPM
Rajasthan	Alwar	RIICO Pump House	I	L	L	M	L
		Gaurav Solvex Ltd	I	L	L	M	L
		Regional Office	R	L	L	C	C
	Jaipur	VKIA	I	L	L	H	M
		RIICO Office, M. I. A.	I	L	L	M	M
		Office of District Education Officer, Chandpole	R	L	M	C	C
		Ajmeri Gate	R	L	M	C	C
		Rajasthan SPCB Office	R	L	L	H	H
		Regional Office (North), RSPCB, Vidaya Nagar	R	L	L	C	C
	Jodhpur	RIICO Office	I	L	L	H	M
		DIC Office	I	L	L	M	M
		Sojati Office	R	L	L	C	C
		Maha Mandir Police Thana	R	L	L	C	C
		Shastri Nagar Polce Thana	R	L	L	C	C
		Office of Housing Board	R	L	L	C	C
Haryana	Faridabad	Shivalic Global Industries	I	L	L	H	H
		Regional Office	R	L	L	C	C
	Yamuna Nagar	Ballarpur Industries	I	—	—	—	—
	Hissar	Urban Estate II	R	—	—	H	H
		Guru jambehswar Univ.	R	—	—	C	C

Note: Abbreviations are defined as follows:

1. Area Type: R-Residential, I-Industrial, S-Sensitive Receptors including religious places, hospitals, schools, etc.
2. Pollutant Levels: L-Low, M-Moderate, H-High,
C-Critical levels of pollution based on the Exceedence Factor, “-”-Not Available.

Source: National Ambient Air Quality Status 2005, Central Pollution Control Board, 2007

Table 10-38 Status of Air Pollution in Major Cities (Uttar Pradesh)

State	City	Location	Type of Area (1)	Levels of Air Pollutants			
				SO ₂	NO ₂	RSPM	SPM
Uttar Pradesh	Lucknow	Talkatora	I	L	L	C	H
		Kapoor Hotel	R	L	M	C	C
		Mahanagar	R	L	M	C	C
		Aminabad	R	L	M	C	C
		Aliganj	R	L	M	—	C
	Kanpur	Fazalganj	I	—	—	—	—
		Jajmau	I	L	L	C	H
		Deputy ka Padao	R	L	L	—	C
		Kidwai Nagar	R	L	L	C	C
		Dabauli/Sharda Nagar	R	L	L	C	C
	Varanasi	Regional Office	R	L	L	C	C
		Shivpur	R	—	—	—	—
	Anpara	Renusagar Colony	I	L	L	H	M
		Anapara Colony	I	L	L	H	M
	Gajraula	Raunaq Auto Limited	I	L	L	M	H
		Indra Chowk	R	—	—	—	—
	Ghaziabad	Shahibabad Industrial Area	I	L	L	C	C
		Bulandshahar Road Industrial Area	I	L	L	C	C
	Agra	Taj Mahal	S	M	H	C	C
		Itmad ud daulah	S	M	C	C	C
		Rambagh	S	M	C	C	C
		Nunhai	S	M	C	C	C
	Noida	M/s GEE PEE Electroplating and Engineering Works	I	L	M	M	H
		Regional Office	R	L	M	—	C
	Firozabad	Center for Development of Glass Industry	I	L	L	—	H
		Tilak Nagar	R	L	L	—	C
		Raza ka Tal	R	L	L	—	C

Note: Abbreviations are defined as follows:

1. Area Type: R-Residential, I-Industrial, S-Sensitive Receptors including religious places, hospitals, schools, etc.
2. Pollutant Levels: L-Low, M-Moderate, H-High,
C-Critical levels of pollution based on the Exceedence Factor, “-”-Not Available.

Source: National Ambient Air Quality Status 2005, Central Pollution Control Board, 2007

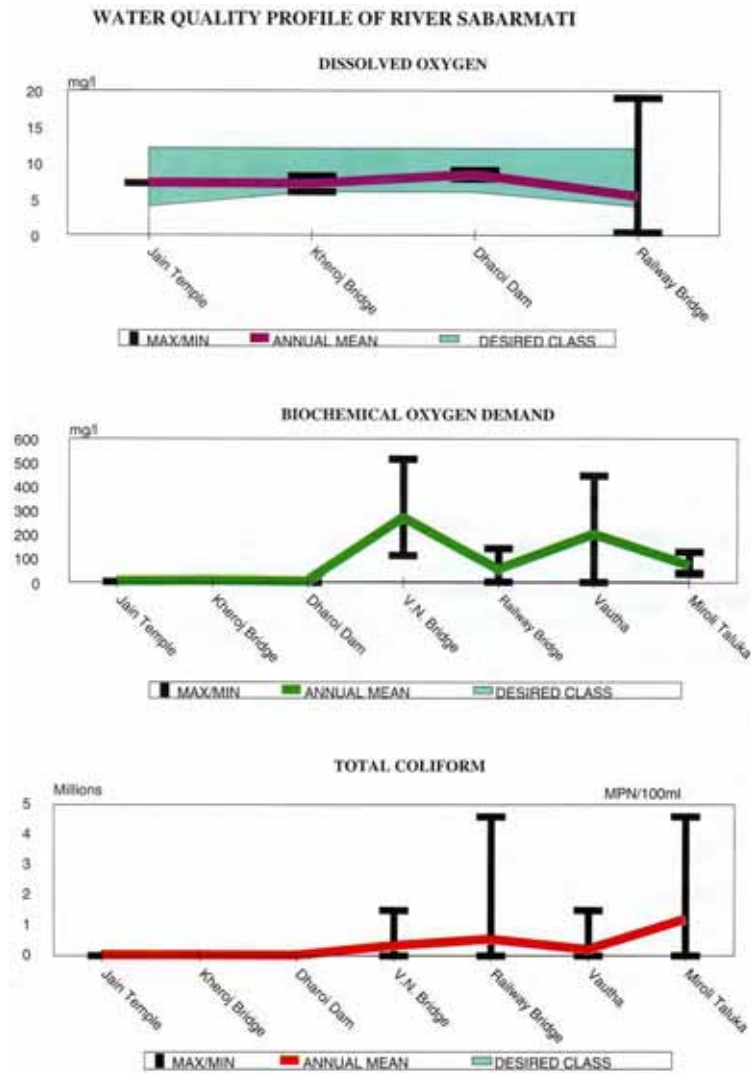
2) Water Pollution

Table 10-39 shows water quality of the important rivers where important railway bridges will be constructed. Sabarmati River, runs through Ahmedabad District from east to west and flows into Arabian Sea, is significantly polluted as shown by the values of BOD and DO. The factor of pollution is considered as a result of discharge of industrial and domestic wastewater and agricultural runoff.

Table 10-39 River Water Quality of Important Rivers

S. No.	Name of River	River Length (km)	Monitoring Point	Year	Monitoring Data							
					Water temp.(°C)	pH	Electrical conductivity (µmhos/cm)	DO (mg/l)	BOD (mg/l)	COD (mg/l)	Total coliform (MPN/100ml)	Fecal coliform (MNP/100 ml)
1	Yamuna	1376	23	2002	3 - 34	6.7 - 9.8	56 - 1959	0.1 - 22.7	1.0 - 36	1 to 112	27-26.3 x 10 ⁶	11-17.2 x 10 ⁵
				2003	2 - 38	6.6 - 10	45 - 3500	0.3 - 22.8	1.0 - 58	1 to 187	110-171 x 10 ⁷	40-203 x 10 ⁶
				2004	7 - 35	6.8 - 9	76 - 2150	0.3 - 19.5	1.0 - 40	Not Done	21-1103 x 10 ⁶	18-62 x 10 ⁶
2	Sabarmati	371	8	2002	12 - 32	2.8 - 8.6	269 - 13530	0.6 - 7.9	0.8 - 475	4 to 1794	210-28 x 10 ⁵	28-28 x 10 ⁵
				2003	22 - 33	5.6 - 8.5	278 - 7270	1.2 - 9.8	0.6 - 275	4 to 803	9-11 x 10 ⁶	4-46 x 10 ⁵
				2004	26 - 35	6.6 - 8.8	286 - 4090	0.7 - 10.2	0.9 - 380	Not Done	28-46 x 10 ⁴	20-24 x 10 ⁴
3	Mahi	583	7	2002	19 - 34	7.1 - 9.2	175 - 5720	0.2 - 8.5	0.1 - 3.0	9 to 163	2 to 2400	3 to 75
				2003	18 - 34	7 - 8.8	97 - 750	2.9 - 10.1	0.5 - 3.9	7 to 38	4 to 2400	2 to 28
				2004	20 - 34	7.4 - 9.2	166 - 650	2.7 - 8.7	0.3 - 4.9	Not Done	4 to 1600	2 to 28
4	Tapi	724	10	2002	20 - 40	7.4 - 9.0	76 - 700	4.8 - 8.8	0.6 - 10.0	8 to 40	40 to 2100	2 to 210
				2003	18 - 36	3.1 - 9.2	119 - 1130	3.1 - 10.4	1.0 - 10	10 to 44	30 to 930	2 to 230
				2004	13 - 39	3.1 - 9.5	190 - 790	1.2 - 8.7	0.7 - 36	Not Done	3-5 x 10 ⁵	2-9 x 10 ⁴
5	Narmada	1,312	14	2002	-	6.9 - 9.3	102 - 1341	5.8 - 9.8	0.1 - 3.8	6 to 47	9 to 2400	2 to 64
				2003	12 - 31	7.1 - 8.5	95 - 441	4.5 - 9.5	0.4 - 3.3	7 to 29	4 to 1600	1 to 110
				2004	15 - 34	7 - 8.6	181 - 815	5.5 - 9.6	0.2 - 3.8	Not Done	3 to 2400	2 to 15

Source: Central Pollution Control Board, 2007



Source: Central Pollution Control Board, 2006

Figure 10-25 River Water Quality of Sabarmati River

3) Ambient Noise Level

Table 10-40 shows ambient noise levels in two cities in the DFC Project area, Ghaziabad and Kanpur. In Kanpur City which is a major and industrialised city in Uttar Pradesh. The ambient noise level at Cardiology Hospital is 73 dB for daytime and 63 dB for night time, though the standard value is 50 dB and 40 dB respectively.

Table 10-40 Ambient Noise Level in Two Cities

City*	Area	Location	Noise Level (dB)					
			Day			Night		
			L_{eq}	L_{min}	L_{max}	L_{eq}	L_{min}	L_{max}
Ghaziabad (UP)	Industrial	O.C.C. Ltd.	77	59	95	68	64	89
	commercial	Clock Tower	75	57	91	65	63	75
	Residential	31, West Model Town	59	45	90	54	42	89
	Silence Zone	Mukandlal Hospital	63	42	72	59	57	62
Kanpur (UP)	Industrial	Govind Nagar	74	56	92	66	55	77
	commercial	Deputy Ka Parav	76	62	90	71	63	79
	Residential	Dada Nagar	74	65	83	70	56	85
	Silence Zone	Cardiology Hospital	73	60	86	63	55	70

Note: Data of Ghaziabad is measurement in 1997, while Kanpur in 2001

Source: Uttar Pradesh Development Report Vol.2., Planning Commission, 2007

10.5.2 Identification of the Impacts Caused by the DFC Project

(1) Identification of the Impacts due to DFC Project

1) Outline of DFC Project

The outline of DFC Project relevant to pollution items is as follows:

a) Dedicated Freight Railway Lines and Related Facilities

- The project area consists of five sections in the Western Corridor and 2 sections of the Eastern Corridor;
- Consisting of the parallel sections and detour sections;
- The existing alignment was reviewed and designed detours to minimise the impacts on social environment, natural environment and pollution if necessary;
- Construction of railway bridges including 13 important railway bridges crossing important rivers, construction of ROBs/RUBs and construction of railway stations (terminal, junction and crossing) are included; and
- Tunnels and Internal Container Depots (ICDs)/Freight Logistic Parks (FLPs) are excluded.

b) Specification of New Freight Train and Train Operation Plan

- Type of traction: electrified traction (electric locomotive); and
- Running operation: 140 trains/direction/day with the same time interval (about one train for every five minutes) at maximum and the maximum speed of 100 km/h. The actual operation plan will vary depending on the section or railway line during post-construction.

c) Civil Engineering Work Plan

Regarding the procurement of construction materials such as stones, aggregates, sand, soil, concrete including PC and RC, steel, etc., the means of extraction, the location of quarries and borrow pits, and the transportation route of construction materials are not yet decided. The outline of earthwork plan for DFC Project is as follows:

- The total length of the earthwork for DFC Project excluding bridges, ROBs/RUBs and

tunnels is 2,700 km. The entire length is divided into 10 sections which length is 270 km. Moreover, each section is subdivided into 10 sections which length is 27 km. The section of 27 km is considered the standard section for construction;

- Assuming the below conditions, the required soil volume per standard section is estimated 521,000 m³ for fillings and 132,800 m³ for cuttings;
- Average height of embankment and cutting is estimate as 2 m, and the soil quantity is calculated 24.1m³/m for fillings and 24.6 m³/m for cuttings;
- 80% of the standard section requires fillings, 20% of the standard section needs cuttings; and
- Average height of the embankment is 2 m.

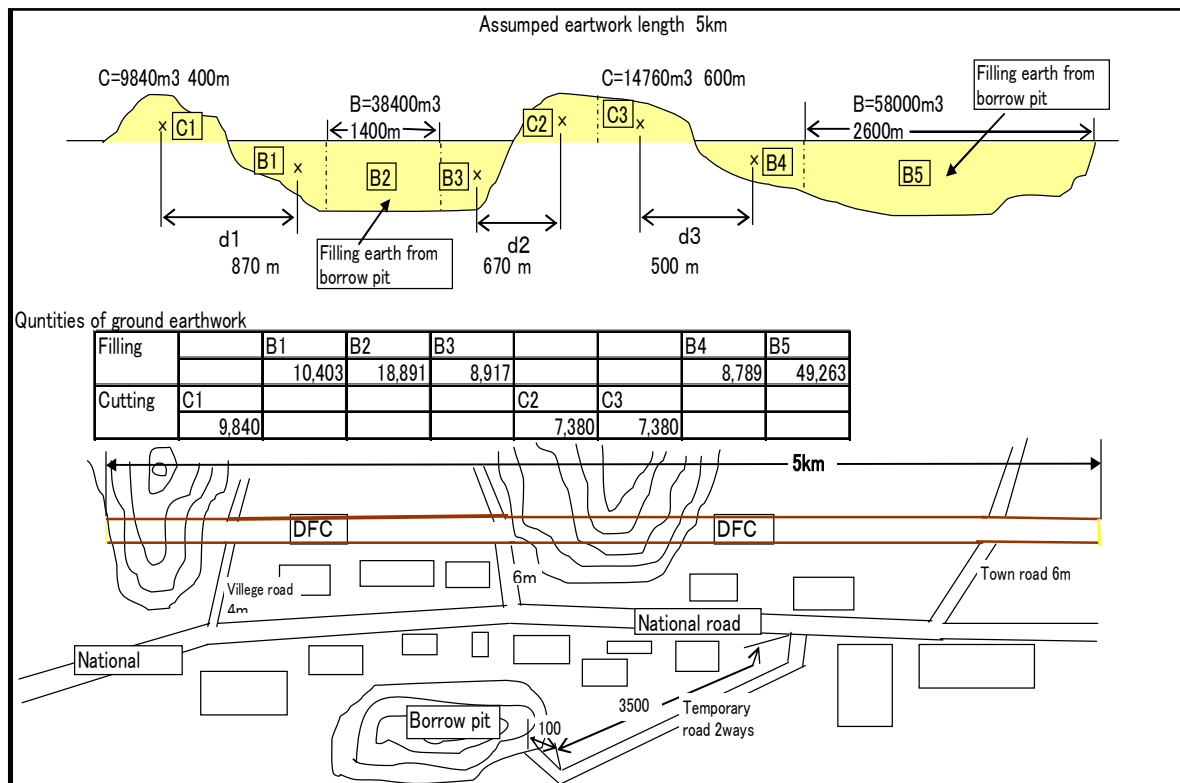


Figure 10-26 Assumed Earthwork Plan and Profile (5 km length)

Table 10-41 shows required construction machines and vehicles for earthworks.

Table 10-41 Required Number of Construction Machines for Simultaneous Construction of 2,700 km

Machine Types	Specification	Number for one unit work party	Number for 270 km	Number for 2,700 km
Scrapper	24 m ³	2	11	110
Bulldozer	18t - D80	2	11	110
Bulldozer	15t - D50	4	22	220
Power Shovel	1.6m ³	1	6	60
Dump truck	15 t	50	270	2,700
Vibration Roller	2-3 t	6	32	320
Hydraulic Excavator	0.9 m ³	4	22	220
Motor Grader	Maintenance temporary road	1	6	60
Truck (with crane attached)	General transport	1	6	60

Source: JICA Study Team

2) Project Activities

Development activities of the DFC Project which are likely to affect the existing status of pollution components are as shown in Table 10-42.

Table 10-42 Development Activities of DFC Project

(1) Pre-construction Phase
1) Surveying of Planned Areas and Sites
2) Selection of the Project Location and Sites
3) Land Acquisition and Resettlement
(2) Construction Phase
1) Extraction of Building Materials (Stones, Aggregates, Sand, Soil, etc.) at Quarries and Borrow Areas
2) Earth Moving: Cutting and Filling of the Construction Works
3) Preparation of Construction Plants, and Warehouses, Work Camps, etc.
4) Operation of Construction Plants, Machines and Vehicles for Construction Works
5) Construction Works for Railway Lines and Related Facilities
a) Construction Works for Railway Lines and Installation of Related Facilities (Foundation, Rails, Tracks, etc.)
b) Construction Works for ICDs and Freight Logistic Parks
c) Construction Works for Stations (Terminal, Junction and Crossing)
d) Construction Works for ROBs and RUBs
e) Construction Works for Railway Bridges
f) Construction Works for Tunnels
6) Localized Employment Opportunities of the Construction Works
7) Localized Business Opportunities Related to the Construction Works
(3) Operation Phase
1) Traffic Conditions of Freight/Passenger Trains
2) Logistic Conditions of Goods, Raw Materials, Agricultural and Industrial Products
3) Traffic Conditions of Roads
4) Operation and Maintenance of Railway Lines and Related Structures
5) Employment Opportunities (Whole Country/Local Level)
6) Freight-oriented Business Opportunities
7) Passenger-oriented Business Opportunities
8) Promoting Development of Surrounding Area
9) Increase in Settlers and Visitors to the Projected Area

3) Scoping of Expected Impacts for Pollution Components

Expected impacts of DFC Project were identified for each pollution components and project implementation phase, such as pre-construction phase, construction phase and operation phase. Scoping of impacts was carried out by scaling, and both positive/beneficial and

negative/adverse impacts were examined. Overall, all the anticipated impacts are classified under to negative/adverse impacts.

Table 10-43 shows overall impacts for the study area, though there are some differences depending on the project activities and environmental status in a district.

Table 10-43 Impact Matrix of Activities of DFC Project and Pollution Items

No.	Project Activities Items of the Environment Subject to	Overall Evaluation on the Project	Pre-construction Stage																Construction Stage																Post-construction Stage																																											
			Surveying of Planned Areas and Sites				Selection of the Project Location and Sites				Land Acquisition and Resettlement				Extraction of Building Materials (stones, aggregates, sand, soil, etc.) at Quarries and Borrow Areas				Earth Moving, Cutting and Filling of the Construction Works				Preparation of Construction Plans, and Warehouses, Work Camps etc.				Operation of Construction Plants, Machines and Vehicles for Construction Works				Construction Works for railway line and related structures				Localized Employment Opportunities of the Construction Works				Localized Business Opportunities Related to the Construction Works				Traffic Conditions of Freight/Passenger Trains				Logistic Condition of Goods, Raw Materials, Agricultural and Industrial Products				Traffic Condition of Roads				Operation and Maintenance of Railway lines and Related Structures				Employment Opportunities (whole country/local level)				Freight-oriented Business Opportunities				Passenger Oriented Business Opportunities				Promoting Development of Surrounding Area				Increase in Settlers and Visitors to the Project Area			
			(A)	(B)	(C)	(D)	(A)	(B)	(C)	(D)	(A)	(B)	(C)	(D)	(A)	(B)	(C)	(D)	(A)	(B)	(C)	(D)	(A)	(B)	(C)	(D)	(A)	(B)	(C)	(D)	(A)	(B)	(C)	(D)	(A)	(B)	(C)	(D)	(A)	(B)	(C)	(D)	(A)	(B)	(C)	(D)	(A)	(B)	(C)	(D)	(A)	(B)	(C)	(D)	(A)	(B)	(C)	(D)	(A)	(B)	(C)	(D)	(A)	(B)	(C)	(D)												
25	Air Pollution	C-	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E																
26	Water Pollution	B-	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E																
27	Soil Contamination	D-	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E																
28	Solid Waste and Industrial Discharge	C-	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E																
29	Noise and Vibration	B-	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E																
30	Land Subsidence	D-	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E																
31	Bottom Sediment	C-	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E																
32	Offensive Odour	D-	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E												

Note: 1. Scaling of impacts, A - very significant impact, B - significant impact, C - considerable impact, D -negligible impact, and E - no impact or no relation

2. Results of the impact matrix would vary depending on project activities and local conditions in each district.

3. Construction works for tunnels and ICDs/FLPs are ranked as "E" because the development activities for these constructions are out of scope in the ESIMMS.

4) Identification of Affected Pollution Components through Scoping

Significance of the expected impacts on pollution components is shown in Table 10-44. As a result of scoping, noise/vibration and water pollution are considered as B-, and air pollution, solid waste and bottom sediment as C- by considering the maximum negative impacts.

Table 10-44 Identified Pollution Impacts to be Subject to Prediction and Evaluation

Pollution Components		Scaling	Major Reasons (Construction Phase)	Major Reasons (Operation Phase)
1	Air Pollution	C-	C-: Dust rising from soil surface due to earth moving and engineering works, and SPM and NOx emission due to operation of construction plants, machines and vehicles	D-: Air pollutant emission (SPM and NOx) from new freight trains are expected to be negligible from electrified locomotive.
2	Water Pollution	B-	(1) B-: In the section that important and major railway bridges will be constructed, increase in SS and turbidity of river water during construction of railway bridge; (2) C-: Wastewater discharge from earthworks, engineering, temporary work camps of construction workers.	D-: Wastewater discharge from new freight trains and related facilities are expected to be negligible.
3	Soil Contamination	D-	D-: Contamination of hazardous materials such as heavy metals and toxic chemicals to soil can be avoided through proper pollution control management during construction phase. Construction material procurement from quarries and borrow pits shall be decided not to contaminate soil.	D-: Discharge of hazardous materials from DFC line and related facilities are expected to be negligible.
4	Solid waste	C-	C-: Generation of construction and household waste during construction phase.	C-: Generation of solid waste from new freight trains and related facilities.
5	Noise and Vibration	B-	C-: Noise and vibration generation due to earth moving and engineering works, and operation of construction plants, machines and vehicles.	(1) B-: Railway noise and vibration due to new freight trains passing in the case that houses and Sensitive Receptors are very close to DFC line, (2) C-: Railway noise due to freight trains passing in suburbs and villages without any houses and Sensitive Receptors nearby.
7	Bottom Sediment	C-	(1) C-: Bottom sediment contamination due to toxic materials when bridges, esp. important bridges are constructed, if toxic materials has been settled at the river bed and are dredged; (2) D-: Other cases.	D-: No activities to cause bottom sediment pollution are planned.
8	Ground Subsidence	D-	D-: Railway lines are planned in the area with firm ground condition. No construction works are planned to affect the groundwater table.	D-: No activities to cause ground subsidence are planned.
9	Offensive Odour	D-	D-: Some possibility of generation of offensive odour during construction work. However, it is expected temporary and negligible.	D-: No facilities and activities are planned to generate offensive odour.

Note: 1. Scaling A -Very significant, B - Relatively significant, C - Insignificant, D - Negligible, E - No impact and/or No relation

2. Scaling results indicate the severest impact amongst all the districts
3. Both negative/adverse and positive/beneficial impacts were considered.

The expected impacts of the identified pollution components are as follows:

- a) Air Pollution: Impacts of air pollution during the construction phrase
- b) Water Pollution: Impacts of water pollution caused by a bridge construction at river banks and dredging the river bed during the construction phrase

- c) Solid Waste: Impacts of construction solid waste and municipal solid waste during the construction phase
- d) Noise and Vibration: Impacts of noise and vibration caused by construction vehicles and machinery during the construction phase and by new freight trains during the operation phase
 - During the construction phase, air pollution, water pollution, noise and vibration, and solid waste will be generated due to earth moving and engineering works, transportation of construction materials and operation of construction plants, machines and vehicles. The impacts are expected to be in both the parallel sections and the detour sections. The impact scale depends on the route and/or structures; however, the impact duration would be short term.
 - In the section where important and major railway bridges are constructed, a temporary increase in SS and turbidity of river water is expected due to earth moving and engineering works at river banks and dredging the river bed during construction of a railway bridge.
 - During the operation phase, impacts of railway noise and vibration due to new freight trains are expected. The impacts would be more significant in the case houses and Sensitive Receptors (SRs⁴) are located near DFC railway line.
 - While negative impacts are expected as above, positive effect of the DFC Project is expected through reduction of the green house effect gas such as CO₂ with reduction of vehicle emission such as truck and electrification of the freight trains (The detail on reduction of vehicle emission is explained in Section 12-10. of this report).
- e) Bottom sediment
 - Bottom sediment contamination due to toxic materials is less expected in ordinary river environment; however, there is a possibility that toxic materials has already contained in the bottom sediment and would be moved and accumulated in the river bed at the middle of the river due to excavation and dredging works of the important railway bridge construction.

10.5.3 Existing Status and Impact Summary (Western Corridor)

(1) Vasai Road – Vadodara Section

In the section, environmental quality and situation such as air, water, solid waste, noise and vibration would be worsen slightly during the construction phase due to the extraction and transportation of construction materials such as stones, aggregates, sand, soil, etc. and the operation of earth moving, engineering and construction works of railway and related structures.

1) Parallel Section

Impacts on noise and vibration due to new freight trains are considered insignificant or negligible because the DFC line avoids the populated areas such as Surat, Bharuch and Vadodara and mostly passes through the area of comparatively lower population density.

In the case that residences and Sensitive Receptors such as schools, hospitals and temples are located near the railway track, considerable adverse impacts are expected.

⁴ Sensitive Receptors were considered as an index to evaluate the impacts of railway noise and vibration.

2) Detour Section

Impacts of railway noise and vibration due to new freight trains are expected to be avoidable in industrial area and highly populated urban area such as Surat, Bharuch and Vadodara, because existing alignment of these areas are changed and connected to the Detour route.

Impacts of railway noise and vibration are also expected to be not significant or negligible, because the detour route is mostly located in the area of scattered housing area and farming area.

3) Important Railway Bridges

Eleven important bridges are planned in the section. Especially for important bridges which cross over Narmada, Tapi, Par and Ambika Rivers during the construction, the river water quality such as turbidity and pollution of bottom sediment would be adversely affected in the short-term due to excavation and dredging at the river bank and river bed.

(2) Vadodara – Ahmedabad Section

In the section, environmental quality and situation such as air, water, solid waste, noise and vibration would be worsen slightly during the construction phase due to the extraction and transportation of construction materials such as stones, aggregates, sand, soil, etc. and the operation of earth moving, engineering and construction works of railway and related structures.

1) Parallel Section

Impacts on noise and vibration due to new freight trains are considered insignificant or negligible because DFC line avoids populated areas such as Vadodara, Kheda and Ahmedabad and mostly passes through the area of comparatively lower population density.

In the case that residences and Sensitive Receptors such as schools, hospitals and temples are located near the railway track, considerable adverse impacts are expected.

2) Detour Section

Impacts of railway noise and vibration due to new freight trains are considered avoidable in the industrial area and the highly populated urban area such as Vadodara, Kheda and Ahmedabad because DFC line avoids the populated areas and mostly passes through the area of comparatively lower population density and the agricultural area.

3) Important Railway Bridges

Construction of important bridges crossing Mahi and Sabarmati Rivers is planned. During the construction phase, the deterioration of river water quality such as increase in turbidity and pollution of bottom sediment is expected in the short-term due to excavation and dredging of the river bank and river bed.

(3) Ahmedabad – Palanpur Section

In the section, environmental quality and situation such as air, water, solid waste, noise and vibration would be worsen slightly during the construction phase due to the extraction and transportation of construction materials such as stones, aggregates, sand, soil, etc. and the operation of earth moving, engineering and construction works of railway and related structures.

1) Parallel Section

Impacts on noise and vibration due to new freight trains are considered insignificant or negligible because DFC line mostly passes through the area of comparatively lower population density.

In the case that residences and Sensitive Receptors such as schools, hospitals and temples are located near the railway track, considerable adverse impacts are expected.

2) Detour Section

Impacts of railway noise and vibration due to new freight trains are considered avoidable in the industrial/commercial areas and the urban area around Ahmedabad because the detour section was designed to avoid these areas.

Impacts of railway noise and vibration are considered insignificant or negligible because the detour route passes through in the less populated residential areas and agricultural land.

3) Important Railway Bridges

Construction of important bridges crossing over Sabarmati River and Saraswati River is planned. During the construction phase, especially at an important bridge over Son River, the deterioration of river water quality such as increase in turbidity and pollution of bottom sediment is expected due to excavation and dredging of the river bank and river bed.

(4) Palanpur –Ajmer Section

In the section, pollution such as air, water, solid waste, noise and vibration would be worsen slightly during the construction phase due to the extraction and transportation of construction materials such as stones, aggregates, sand, soil, etc. and the operation of earth moving, engineering and construction works of railway and related structures.

1) Parallel Section

Impacts on noise and vibration due to new freight trains are considered insignificant or negligible because DFC line mostly passes through the area of comparatively lower population density.

In the case that residences and Sensitive Receptors such as schools, hospitals and temples are located near the railway track, considerable adverse impacts are expected.

2) Detour Section

Impacts of railway noise and vibration due to new freight trains are expected to be avoidable in the industrial area such as Kishangarh and the urban areas of Palanpur and Ajmer because the detour section was designed to avoid the populated areas.

Impacts of railway noise and vibration are considered insignificant or negligible because the detour route goes through the scattered residential area and the agricultural land.

3) Important Railway Bridges

There is no important railway bridge which DFC line would cross over.

(5) Ajmer – Rewari Section

In the section, during the construction phase, pollution such as air, water, solid waste, noise and vibration would be worsen slightly due to the extraction and transportation of

construction materials such as stones, aggregates, sand, soil, etc. and the operation of earth moving, engineering and construction works of railway and related structures.

1) Parallel Section

Impacts on noise and vibration due to new freight trains are considered insignificant or negligible because DFC line mostly passes through the area of comparatively lower population density.

However, in the case that residences and Sensitive Receptors such as schools, hospitals and temples are located near the railway track, considerable adverse impacts are expected.

2) Detour Section

Impacts of railway noise and vibration due to new freight trains are expected to be avoidable in the industrial area and the populated area in Phulera, Ringas and Rewari because the detour was designed to avoid the populated areas.

Impacts of railway noise and vibration are considered insignificant or negligible because the detour route is located in the agricultural land.

3) Important Railway Bridges

There is no important railway bridge which DFC line would cross over.

10.5.4 Existing Status and Impact Summary (Eastern Corridor)

(1) Mughal Sarai – Kanpur Section

In the section, during the construction phase, pollution such as air, water, solid waste, noise and vibration would be worsen slightly due to the extraction and transportation of construction materials such as stones, aggregates, sand, soil, etc. and the operation of earth moving, engineering and construction works of railway and related structures.

1) Parallel Section

Impacts on noise and vibration due to new freight trains are considered insignificant or negligible because railway line mostly passes through the area of comparatively lower population density.

However, in the case that residences and Sensitive Receptors such as schools, hospital and temples are located near the railway track, considerable adverse impacts are expected.

2) Detour Section

Impacts of railway noise and vibration due to new freight trains are expected to be avoidable in the industrial and highly populated urban area such as Allahabad, Kanpur and Mughal Sarai, because the detour was designed to avoid the populated areas.

Impacts of railway noise and vibration are considered insignificant or negligible because the detour route is mostly located in the area of scattered residential area and the agricultural land.

3) Important Railway Bridges

Construction of important bridges over Tons River and Yamuna River is planned. During the construction phase, the deterioration of river water quality such as increase in turbidity and

pollution of bottom sediment is expected in the short term due to excavation and dredging of the river bank and river bed.

(2) Kanpur – Khurja/Dadri Section

In the section, during the construction phase, pollution such as air, water, solid waste, noise and vibration would be worsen slightly due to the extraction and transportation of construction materials such as stones, aggregates, sand, soil, etc. and the operation of earth moving, engineering and construction works of railway and related structures.

1) Parallel Section

Impacts on noise and vibration due to new freight trains are considered insignificant or negligible because DFC line mostly passes through the area of comparatively lower population density.

However, in the case that residences and Sensitive Receptors such as schools, hospitals and temples are located near the railway track, considerable adverse impacts are expected.

2) Detour Section

Impacts of railway noise and vibration due to new freight trains are expected to be avoidable in the industrial area and the populated area such as Kanpur, Etawah, Tundla, Hathras and Aligarh because the detours were designed to avoid the populated areas.

Impacts of railway noise and vibration are considered insignificant or negligible because the detour route is mostly located in the area of scattered residential area and the agricultural land.

3) Important Railway Bridges

There is no important railway bridge which the DFC line would cross over.

10.5.5 Railway Noise and Vibration Survey

(1) Outline of the Survey

1) Background and Need of the Survey

One of the major environmental concerns caused by the new freight train operation are railway noise and vibration.

In general, noise has impacts on the human health, and vibration could damage residential structures, Sensitive Receptors such as schools, hospitals and temples, and other establishments alongside the railway track, if magnitude of the impact is very significant. Even though the impacts are smaller, railway noise and vibration could disturb local residents living near the railway track.

Therefore, noise and vibration survey has been incorporated in the scope of ESCS and ESIMMS as pollution components which would be affected significantly during the feasibility study of DFC Project.

2) Railway Noise Regulations and Standards and Vibration Regulations in Japan

In Japan, standards and/or guidelines for railway noise and vibration are set for *Shinkansen*, a superexpress railway (or called as “bullet train”), and other railways. However, in India,

railway development activities are exempted from EIA. Moreover, there are no regulations or guidelines for railway noise and vibration.

Table 10-45 Recommended Standard Level of Railway Noise in Japan

New Construction of Railway	Daytime (7:00 - 22:00): 60 dB (L_{Aeq}) or less
	Night time (22:00 - 7:00): 55 dB (L_{Aeq}) or less
	Minimise the railway noise in the residential area as much as possible
Large-Scale Improvement of Existing Railway	Improve the railway noise level less before the construction

Note: Railway other than *Shinkansen* Express Railway (bullet train)

Source: Guidelines for Countermeasures for Railway Noise in Case of New Constructions and Large-scale Improvement of Existing Railways, Environmental Agency of Japan, Dec. 1995

Table 10-46 Guideline Value of Vibration from *Shinkansen* Superexpress Railway in Japan

Corrected Acceleration Level	dB (L_{peak})
	70 or less

Note: There is no guideline value for the railway except *Shinkansen* Express Railway. However, vibration speed (0.5 mm/sec) or less (corresponding vibration level is 65 dB (L_{peak}) or less) for the railway, which was recommended by Pollution Control Committee of Yokohama City (1974) which has been applied the level as a de-facto standard value of the railway vibration in EIA procedure.

Source: Environmental Agency of Japan, 1976

3) Regulation and Standards of Railway Noise and Vibration Regulation in India

As mentioned above, regulations, standards or guidelines for railway noise and vibration are not yet established in India. Moreover, the standards or regulations of ambient vibration have not been established, while the standard for ambient noise has been established. The ambient noise standard in India is shown in the following table.

Table 10-47 Ambient Noise Standard in India

Area Code	Category of Area Zone	Limits in dB (L_{Aeq})	
		Daytime (6:00 – 22:00)	Night (22:00 - 6:00)
(A)	Industrial Area	75	70
(B)	Commercial Area	65	55
(C)	Residential Area	55	45
(D)	Silence Zone*	50	40

Note: Silence zone is defined as an area comprising not less than 100 meters around hospitals, educational institutions and courts. The silence zones are zones which are declared as such by the competent authority.

Source: The Noise Pollution (Regulation and Control) Rules, 2000

Therefore, the official standardised methods of measurement and evaluation for railway noise and vibration are not available in India. Moreover, the secondary data on railway noise and vibration is not available.

(2) Railway Noise and Vibration Survey along Railway Lines

1) Background and Purpose of the Survey

In order to predict and evaluate the noise and vibration levels due to new freight trains, it is necessary to collect data on unit level of the railway noise and vibration with respect of the features such as train categories, railway track characteristics, structural characteristics, attenuation patterns with distance/train speed, etc.

However, there is presently no published data on railway noise and vibration in India. In ESCS, the preliminary survey to obtain baseline data of railway noise and vibration was carried out alongside the railway lines around Delhi. In ESIMMS, a further survey has been carried out from the end of June until August 2007 to obtain supplementary data of railway and ambient noise/vibration levels.

2) Survey Method

a) Selection of Survey Sites

Fifteen (15) survey sites including the plain routes and the railway bridges were selected in the field survey. They are as follows:

- Package 1 (Gujarat and Maharashtra States): 5 sites
- Package 2 (Haryana and Rajasthan States): 5 sites
- Package 3 (Uttar Pradesh State): 5 sites

b) Categorisation of Trains with Different Railway Traffic Conditions

Railway traffic conditions are initially classified into 16 categories considering (i) the train type (freight or passenger), (ii) the traction system (diesel or electrified), (iii) the loading for freight train (container, covered wagon or open wagon), and (iv) the railway track (plain route or bridge) as shown in Table 10-48.

Table 10-48 Train Type Categories

Category	Specification				
	Train	Traction	Load	Route	
1	FD1A	Freight Train	Diesel Traction	Container	Plain route
2	FD1B	Freight Train	Diesel Traction	Container	Bridge
3	FD2A	Freight Train	Diesel Traction	Covered Wagon	Plain route
4	FD2B	Freight Train	Diesel Traction	Covered Wagon	Bridge
5	FD3A	Freight Train	Diesel Traction	Open wagon for bulk transportation	Plain route
6	FD3B	Freight Train	Diesel Traction	Open wagon for bulk transportation	Bridge
7	FE1A	Freight Train	Electrified	Container	Plain route
8	FE1B	Freight Train	Electrified	Container	Bridge
9	FE2A	Freight Train	Electrified	Covered Wagon	Plain route
10	FE2B	Freight Train	Electrified	Covered Wagon	Bridge
11	FE3A	Freight Train	Electrified Traction	Open wagon for bulk transportation	Plain route
12	FE3B	Freight Train	Electrified Traction	Open wagon for bulk transportation	Bridge
13	PDA	Passenger Train	Diesel Traction	–	Plain route
14	PDB	Passenger Train	Diesel Traction	–	Bridge
15	PEA	Passenger Train	Electrified	–	Plain route
16	PEB	Passenger Train	Electrified	–	Bridge

c) Measurement of Railway Noise and Vibration

(i) Monitoring Point

- Railway noise and vibration measurements were carried out simultaneously using noise and vibration level meters at 3 points at 12.5 m, 25 m and 50 m distance from the centre of the nearest railway track. The readings were taken simultaneously at all the three points for each passing train in one direction.

(ii) Railway Noise

- As for railway noise level, sound pressure level (L_{AE}) and equivalent continuous A-weighted sound pressure level (L_{Aeq}) of passing trains were measured.
- Method of railway noise measurement is not established in India. However, the standardized method applied to ambient noise in India is overall the same as that in Japan. Therefore, JIS Z 8731 (Method of Measurement of Noise Vibration Level) of Japan was used for noise measurement.

(iii) Railway Vibration

- As for railway vibration levels, peak level (L_{peak}) of vibration was measured.
- In general vertical vibration may affect directly to human body while horizontal vibration may affect to stability of structures such as trembling and cracking wall and human body. In India, the method of vibration measurement is based upon the ISO procedure which measure both vertical and horizontal vibration. One of the reasons why the above procedure is applied is that structural instability of buildings results in collapse and cracking of structure walls in India.
- On the other hand, in Japan the designated method is focused to vertical vibration by considering the effect on human body.
- In this survey, JIS Z 8735 (Method of Measurement of Vibration Level) of Japan was used for vibration measurement.

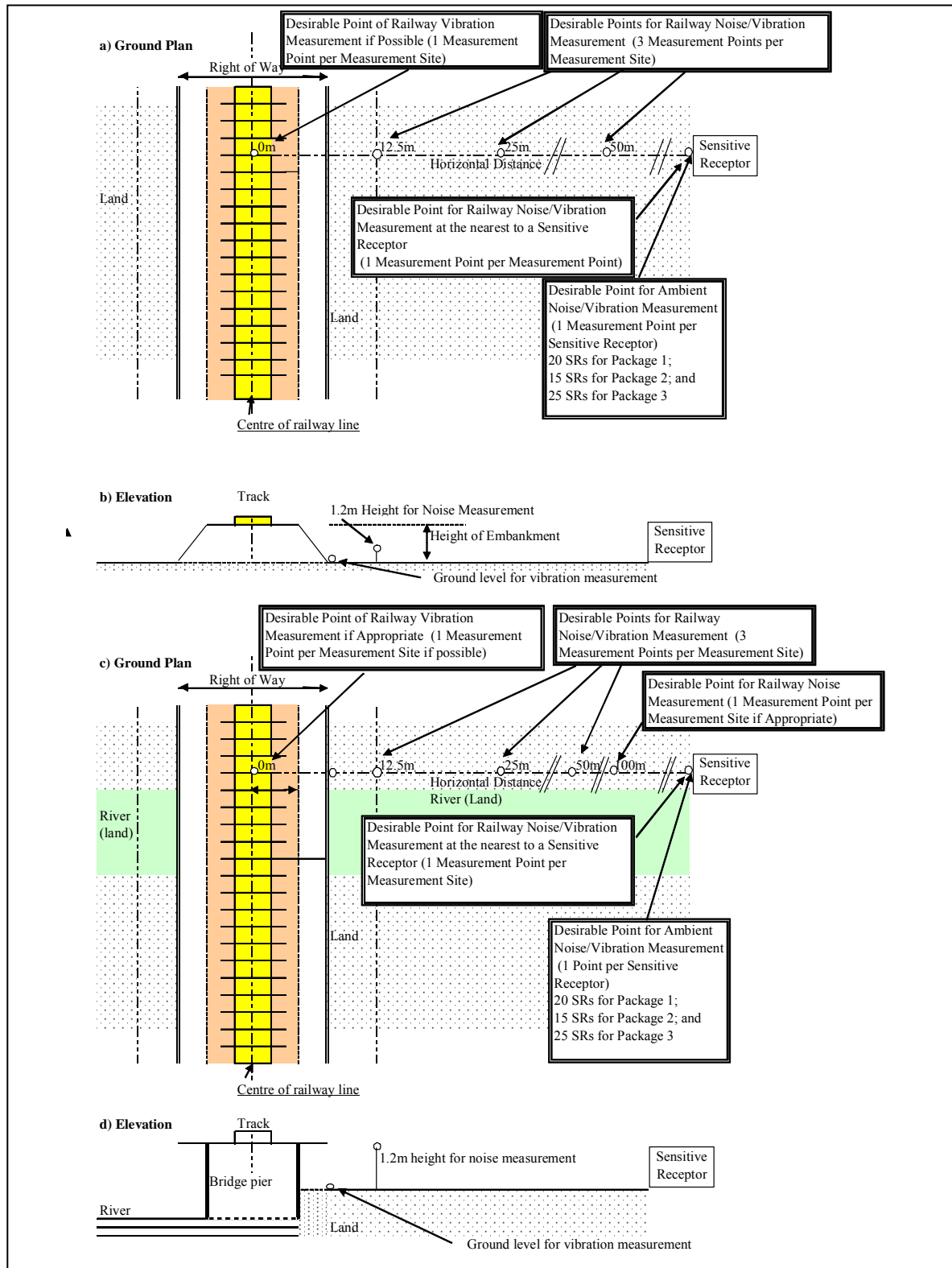


Figure 10-27 Schematic Layout of Noise and Vibration Measurement Sites

3) Results of Railway Noise and Vibration Survey

Railway noise and vibration survey was carried out at sites alongside 10 plain routes and 5 railway bridges among 15 sites.

- Package 1 (Maharashtra & Gujarat): 2 sites for the plain route and 3 sites for the railway bridges
- Package 2 (Rajasthan and Haryana): 5 sites for the plain route
- Package 3 (Uttar Pradesh): 3 sites for the plain route and 2 sites for the railway bridges

Results of railway noise and vibration measurement are shown in Table 10-49, Table 10-50 and Table 10-51 by package (For details of the measurement sites, see 10-(5) of “Volume 4: Technical Working Paper Task 2”).

**Table 10-49 Result of Railway Noise and Vibration Measurement
(Package 1: Maharashtra and Gujarat)**

DR Site No.	Type of Track	Location of DR site (District, State)	Category of trains	Number of trains	Passage Time (sec)	Running Speed (km/hr)	Railway Noise Level						Railway Vibration Level		
							Lea (dB)			LEA (dB)			Leak (dB)		
							12.5m	25m	50m	12.5m	25m	50m	12.5m	25m	50m
P1-DRP-1	Plain Route	Near Biltmore Station (Navarre, Gujarat)	PEA	21	110	72	84	79	74	97	95	92	78	65	56
			FE1A	47	40	97	86	82	77	100	98	95	78	68	54
			PEA	12	10	99	87	77	69	95	91	86	80	70	55
			FE1A	47	30	96	87	84	79	102	98	97	79	71	57
			PEA	19	22	72	84	82	77	100	97	95	78	67	55
			PEA	22	23	79	86	81	74	99	95	92	77	66	54
P1-DRP-2	Plain Route	Malingar (Ahmedabad, Gujarat)	PEA	23	21	91	85	83	74	48	48	47	75	67	53
			PEA	13	15	72	81	75	72	92	89	84	64	51	43
			PEA	19	24	83	82	78	73	96	92	87	63	52	44
			FD3A	16	17	37	80	76	80	92	89	84	64	53	44
			PDA	18	37	40	78	74	70	93	89	85	60	52	43
			PEA	12	15	66	89	84	80	101	96	92	63	54	45
			PDA	14	14	83	94	90	88	106	102	100	64	53	47
			PDA	22	35	52	78	74	70	93	90	84	63	52	44
P1-DRB-1	Railway Bridge	Ambica River Bridge (Navsari, Gujarat)	PEA	24	30	66	82	80	66	97	95	66	63	51	44
			PEA	22	43	42	77	72	80	94	88	94	61	51	40
			FE3B	60	100	23	91	88	82	102	88	83	81	76	54
			FE3B	11	18	24	90	88	83	102	87	83	74	71	53
			PEB	22	20	91	88	86	81	102	87	82	75	71	53
			PEB	17	15	94	90	88	82	101	97	90	94	69	57
			PEB	13	15	72	93	90	84	105	98	92	77	76	54
P1-DRB-2	Railway Bridge	Narmada River Bridge (Bharuch, Gujarat)	FE2B	42	40	55	88	87	82	102	97	92	97	72	52
			PEB	24	17	116	89	87	82	101	95	89	76	74	53
			PEB	23	48	40	75	59	64	70	66	71	65	52	56
			PEB	13	48	22	63	64	63	70	71	70	68	55	53
			PEB	14	40	29	65	66	65	72	73	72	65	55	53
			PEB	20	42	39	62	75	67	69	82	74	68	56	56
P1-DRB-3	Railway Bridge	Sabarmati Bridge (Ahmedabad, Gujarat)	PEB	19	100	16	79	68	61	86	75	68	67	56	55
			FD1B	41	56	61	86	81	79	105	100	98	54	58	46
			PDB	13	25	43	79	80	75	100	94	89	52	54	48
			PDB	18	25	60	87	82	78	103	97	93	56	53	53
			PDB	14	40	29	87	82	82	105	99	99	48	53	46
			FD1B	44	110	33	83	77	73	103	98	94	56	54	52
			PDB	23	65	29	81	76	72	99	94	90	51	55	52
			PDB	15	26	48	89	83	78	103	97	93	57	56	49

Note: "Category of Trains" consisting of 16 freight and passenger train types in Table 10-48 were applied.

**Table 10-50 Result of Railway Noise and Vibration Measurement
(Package 2: Rajasthan and Haryana)**

DR Site No.	Type of Track	Location of DR site (District, State)	Category of trains	Number of trains	Passage Time (sec)	Running Speed (km/hr)	Railway Noise Level						Railway Vibration Level		
							LAeq (dB)			LAE (dB)			Lpeak (dB)		
							12.5m	25m	50m	12.5m	25m	50m	12.5m	25m	50m
DP2-DRP-1	Plain Route	Railway crossing near Khalipur RS (H -Rewari)	FD1A	46	110	35	75	70	65	96	92	85	68	57	49
			PDA	24	54	37	73	68	62	93	90	84	69	58	49
			PDA	23	62	31	74	69	62	94	90	83	59	55	48
			PDA	46	111	34	75	70	63	85	81	76	62	55	50
			PDA	21	43	40	76	70	66	95	91	86	70	63	53
			PDA	26	49	44	76	72	66	95	90	86	66	54	49
DP2-DRP-2	Plain Route	Halfway between Bharawas and Bawal RS. (H -reward)	PDA	24	25	80	89	83	79	99	99	96	74	66	62
			FD1A	43	31	28	88	85	81	105	101	99	72	69	61
			PDA	23	24	79	89	87	79	106	102	97	70	63	57
			PDA	21	15	116	91	85	85	104	100	100	73	65	63
			PDA	10	12	69	90	85	77	104	100	95	72	63	56
DP2-DRP-3	Plain Route	Ringas Railway crossing (R - Sikar)	PDA	12	23	43	81	76	73	96	94	88	66	59	48
			PDA	10	21	39	91	86	84	108	104	101	67	67	51
			PDA	13	26	41	85	82	76	102	99	93	64	59	47
			PDA	10	30	28	87	80	77	101	97	91	64	62	51
			PDA	11	17	54	95	90	86	111	107	101	66	64	51
DP2-DRP-4	Plain Route	Near Ajmer RS. (R -Ajmer)	PDA	26	30	72	80	72	71	96	91	87	63	56	50
			FD1A	51	74	57	73	73	52	91	91	71	62	56	50
			PDA	14	19	61	82	82	79	99	99	95	62	56	50
			FD1A	42	83	42	85	85	80	103	103	100	67	56	48
			PDA	13	13	45	81	81	76	97	97	91	71	59	51
DP2-DRP-5	Plain Route	Near Marwar RS. (R -Pali)	PDA	23	110	17	75	68	60	95	89	78	70	62	52
			FD1A	42	72	48	68	64	62	87	81	79	76	67	57
			PDA	12	25	40	91	87	81	109	95	90	74	66	55
			PDA	20	81	20	81	75	71	89	84	77	69	61	51
			PDA	40	70	19	83	77	71	101	95	89	71	64	53

Note: "Category of Trains" consisting of 16 freight and passenger train types in Table 10-48 were applied

**Table 10-51 Result of Railway Noise and Vibration Measurement
(Package 3: Uttar Pradesh)**

DR Site No.	Type of Track	Location of DR site (District, State)	Category of trains	Number of trains	Passage Time (Sec)	Running Speed (km/hr)	Railway Noise Level						Railway Vibration Level		
							LAeq (dB)			LAE (dB)			Lpeak (dB)		
							12.5m	25m	50m	12.5m	25m	50m	12.5m	25m	50m
P3-DRP-1	Plain route	Alligarh (Alligarh, UP)	PDA	13	25	43	75	70	70	93	88	85	65	59	49
			PEA	20	60	27	79	77	73	100	97	94	68	63	53
			PEA	20	20	83	87	82	77	101	95	94	69	63	56
			FE3A	23	20	45	88	84	78	101	96	94	70	65	56
			PEA	57	60	79	85	82	76	101	97	95	70	66	58
			PEA	23	20	95	87	83	77	102	94	94	71	61	58
			PEA	23	20	95	87	85	78	103	99	95	70	65	56
			PEA	18	15	99	88	75	79	104	85	97	71	53	58
P3-DRP-2	Plain route	Mughal Sarai (Chandauli, UP)	PEA	22	17	107	90	84	80	102	97	93	92	72	63
			PEA	33	24	114	92	87	83	107	115	97	90	69	62
			FE2A	39	139	15	68	62	57	82	76	72	90	64	56
			PEA	25	19	109	93	87	80	108	118	92	83	69	64
			FE3A	51	168	11	66	61	57	85	80	74	90	61	54
			FE3A	36	85	16	74	67	64	89	85	80	88	60	59
			PEA	30	23	108	90	85	82	105	99	93	90	67	65
P3-DRP-3	Plain route	Chunar (Mirzapur, UP)	FE2A	51	32	51	87	82	80	102	97	93	64	56	48
			PEA	13	10	108	87	82	83	97	91	97	70	58	49
			FE3A	31	29	42	87	80	80	101	95	93	69	57	47
			FE3A	41	29	55	86	79	75	100	94	97	67	58	48
			FE3A	40	28	46	86	80	75	100	94	95	73	52	48
			FE3A	60	31	57	89	84	74	104	99	86	65	58	55
			PEA	22	18	101	89	82	76	102	94	91	69	59	50
			FE3A	60	28	57	88	82	77	103	97	92	67	89	70
			PEA	27	17	132	92	84	77	105	97	92	68	58	49
P3-DRB-1	Railway bridge	Tons River Railway Bridge (Allahabad, UP)	FE3B	60	37	63	99	95	93	114	109	108	56	57	56
			FE3B	57	32	69	98	96	93	113	111	108	58	61	58
			FE3B	60	52	45	93	89	84	110	106	102	56	57	57
			FE3B	63	41	69	90	86	85	106	103	101	52	52	54
			PEB	16	18	74	98	94	90	110	105	103	60	54	53
			PEB	24	22	90	99	88	93	112	88	107	55	55	54
			PEB	30	32	78	92	88	87	109	104	103	54	56	50
			PEB	23	20	95	98	94	92	111	107	106	52	54	45
P3-DRB-2	Railway bridge	Iron Railway Bridge crossing water drainage (Allahabad, UP)	PDB	9	32	23	72	72	72	88	87	87	45	43	51
			PEB	25	110	19	72	65	42	93	90	91	52	46	49
			FE3B	58	120	40	79	75	71	100	95	92	50	57	50
			PEB	24	90	22	74	72	70	94	92	90	53	43	48
			PEB	23	110	17	69	65	60	90	85	80	47	51	39
			FE3B	57	118	19	76	74	77	96	96	98	52	51	45
			FE3B	38	92	16	78	74	69	98	95	88	51	49	54

Note: "Category of Trains" consisting of 16 freight and passenger train types in Table 10-48 were applied

Total number of obtained railway noise and vibration data for each passing train was 100. Among them, there are 30 data for freight trains and 70 data for passenger trains. The initial 16 train categories were reclassified into 8 categories, and the results were summarised in Table 10-52.

Table 10-52 Classification of Observed Data

Name of Category		Category No.	Specification				Number of Data		
			Train	Traction	Loading	Route			
F-1	FEP	FE1A	7	Freight Train	Electrified Traction	Container	Plain route	12	2
		FE2A	9	Freight Train	Electrified Traction	Covered Wagon	Plain route		2
		FE3A	11	Freight Train	Electrified Traction	Open wagon for bulk transportation	Plain route		8
F-2	FDP	FD1A	1	Freight Train	Diesel Traction	Container	Plain route	6	5
		FD2A	3	Freight Train	Diesel Traction	Covered Wagon	Plain route		0
		FD3A	5	Freight Train	Diesel Traction	Open wagon for bulk transportation	Plain route		1
F-3	FEB	FE1B	8	Freight Train	Electrified Traction	Container	Bridge	10	0
		FE2B	10	Freight Train	Electrified Traction	Covered Wagon	Bridge		1
		FE3B	12	Freight Train	Electrified Traction	Open wagon for bulk transportation	Bridge		9
F-4	FDB	FD1B	2	Freight Train	Diesel Traction	Container	Bridge	2	2
		FD2B	4	Freight Train	Diesel Traction	Covered Wagon	Bridge		0
		FD3B	6	Freight Train	Diesel Traction	Open wagon for bulk transportation	Bridge		0
P-1	PEP	PEA	13	Passenger Train	Electrified Traction	–	Plain route	23	23
P-2	PEB	PEB	14	Passenger Train	Electrified Traction	–	Bridge	16	16
P-3	PDA	PDA	15	Passenger Train	Diesel Traction	–	Plain route	25	25
P-4	PDB	PDB	16	Passenger Train	Diesel Traction	–	Bridge	6	6
Total								100	100

3) Overall Findings of Railway Noise and Vibration Survey

Figure 10-28 also shows a typical attenuation pattern of railway noise and vibration level with distance from centre of the nearest railway track. In this survey, the measurement points were selected in order to evaluate the noise and vibration levels by considering Indian and Japanese evaluation methodologies. There are 3 trends of railway noise and vibration levels along the existing railway lines.

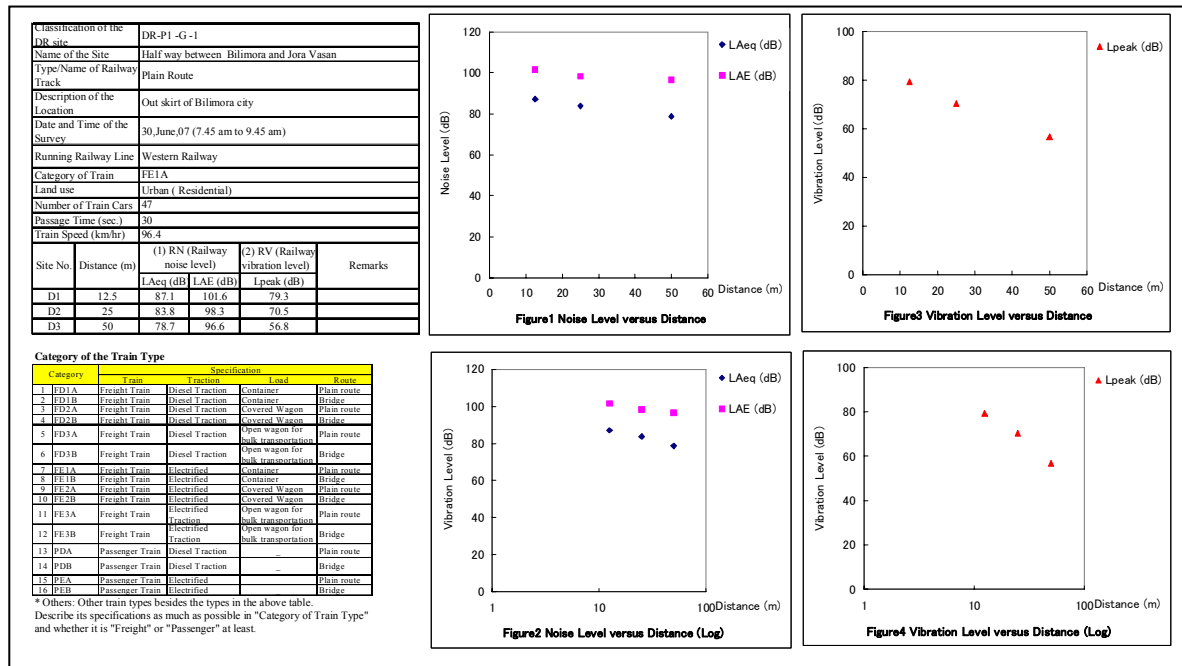


Figure 10-28 Typical Attenuation Pattern with the Distance

- a) Relation between the Railway Noise Level and Distance from Centre of the Nearest Railway Track
 - It was found railway noise level was slowly attenuated in accordance in proportion to the increase in distance. It has almost a linear relation with logarithm value of the distance.
 - The railway noise level is very slowly attenuated. Even at the point of 500 m apart from railway track, the railway noise level was measured. Thus, this implies some difficulty to avoid the influence of other noise sources such as road traffic and factories which are often found around railway lines. In fact, the graphs, sometimes it was found the data was scattered and shows large variations.
- b) Relation between Railway Vibration Level and Distance from Centre of the Nearest Railway Track
 - It was found railway vibration level sharply decreased in accordance with the distance from centre of the nearest railway track, compared to that of railway noise level. The level consequently comes up to threshold level (about 50 dB) at 50 m away from the railway track.
 - Any influence by other vibration sources was not found.
 - The above findings are similar as those observed for railway vibration in Japan.
- c) Comparison with of the Railway Noise Guideline Value of Japan
 - As a reference, observed railway noise levels at 12.5 m from the centre of the nearest railway track were compared with the guideline value for railway noise in Japan (60 dB for daytime). Among the observed railway noise levels, most of data exceeds higher the guideline value of Japanese.
 - However, a careful examination is required to compare the survey results with the Japanese standard or guideline values due to the limitation of different measurement conditions and the limited number of data.

10.5.6 Noise and Vibration Survey at Sensitive Receptor (SR) Sites

(1) Method of Survey at Sensitive Receptor (SR) Sites

1) Definition of SR Sites

Facilities and structures such as schools, hospitals, temples, historical & cultural assets and parks have important roles to community and residents and need to have quietness and substantial structural stability. If these facilities are close to the railway line, adverse impact of noise and vibration due to traffic of freight trains may occur to some extent. Thus, these facilities are defined as Sensitive Receptor (SR) sites which serve as indicators for the evaluation of noise and vibration impacts.

2) Listing of Candidate Sensitive Receptor (SR) Sites

From the empirical data on railway noise and vibration in Japan, most affected areas for railway noise are considered to be within 100 m of horizontal distance from the centre of the nearest railway track, and the same for railway vibration is 50 m. The Silence Zone including sensitive receptor sites is defined as an area comprising not less than 100 meters around hospitals, educational institutions, etc. Therefore, sites which are located up to 200 m of horizontal distance away from the centre of the nearest railway track should be listed as candidate SR sites alongside planned and existing railway lines.

3) Selection of SR Sites

From the pre-survey, 60 sites were selected as representative/typical SR sites considering (i) characteristics of railway line and structures, (ii) number of trains passing per day, (iii) land use pattern alongside railway line, etc.

- Package 1 (Gujarat and Maharashtra States): 20 SR sites;
- Package 2 (Haryana and Rajasthan States): 15 SR sites; and
- Package 3 (Uttar Pradesh States): 25 SR sites.

4) Measurement of Ambient and Railway Noise and Vibration at SR sites

Ambient noise and vibration levels were measured for L_{Aeq} and ambient vibration levels were also measured for L_{peak} and L_{10} at each SR sites for daytime hours and for night time hours.

Together with ambient noise and vibration measurement, railway noise and vibration measurement at SR sites were measured for L_{Aeq} and L_{peak} , respectively.

Measurement was conducted in accordance with standardized method prevailing in India or JIS Z 8731 for noise and JIS Z 8735 for vibration.

(2) Results of Noise and Vibration Measurement at SR Sites

Table 10-53, Table 10-54, and Table 10-55 show both results of ambient noise and vibration measurement at SR sites and results of railway noise and vibration measurement at SR sites (For details of the measurement sites, see 10-(5) of "Volume 4: Technical Working Paper Task 2").

There are 3 findings from the noise and vibration measurement at SR sites.

- 1) In general, it was found difficult to select SR sites without influence of road traffic because the sites are mostly accompanied with accessing road to visit and stay.

- 2) It is required to monitor noise and vibration levels at residences which are located near the railway lines in addition to the monitoring at SRs. Moreover, at residences and hospitals where noise and vibration levels are often very low during night time, the contribution to noise and vibration levels from the freight trains would be higher. Therefore, the noise and vibration measurement should be decided by considering the noise and vibration impacts in these areas during night time.
- 3) Ambient noise and vibration levels were monitored for seven sites were alongside planned detour routes. Observed data are considered the background level without railway noise and vibration.

**Table 10-53 Results of Ambient Noise and Vibration at SR Sites
(Package 1: Maharashtra and Gujarat)**

Serial No. (1)	Type of SR	Location of SR site	State -(District) (2)	Name of Railway	Type of Railway Line (E, P, D) (3)	Duration of measurement (hr)	Distance (m) (4)	Ambient Noise Level (dB)		Ambient Vibration Level (dB)	
								L _{Aeq}	L _{peak}	L ₁₀	
P1-1	Hospital	Gupta Hospital, Billimora	G-Navsari	Western Railway	E	4	65	67	108	59	
P1-2	Hindu Temple	Hindu temple, Village Kartalot Near Ambica River Bridge	G-Navsari	Western Railway	E	4	95	57	47	38	
P1-3	Hindu Temple	Hindu Temple, Near Ankaleshwar Crossing	G-Bharuch	Western Railway	E	4	100	71	109	57	
P1-4	Mosque	Mosque, Near Bharuch RS	G-Bharuch	Western Railway	E	4	100	67	110	50	
P1-5	Hindu temple	Hindu Temple, Near Miyagam Karjan RS	G-Kheda	Western Railway	E	4	115	72	66	73	
P1-6	Hospital	Shree Mahalaxmi Mahilaji Hospital, Near Vishvamitri RS	G-Vadodara	Western Railway	E	4	125	68	54	40	
P1-7	Hospital	Darbar Shri Gopaldas Desai TB Hospital, Near Anand RS	G-Anand	Western Railway	E	4	55	73	99	65	
P1-8	Farmland	Diversion, village Kashindra (Ahmedabad)	G-Ahmedabad	Western Railway	D	4	0	58	56	30	
P1-9	Minaret	Shaking minaret-2, Near Ahmedabad Junction	G-Ahmedabad	Western Railway	E	4	15	72	90	45	
P1-10	Hospital	Gujarat State Police Hospital, near Madhupura Crossing	G-Ahmedabad	Western Railway	E	3	15	76	110	49	
P1-11	Hindu temple	Hindu Temple, near Sabarmati Railway bridge	G-Ahmedabad	Western Railway	E	2	15	75	106	50	
P1-12	Hindu temple	Hindu Temple, Near Sabarmati RS	G-Ahmedabad	Western Railway	E	4	65	69	60	39	
P1-13	Hindu Temple	Hindu Temple near Central Jail, (Sabarmati)	G-Ahmedabad	Western Railway	E	4	55	77	110	49	
P1-14	Hospital	Kuldeep Hospital, Near Kalo RS	G-Mahesana	Western Railway	E	4	45	71	64	44	
P1-15	Hospital	Hospital, Near Siddhapur RS	G-Mahesana	Western Railway	P	4	35	66	110	38	
P1-16	Farmland	Diversion, village Antroli (Surat)	G-Surat	Western Railway	D	2	500	52	71	38	
P1-17	Hospital	Tapi River side	G-Surat	Western Railway	P	2	40	70	68	46	
P1-18	Hindu Temple	Vangaon Railway Crossing	M-Thane	Western Railway	P	2	30	75	67	53	
P1-19	School	Vangaon Railway Crossing	M-Thane	Western Railway	P	2	30	70	66	52	
P1-20	Hospital	Vangaon Railway Station	M-Thane	Western Railway	P	2	100	64	58	39	

Note 1: Same numbering as corresponding SR site

Note 2: Name of State, G - Gujarat, M - Maharashtra

Note 3: E - Existing railway line but out of DFC alignment, P - Paralleling railway line to existing one,

D - Alongside planned Detour

Note 4: Horizontal distance of measuring point from centre of the nearest track (m)

**Table 10-54 Result of Ambient Noise and Vibration at SR Sites
(Package 2: Rajasthan and Haryana)**

Serial No. (1)	Type of SR	Location of SR site	State -(District) (2)	Name of Railway	Type of Railway Line (E, P, D) (3)	Duration of measurement (hr)	Distance (m) (4)	Ambient Noise Level (dB)			Ambient Vibration Level (dB)		
								L _{Aeq}	L _{peak}	L ₁₀	L _{peak}	L ₁₀	L ₅
P2-SR1	School	SVN public school , between Ateli RS and Narnaul RS	H-Mahendragarh	Western Railway	P	4	1500	70	61	39			
P2-SR2	Govt College	Govt College , near Narnaul RS	H-Mahendragarh	Western Railway	P	4	130	75	61	32			
P2-SR3	Hindu	Hindu temple adjacent to RS, Nim ka Thane RS	R - Sikar	Western Railway	P	4	10	79	80	41			
P2-SR4	Temple	Temple near railway crossing, Shri Madhopur	R - Sikar	Western Railway	P	4	20	71	62	37			
P2-SR5	School	School near railway crossing, Ringas RS	R - Sikar	Western Railway	P	4	150	71	57	35			
P2-SR6	Hospital near railway crossing	Hospital near railway crossing, Ringas RS	R - Sikar	Western Railway	P	4	100	78	58	39			
P2-SR7	Waste land	Diversion , near Harinagar Rewari	H-Rewari	Western Railway	D	4	-	44	46	38			
P2-SR8	School	School, near Phulera Jn.	R - Jaipur	Western Railway	E	4	80	66	57	35			
P2-SR9	Hospital	Hospital along RS, Ajmer RS	R - Ajmer	Western Railway	E	4	143	72	60	31			
P2-SR10	School	School along RS, Ajmer RS	R - Ajmer	Western Railway	E	4	125	81	62	39			
P2-SR11	Agricultural land	Diversion, near Madar RS	R - Ajmer	Western Railway	P	4	100	77	41	38			
P2-SR12	Waste land	Diversion, near Daurai RS	R - Ajmer	Western Railway	P	4	-	58	41	38			
P2-SR13	Temple	Temple, Front side of Marwar RS	R - Pali	Western Railway	P	4	75	77	70	51			
P2-SROP3	School	School, Front side of Marwar RS	R - Pali	Western Railway	P	4	140	76	68	50			
P2-SROP5	SR site	SR site , Rewari RS	H-Rewari	Western Railway	E	4	50	69	56	36			

Note 1: Same numbering as corresponding SR site

Note 2: Name of State, G - Gujarat, M - Maharashtra

Note 3: E - Existing railway line but out of DFC alignment, P - Paralleling railway line to existing one,

D - Alongside planned Detour

Note 4: Horizontal distance of measuring point from centre of the nearest track (m)

**Table 10-55 Result of Ambient Noise and Vibration at SR Sites
(Package 3: Uttar Pradesh)**

Serial No. (1)	Type of SR	Location of SR site	State/District (2)	Name of Railway	Type of Railway Line (E, P, D)(3)	Duration of measurement (hr)	Distance (m) (4)	Ambient Noise Level (dB)			Ambient Vibration Level (dB)		
								L _{Asq}	L _{peak}	L ₁₀	L _{peak}	L ₁₀	
SR-01	Primary School	Khurja Junction, Central Primary School	UP-Bulandshahr	North Central Rly	P	4	2	79	110	51			
SR-02	School	S.D.Public School,Bimla Nagar, Near Khurja Rly Stn.	UP-Bulandshahr	North Central Rly	P	4	100	58	75	49			
SR-03	Temple	Near to Aligarh Railway Station, Small Hanumanji Temple	UP-Aligarh	North Central Rly	E	4	70	67	56	40			
SR-04	Agricultural lands	Aligarh diversion	UP-Aligarh	North Central Rly	D	4	4	52	53	38			
SR-05	Hospital	Near Etawah hospital (railways)	UP-Etawah	North Central Rly	E	4	100	67	58	45			
SR-06	Park	Etawah park	UP-Etawah	North Central Rly	E	4	20	65	87	40			
SR-07	Agricultural lands	Etawah diversion	UP-Etawah	North Central Rly	D	4	1500	63	50	38			
SR-15	School	Railway Colony,Civil Lines, 1km away from Allahabad Railway Stn.	UP-Allahabad	North Central Rly	E	5	50	55	38	37			
SR-16	Temple	Hanumanji Temple, Allahabad Railway Station,	UP-Allahabad	North Central Rly	E	4	25	68	53	35			
SR-18	Temple	Reporting Police Chouki,Bheerpur, 2 km away from Bheerpur RS.	UP-Allahabad	North Central Rly	P	4	22	70	55	35			
SR-19	Temple	Near to Bheerpur Railway Station, One Shiv Temple	UP-Allahabad	North Central Rly	P	4	12	76	90	37			
SR-21	Temple	Near to Chunar Railway Station, Shree Krishna Temple	UP-Mirzapur	North Central Rly	P	4	32	67	48	39			
SR-22	Hospital	Railway Health Centre, Chunar Rly Stn,	UP-Mirzapur	North Central Rly	P	4	10	73	59	36			
SR-24	School	Near to Mughalsarai Railway Station New Central Colony, A.T.P School	UP-Chandauli	North Central Rly	E	4	30	63	83	34			
SR-25	Hospital	Near to Mughalsarai Railway Station New Central Colony, Divisional Railway Hospital	UP-Chandauli	North Central Rly	E	4	60	68	60	40			
SR-OP 01	Hospital	Hathras hospital	UP-Bulandshahr	North Central Rly	P	4	200	72	70	45			
SR-OP 02	School	Hathras school	UP-Hathras	North Central Rly	P	4	50	61	64	41			
SR-OP 03	School	Tundla College	UP-Firozabad	North Central Rly	E	4	100	57	46	36			
SR-OP 04	Hospital	Tundla hospital	UP-Firozabad	North Central Rly	E	4	70	65	46	40			
SR-OP 05	Temple	Temple ,halfway between etawah and ekdill	UP-Etawah	North Central Rly	E	4	100	83	66	44			
SR-OP 06	Mosque	Ekdil Masjid	UP-Etawah	North Central Rly	P	4	25	74	63	46			
SR-OP 07	Hospital	Etawah hospital (NH)	UP-Etawah	North Central Rly	E	4	250	68	58	45			
SR-OP 08	Hindu Temple in from of Railway stn.	Etawah	UP-Etawah	North Central Rly	E	4	20	83	66	44			
SR-OP09	Mosque	Near to Aligarh Railway Station	UP-Aligarh	North Central Rly	E	4	4	80	76	62			
SR-OP10	Temple	Khurja ,temple	UP-Bulandshahr	North Central Rly	P	4	25	76	63	47			

Note 1: Same numbering as corresponding SR site

Note 2: Name of State, G - Gujarat, M - Maharashtra

Note 3: E - Existing railway line but out of DFC alignment, P - Paralleling railway line to existing one,
D - Alongside planned Detour

Note 4: Horizontal distance of measuring point from centre of the nearest track (m)

(3) Questionnaire Survey on Noise and Vibration near SR Sites

The questionnaire survey was conducted to collect opinions of the local residents related to their perceptions over the disturbances and annoyance caused by existing railway noise and vibration as well as other pollution components at each Sensitive Receptor site. The number of interviewee was ten (10) residents living near the railways per surveyed SR site.

The major questions of the questionnaire are listed below.

- What kind of pollution you are suffering?
- Does railway noise annoys your life?
- Does railway vibration annoys your life?
- Are there any noise and vibration sources generated from a factory, road traffic, constructions, etc?
- Are there any comments and suggestions on noise and vibration mitigation measures?

The summary of the questionnaire is shown in Table 10-56. Major findings are also provided below.

Table 10-56 Summary of Pollution Interview Survey

Area	No of Persons Interviewed	Noise from railway annoys your life?			Vibration from railway annoys your life?		
		Yes	No	NA	Yes	No	NA
Urban	293	204	48	1	232	79	1
Rural	271	137	133	5	115	166	6
Total	564	341	181	6	347	245	7

The majority of the interviewees identified “Noise and Vibration,” “Vibration only” and “Nothing” as the answer to the question on the most significant pollution components. Moreover, compared to noise, the vibration is not considered as a significant pollution.

10.5.7 Prediction and Evaluation of Railway Noise and Vibration

(1) Procedure of Prediction and Evaluation

Prediction and evaluation of railway noise and vibration due to the passing freight trains have been carried out for each SR site according to the procedure of prediction and evaluation as shown in Figure 10-29.

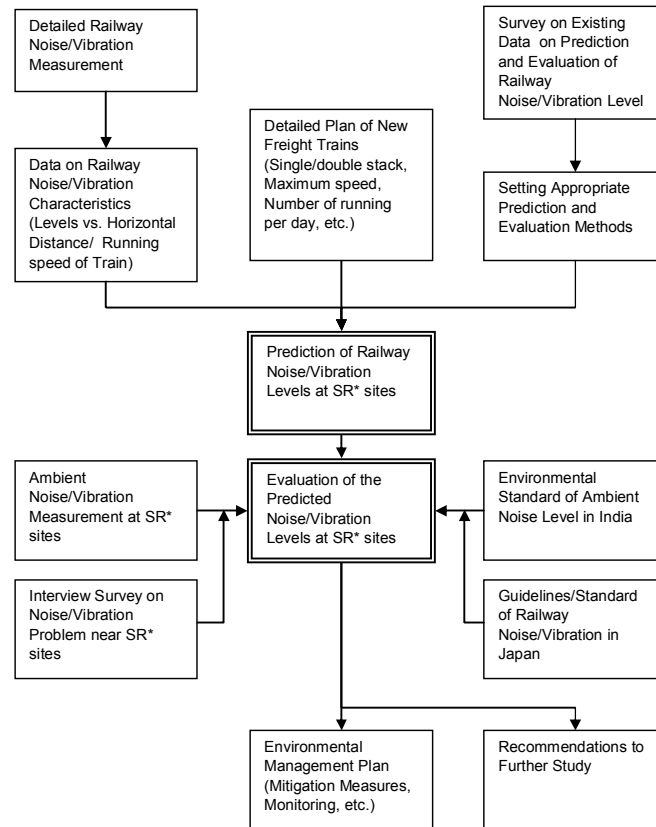


Figure 10-29 Procedure for Prediction and Evaluation of Noise and Vibration Levels

(2) Examination of Prediction Method

1) Railway Noise

As mentioned above, in Japan regarding railway noise generated by conventional trains (local trains, express trains and limited express trains), main causes include (1) traction movements, (2) structures and (3) machines equipped to the train. Among them, the traction movement contributes to the generation of noise greatly.

In Japan, several types of prediction equations were proposed for various types of railway track structures, such as the elevation, embankment and cutting. The equation proposed by Railway Technical Research Institute of Japan (1996), one of the potential equations to be applied for this survey, is based on the data of passenger trains in Japan. By considering differences in tracks, trains, structures between India and Japan, it is not desirable to apply the equation and relevant parameters directly to predict the noise level of freight trains in India.

Therefore, prediction was carried out applying the actual data of railway noise level (L_{AE}), running speed (V) of trains, and the distance from centre of the nearest railway track (D).

Based on the obtained the data of railway noise at 15 sites, the empirical equation was extracted by using a simple regression and correlation analysis. The data at 2 sites was examined to extract the empirical equation by referring the precedents in Japan. It was decided to use the below equation for noise prediction.

Assuming V is constant, D is only one variable, and the empirical equation is shown below. A predicted railway noise level is shown in the below table.

$$L_{AE1} = A_1 + B_1 \text{Log}_{10}(D) \quad \text{----- (1-1)}$$

$$L_{Aeq1} = L_{AE1} + 10 \text{Log}_{10}(N/T) \quad \text{----- (1-2)}$$

Table 10-57 Predicted Railway Noise Level by Distance

Trains	Category	A	B	Railway Noise Level (LAE & Laeq (dB))					Noise Level
				12.5 m	25 m	50 m	100 m	200 m	
Freight Electric	FEP	110.59	-8.89	101.0	98.2	95.5	92.8	90.1	LAE
				76.1	73.3	70.6	67.9	65.2	LAeq

Note 1: Electrified Freight Train (Plain Route) Running at 100 km/h.

Note 2: LAE=A+BLog₁₀(D), Laeq=LAE-10Log₁₀(N/T)

Note 3: Number of Sample: 6 data, r²=0.899

2) Prediction Method of Railway Vibration

In Japan, the methodology of railway vibration prediction is not fully established, compared to that of railway noise. Based on the data on the running speed of trains, track types, structures and the distance from the centre of the nearest railway track, a few empirical equations were proposed by Tokyo Metropolitan Government and Osaka Prefecture Government.

Initially the equations developed by these 2 organizations were examined. However, it is also undesirable to apply directly the equations developed in Japan to predict railway vibration levels of freight trains in India. One of the reasons would be that the propagation pattern of vibration changes depending upon conditions of railway tracks, foundations, structures, the surface of ground (soil types, concrete or asphalt), etc., and these conditions are considered different from these in Japan.

Therefore, prediction was carried out applying in the similar manner by applying the actual data of the railway vibration level (L_{peak}), the running speed (V) of train, and the distance from centre of the nearest railway track (D).

Based on the actual data obtained through railway vibration measurement at 15 sites along the existing the railway, the equation was prepared for the prediction of vibration levels:

Assuming V is constant, D is only one variable, and the empirical equation is shown below. A predicted railway noise level is shown in the below table.

$$L_{\text{peak}2} = A_2 + B_2 \text{Log}_{10}(D) \quad \text{----- (2)}$$

Table 10-58 Predicted Railway Vibration Level by Distance

Trains	Category	A	B	Railway Vibration Level (L _{peak} (dB))				
				12.5 m	25 m	50 m	100 m	200 m
Freight Electric	FEP	120.86	-38.04	79.8	67.7	56.2	44.8	33.3

Note 1: Electrified Freight Train (Plain Route) Running at 100 km/h.

Note 2: L_{peak} = A + B Log₁₀(D)

Note 3: Number of Sample: 6 data, r²=0.973

(3) Prediction and Evaluation of Railway Noise and Vibration due to Dedicated Freight Trains

1) Condition of Prediction

Following conditions are assumed:

- Type of traction: electrified traction (electric locomotive)
- Running operation: 140 trains/direction/day with the same time interval

(approximately one train for every five minutes⁵)

- Maximum running velocity: 100 km/h
- Targeted railway structures:
- Majority of the existing railway line structures is the embankment structures with approximately 2 to 5 m high from the ground level at the site. Therefore, railway tracks are expected to be located at the same as ground level.
- Railway noise and vibration generation level due to planned dedicated freight train: remains the same as the existing freight train, although DFC plan would have various factors contributing to reduction in railway noise and vibration.

2) Prediction and Evaluation Points

- a) SR sites along the existing railway lines within the parallel sections of the DFC Project
- b) SR sites along the existing railway lines within the detour sections of the DFC Project
- c) Sites along the planned detour routes where no railway noise and vibration were observed as a reference point of the background level monitoring because SR sites were hardly found alongside the detour sectors.

(4) Prediction and Evaluation Results

1) Prediction of Railway Noise Levels

Estimated noise levels (L_{Aeq})⁶ due to additional new freight trains are shown in Table 10-59. The results were evaluated by comparing with (i) the ambient noise standard in India, (ii) existing ambient noise levels at SR and (iii) existing railway noise at SR.

Predicted railway noise levels are within the range of 42-84 dB, and all the predicted noise levels except these of the diversion in Aligarh, Uttar Pradesh exceed the ambient noise standard of India. However, it should be mentioned that the existing noise levels are between 44-83 dB and exceed the ambient noise standard of India except one measurement site in the diversion in Rewari, Haryana.

It is considered that road traffic contributes to the higher noise levels at SR sites since at most SR measurement sites, heavy road traffic or relatively heavy traffic was observed during the survey. Moreover, the silent zone which standard level is the lowest, is specified not in accordance with the land use type but the building use, such as schools, temples, hospitals, etc. Therefore, it is relatively difficult to meet the standard at the places where a SR is located within the industrial area or commercial area.

Compared to the existing ambient noise levels, the predicted levels (42-84 dB) are in the same range of the existing ambient noise levels (44-83 dB). However, depending on the measurement site, the differences between the predicted noise levels and the existing noise levels are between -15 dB and 16 dB. For instance, at the hospital near Vangaon Station, Maharashtra and the school near Ajmer Station, Rajasthan, the difference of approximately 15 dB was observed.

⁵ Since “one train for every five minutes” is simply estimated on average in 24 hours, noise and vibration level may increase during daytime in the case where frequency of the train operation in night time is reduced.

⁶ Predicted noise levels are estimated noise levels generated from railways only. The correction of the background level is not considered.

As for the comparison with existing railway noise levels at SRs, the differences are between -17 dB and 2 dB, and in most cases, the predicted noise levels tend to be lower than the existing railway noise levels in SRs.

Overall, because SRs along the railway lines are located in the urban area and city area, the existing noise levels are already higher, it is recommended that DFC alignment should avoid the urban and city areas not to increase the noise levels. While the review of the DFC alignment has been conducted from the view point of social environment and land acquisition, it is suggested to review the alignment in terms of ambient noise control as well.

Although in the detour routes the impacts to residents would be small, the railway noise would be newly added to the residents' life, and the appropriate mitigation measures should be prepared for SRs and residences along the railway line.

In the detour section, at the SRs where the additional impact of the noise is large, it is suggested to adopt necessary mitigation measurements such as lowering the train speeds and establishing soundproof walls in the Detailed Design stage.

Table 10-59 Predicted Result of Railway Vibration

Serial No.	Type of SR	Location of SR site	State -(District) (1)	Predicted Noise Level (dB)	Standard Noise Level (2)	Present Ambient Noise Level (dB)	Present Railway Noise Level (dB)
				LAeq	LAeq	LAeq	LAeq
1	Hospital	Gupta Hospital, Billimora	G-Navsari	69	50	67	73
2	Hindu Temple	Hindu temple, Village Kartalot Near Ambica River Bridge	G-Navsari	68	50	57	-
3	Hindu Temple	Hindu Temple, Near Ankaleshwar Crossing	G-Bharuch	68	50	71	74
4	Mosque	Mosque, Near Bharuch RS	G-Bharuch	68	50	67	66
5	Hindu temple	Hindu Temple, Near Miyagam Karjan RS	G-Kheda	67	50	72	-
6	Hospital	Shree Mahalaxmi Mahilaji Hospital, Near Vishvamitri RS	G-Vadodara	67	50	68	68
7	Hospital	Darbar Shri Gopaldas Desai TB Hospital, Near Anand RS	G-Anand	70	50	73	73
8	Minaret	Shaking minaret-2, Near Ahmedabad Junction	G-Ahmadabad	75	50	72	-
9	Hospital	Gujrat State Police Hospital, near Madhupura Crossing	G-Ahmadabad	75	50	76	-
10	Hindu temple	Hindu Temple, near Sabarmati Railway bridge	G-Ahmadabad	75	50	75	81
11	Hindu temple	Hindu Temple, Near Sabarmati RS	G-Ahmadabad	69	50	69	-
12	Hindu Temple	Hindu Temple near Central Jail, (Sabarmati)	G-Ahmadabad	70	50	77	79
13	Hospital	Kuldeep Hospital, Near Kalol RS	G-Mahesana	71	50	71	71
14	Hospital	Hospital, Near Siddhapur RS	G-Mahesana	72	50	66	-
15	Farmland	Diversion, Ramnagar village Antroli (Surat)	G-Surat	61	50	75	-
16	Hospital	Tapi River side	G-Surat	71	50	70	85
17	Hindu Temple	Vangaon Railway Crossing	M-Thane	72	50	64	-
18	School	Vangaon Railway Crossing	M-Thane	72	50	70	81
19	Hospital	Vangaon Railway Station	M-Thane	68	50	52	-
20	School	SVN public school, between Ateli RS and Narnaul RS	H-Mahendragarh	65	50	70	72
21	School	Govt College, near Narnaul RS	H-Mahendragarh	66	50	75	70
22	Temple	Hindu temple adjacent to RS, Nim ka Thane RS	R - Sikar	77	50	79	76
23	Temple	Temple near railway crossing, Shri Madhopur	R - Sikar	74	50	71	77
24	School	School near railway crossing, Ringas RS	R - Sikar	65	50	71	78
25	Hospital	Hospital near railway crossing, Ringas RS	R - Sikar	67	50	78	78
26	School	School, near Phulera Jn.	R - Jaipur	68	50	66	-
27	Hospital	Hospital along RS, Ajmer RS	R - Ajmer	65	50	72	73
28	School	School along RS, Ajmer RS	R - Ajmer	66	50	81	80
29	Farmland	Diversion, near Madar RS	R - Ajmer	67	50	77	-
30	Temple	Temple, Front side of Marwar RS	R - Pali	68	50	77	85
31	School	School, Front side of Marwar RS	R - Pali	65	50	76	-
32	Temple	Temple near Rewari RS	H-Rewari	70	50	69	75
33	Primary School	Khurja Junction, Central Primary School	UP-Bulandsahar	84	50	79	85
34	School	S.D.Public School,Bimla Nagar, Near Khurja Rly Stn,	UP-Bulandsahar	67	50	58	-
35	Temple	Near to Aligarh Railway Station, Small Hanumanji Temple	UP-Aligarh	68	50	67	-
36	Agricultural lands	Aligarh diversion	UP-Aligarh	42	50	52	-
37	Hospital	Near Etawah hospital (railways)	UP-Etawah	67	50	67	69
38	Park	Etawah park	UP-Etawah	74	50	65	-
39	Agricultural lands	Etawah diversion	UP-Etawah	55	50	63	-
40	School	Railway Colony,Civil Lines, 1km away from Allahabad Railway Stn.	UP-Allahabad	70	50	55	-
41	Temple	Hanumanji Temple, Allahabad Railway Station,	UP-Allahabad	73	50	68	-
42	Temple	Reporting Police Chouki,Bheerpur, 2 km away from Bheerpur RS,	UP-Allahabad	73	50	70	-
43	Temple	Near to Bheerpur Railway Station, One Shiv Temple	UP-Allahabad	76	50	76	-
44	Temple	Near to Chunar Railway Station, Shree Krishna Temple	UP-Mirzapur	72	50	67	-
45	Hospital	Railway Health Centre, Chunar Rly Stn,	UP-Mirzapur	77	50	73	80
46	School	Near to Mugalsarai Railway Station New Central Colony, A.T.P School	UP-Chandauli	72	50	63	-
47	Hospital	Near to Mugalsarai Railway Station New Central Colony, Divisonal Railway Hospital	UP-Chandauli	69	50	68	67
48	Hospital	Hathras hospital	UP-Bulandsahar	64	50	72	72
49	School	Hathras school	UP-Hathras	70	50	61	-
50	School	Tundla College	UP-Firojabad	67	50	57	-
51	Hospital	Tundla hospital	UP-Firojabad	68	50	65	-
52	Temple	Temple, halfway between etawah and ekdill	UP-Etawah	67	50	83	82
53	Mosque	Ekdil Masjid	UP-Etawah	73	50	74	71
54	Hospital	Etawah hospital (NH)	UP-Etawah	63	50	68	68
55	Temple	Hindu Temple in from of Railway stn. , Etawah	UP-Etawah	74	50	83	-
56	Mosque	Near to Aligarh Railway Station	UP-Aligarh	81	50	80	83
57	Temple	Khurja, temple	UP-Bulandsahar	73	50	76	71
Maximum Noise Level				84	-	83	85
Minimum Noise Level				42	-	52	66

Note 1: Name of State: G - Gujarat, M - Maharashtra, R-Rajasthan, H-Haryana; and U-Uttar Pradesh

Note 2: The ambient noise standard for Silent Zones during daytime which is applicable to Sensitive Receptors is shown.

Note 3: Estimated average number of current freight trains is 175 trains/day/direction for the Western Corridor (JNPT-Rewari) and 138 trains/day/direction for the Eastern Corridor (Mughal Sarai - Khurja) for 2004-05.

2) Prediction of Railway Vibration Levels

Estimated vibration levels (L_{peak})⁷ due to additional new freight trains are shown in Table 10-60. Estimated vibration levels (L_{peak}) due to additional new freight trains are evaluated by comparing with (i) the existing ambient vibration level at SR sites and (ii) the existing railway vibration level at SR sites.

⁷ Predicted vibration levels are estimated vibration levels generated from railways only. The correction of the background level is not considered.

Compared to the existing ambient vibration levels, which are in the range of 38-110 dB, the predicted railway vibration levels are also in the similar range of 18-103 dB. However, the differences between the predicted levels and existing levels are between -66-40 dB.

There are some cases in which the predicted levels are much lower than the existing vibration levels. Since this was observed in the areas with heavy traffic, it is considered that the major contributor of the vibration levels is not the railway but also the other vibration sources such as road traffic near the measurement sites.

On the other hand, the predicted vibration levels which exceed the existing vibration levels were observed at the measurement sites. Mostly these sites are located within 4-50 m from the railway lines. Therefore, appropriate mitigation measurements should be adopted by considering the SRs and residences along the railway lines at Detailed Design stage.

Table 10-60 Predicted Result of Railway Vibration

Serial No.	Type of SR	Location of SR site	State -(District) (1)	Predicted vibration Level (dB)	Ambient Vibration Level (dB)		Railway Vibration Level (dB)
					Lpeak	L ₁₀	Lpeak
1	Hospital	Gupta Hospital, Billimora	G-Navsari	52	108	59	80
2	Hindu Temple	Hindu temple, Village Kartalot Near Ambica River Bridge	G-Navsari	45	47	38	-
3	Hindu Temple	Hindu Temple, Near Ankaleshwar Crossing	G-Bharuch	44	109	57	110
4	Mosque	Mosque, Near Bharuch RS	G-Bharuch	44	110	50	48
5	Hindu temple	Hindu Temple, Near Miyagam Karjan RS	G-Kheda	42	66	73	-
6	Hospital	Shree Mahalaxmi Mahilaji Hospital, Near Vishvamitri RS	G-Vadodara	41	54	40	57
7	Hospital	Darbar Shri Gopaldas Desai TB Hospital, Near Anand RS	G-Anand	54	99	65	52
8	Minaret	Shaking minaret-2, Near Ahmedabad Junction	G-Ahmadabad	76	90	45	-
9	Hospital	Gujrat State Police Hospital, near Madhupura Crossing	G-Ahmadabad	76	110	49	-
10	Hindu temple	Hindu Temple, near Sabarmati Railway bridge	G-Ahmadabad	76	106	50	63
11	Hindu temple	Hindu Temple, Near Sabarmati RS	G-Ahmadabad	52	60	39	-
12	Hindu Temple	Hindu Temple near Central Jail, (Sabarmati)	G-Ahmadabad	54	110	49	59
13	Hospital	Kuldeep Hospital, Near Kalol RS	G-Mahesana	58	64	44	48
14	Hospital	Hospital, Near Siddhapur RS	G-Mahesana	62	110	38	-
15	Farmland	Diversion, Ramnagar village Antroli (Surat)	G-Surat	18	67	38	-
16	Hospital	Tapi River side	G-Surat	60	66	46	68
17	Hindu Temple	Vangaon Railway Crossing	M-Thane	64	58	53	-
18	School	Vangaon Railway Crossing	M-Thane	64	68	52	67
19	Hospital	Vangaon Railway Station	M-Thane	44	71	39	-
20	School	SVN public school, between Ateli RS and Naraul RS	H-Mahendragarh	40	61	39	60
21	School	Govt College, near Naraul RS	H-Mahendragarh	42	61	32	42
22	Temple	Hindu temple adjacent to RS, Nim ka Thane RS	R - Sikar	79	80	41	70
23	Temple	Temple near railway crossing, Shri Madhopur	R - Sikar	69	62	37	62
24	School	School near railway crossing, Ringas RS	R - Sikar	40	57	35	57
25	Hospital	Hospital near railway crossing, Ringas RS	R - Sikar	46	58	39	61
26	School	School, near Phulera Jn.	R - Jaipur	49	57	35	-
27	Hospital	Hospital along RS, Ajmer RS	R - Ajmer	41	60	31	60
28	School	School along RS, Ajmer RS	R - Ajmer	43	62	39	62
29	Farmland	Diversion, near Madar RS	R - Ajmer	46	41	38	-
30	Temple	Temple, Front side of Marwar RS	R - Pali	50	70	51	67
31	School	School, Front side of Marwar RS	R - Pali	41	68	50	-
32	Temple	SR site, Rewari RS	H-Rewari	56	56	36	56
33	Primary School	Khurja Junction, Central Primary School	UP-Bulandsahar	103	110	51	72
34	School	S.D.Public School, Bimla Nagar, Near Khurja Rly Stn.	UP-Bulandsahar	46	75	49	-
35	Temple	Near to Aligarh Railway Station, Small Hanumanji Temple	UP-Aligarh	51	56	40	-
36	Agricultural lands	Aligarh diversion	UP-Aligarh	93	53	38	-
37	Hospital	Near Etawah hospital (railways)	UP-Etawah	46	58	45	58
38	Park	Etawah park	UP-Etawah	69	87	40	-
39	School	Railway Colony, Civil Lines, 1km away from Allahabad Railway Stn.	UP-Allahabad	56	38	37	-
40	Temple	Hanumanji Temple, Allahabad Railway Station,	UP-Allahabad	66	53	35	-
41	Temple	Reporting Police Chouki, Bheerpur, 2 km away from Bheerpur RS.	UP-Allahabad	68	55	35	-
42	Temple	Near to Bheerpur Railway Station, One Shiv Temple	UP-Allahabad	77	90	37	-
43	Temple	Near to Chunar Railway Station, Shree Krishna Temple	UP-Mirzapur	63	48	39	-
44	Hospital	Railway Health Centre, Chunar Rly Stn.	UP-Mirzapur	79	59	36	60
45	School	Near to Mugsarsari Railway Station New Central Colony, A.T.P School	UP-Chandauli	63	83	34	-
46	Hospital	Near to Mugsarsari Railway Station New Central Colony, Divisional Railway Hospital	UP-Chandauli	53	60	40	47
47	Hospital	Hathras hospital	UP-Bulandsahar	36	70	45	60
48	School	Hathras school	UP-Hathras	56	64	41	-
49	School	Tundla College	UP-Firojabad	46	46	36	-
50	Hospital	Tundla hospital	UP-Firojabad	51	46	40	-
51	Temple	Temple, halfway between etawah and ekdill	UP-Etawah	46	66	44	52
52	Mosque	Ekdil Masjid	UP-Etawah	66	63	46	63
53	Hospital	Etawah hospital (NH)	UP-Etawah	33	58	45	58
54	Temple	Hindu Temple in from of Railway stn. Etawah	UP-Etawah	69	66	44	-
55	Mosque	Near to Aligarh Railway Station	UP-Aligarh	93	76	62	77
56	Temple	Khurja, temple	UP-Bulandsahar	66	63	47	63
Maximum Vibration Level				103	110	73	110
Minimum Vibration Level				18	38	31	42

Note 1: Name of State: G - Gujarat, M - Maharashtra, R-Rajasthan, H-Haryana; and U-Uttar Pradesh

Note 2: Estimated average number of current freight trains is 175 trains/day/direction for the Western Corridor (JNPT-Rewari) and 138 trains/day/direction for the Eastern Corridor (Mughal Sarai - Khurja) for 2004-05.

10.5.8 Overall Findings and Recommendations

(1) Findings on SRs from Prediction and Evaluation Results

Overall, since at SRs located along the railway lines in the urban area and city area, the existing noise levels are already higher. Thus it is recommended that DFC alignment should avoid the urban and city areas not to increase the noise levels. The review of the DFC alignment has been conducted from the point of view of socio environment and land acquisition, it is suggested to review the alignment in terms of ambient noise control as well.

While in the detour routes the impacts to residents would be small; however, the railway noise would be newly added to the residents' life, and the appropriate mitigation measures should be prepared for SRs and residences along the railway line.

In the detour section, at the SRs where the additional impact of the noise is large, it is suggested to adopt necessary mitigation measurements such as lowering the train speed, and establishing soundproof walls in the Detailed Design stage.

(2) Consideration of the Noise and Vibration Measurement at Residences besides SRs

In this study, SRs were selected as noise and vibration measurement sites as the representative or typical sites by considering various factors of the study such as the purpose, the survey period, availability of the measurement methodology, noise and vibration standards and environmental consultants in India. It is suggested that the noise and vibration survey should be conducted at residences along the railway lines where actual affected people live in the Detailed Design stage.

(3) Implementation of Railway Noise and Vibration Mitigation Measures

As this study result shows, at SRs in the urban and city area, the existing ambient noise and vibration tend to be high due to the traffic, people nearby, their own religious activities, etc. Moreover, the interview survey results show that not only railway noise but also road traffic are environmental concerns of the residents. Additionally the horns from trains were also identified a significant noise contributor. Therefore, the railway noise and vibration mitigation measures should be adopted gradually in accordance with the rise in environmental awareness especially for noise and vibration.

(4) Baseline Data Collection of Railway Noise and Vibration and Establishment of Prediction and Evaluation Methods

1) Establishment of the Methods of Railway Noise Monitoring

For further detailed noise and vibration monitoring, it is necessary to obtain the baseline data as well as the established methodologies of railway noise and vibration measurement. Since there is very limited data on noise and vibration in India. It is considered that extensive railway noise and vibration survey was conducted in ESCS and ESIMMS for the first time in India. Although there are railway noise and vibration survey data and methodologies available in Japan, they are not applicable to India since there are various different conditions such as the railway and train design and operation.

2) Establishment of the Methods of Railway Vibration Monitoring

In Japan, the ambient and railway vibration measurement covers only direct impacts to human beings and vertical movement of vibration. However, in India, the horizontal impacts are considered because the major concern of vibration is impacts on buildings. Therefore, vibration measurement in buildings should be also considered for the further study in the Detailed Design stage.

3) Impact Study on All Affected SRs, Houses, and Private Facilities

A detailed survey on SRs along the proposed DFC railway alignment should be conducted in the Detailed Design stage to identify all affected SRs located within certain area such as 100-m strip for both sides of the railway. Among the identified SRs, impact forecast and required measures should be conducted for important SRs to be potentially affected seriously. In addition, Impacts for the houses and privately-owned facilities should be examined and measures should be proposed, if required.

10.6 STAKEHOLDER/PUBLIC CONSULTATION MEETING

A series of the stakeholder/public consultation meetings were conducted as shown in Figure 10-30. In this section, results of the meetings after the 2nd stage are summarised. As shown in Figure 10-30, MOR and DFCCIL should continue similar meeting to explain about the project and obtain consensus of related matters of the project such as procedures on land acquisition, compensation and resettlement.

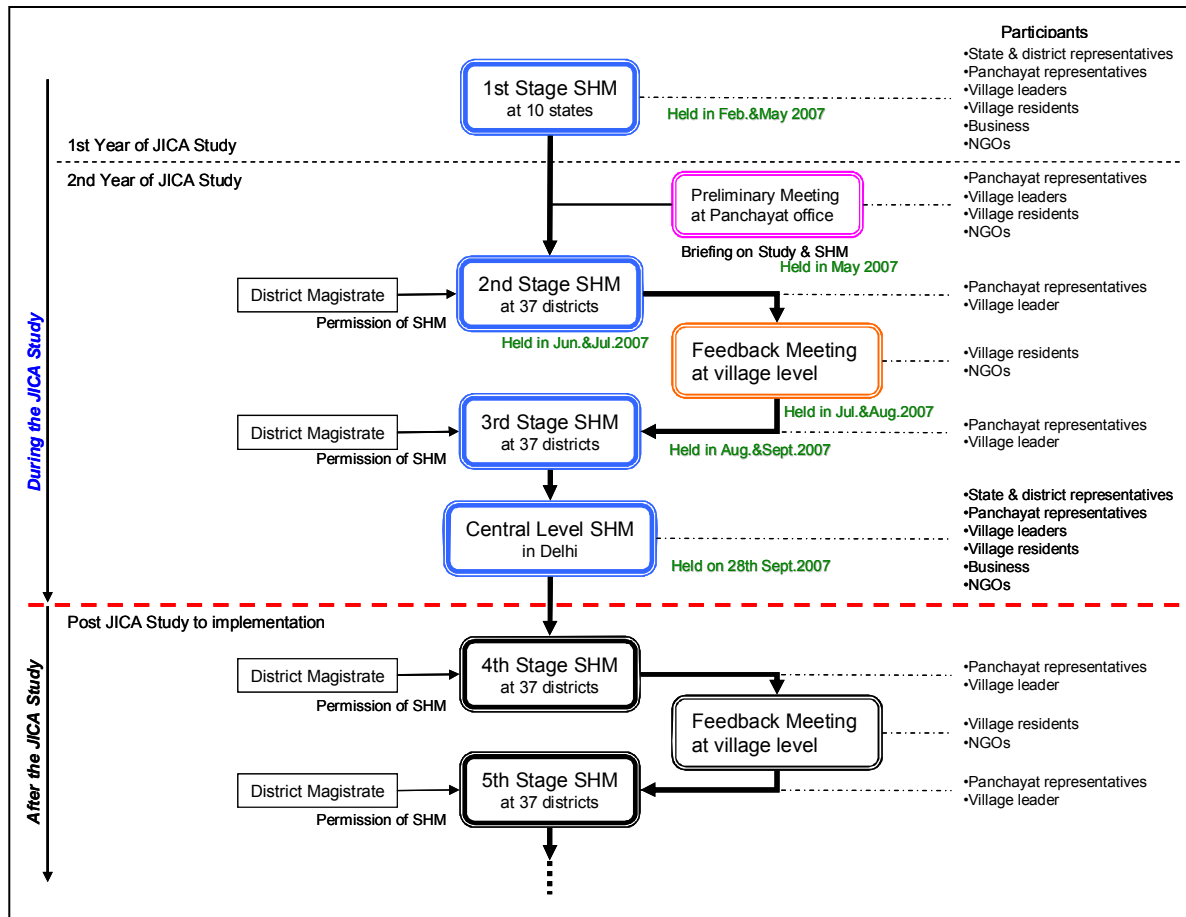


Figure 10-30 Flow of the Stakeholder/Public Consultation Meeting

10.6.1 Methodology of the Second Stage Stakeholder/Public Consultation Meeting

(1) Basic Policy of Stakeholder/Public Consultation Meeting

The Stakeholder/Public Consultation Meetings (SHM) were held based on the following policies.

1) Conducting Stakeholder/Public Consultation Meetings in Every Affected Districts

Following the First Stage SHM held in January-February 2007, Second Stage SHM was held in 37 Districts which will be directly affected by the Project.

2) Encouraging Participation of Project Affected Families (PAPs)

Those stakeholders directly affected by the Project with detour routes, parallel section with highly populated areas, junction/crossing stations, ROBs of each District were encouraged to participate in the SHM.

3) Involvement of Panchayat System

Panchayat System, which is considered a well representing system of the local residents in India, is involved in the discussion process.

4) Systematic Arrangement of Meeting Schedule

The affected districts are located extensively. Therefore, a series of meetings are held every two days starting from one side of the alignment to the other in order to confront with limited time.

(2) Methodology of Stakeholder/Public Consultation Meeting

1) Announcement of the Second Stage SHM

The announcement for the SHM was conducted with the following procedure:

- The announcement of the SHM at each district was made by official letters of the concerned district administration;
- The announcement to the Panchayats and villages on the SHM was made by the distribution of handout materials made by the local consultants;
- The announcement to the local business enterprises and associations concerned with the Project was made by the letter issued by the local consultants attaching the letter issued by the district administration; and
- Announcement to the local news Papers and TV was made a few days before of the meeting. A press note was drafted by the local consultants.

2) Second Stage SHMs

The meetings were initiated and facilitated by Meeting Facilitator of Local Consultant (NGO). The results of the discussion were recorded by the NGO.

3) Feed-back Meeting

In order to feedback the results of the Second Stage SHM, feed-back meetings were held in each village after the Second Stage SHM. In addition, the issues of resettlement and land acquisition are discussed at the meetings.

4) Announcement of the Third Stage SHM

- The procedures for the announcement of Third Stage SHM are same as of the Second Stage SHM.
- The participants present the discussion records/presentation materials of their own feed-back meeting and discuss an important topic of each village among the participant in order to reach agreement on the common consensus on the basic matters.

10.6.2 Results of Second Stage SHM in Western Corridor

(1) Package 1 Area

The SHMs in the Package 1 area were conducted as shown in Table 10-61.

Table 10-61 Second Stage SHM (Package 1)

State	District	Date of 2nd Stage Meeting	Meeting Place	No. of Affected Villages	Participated No. of Villages	Total No. of Participants	Participated No. of Towns
Gujarat	Banas Kantha	15.06.2007	Palanpur	31	12	200	1
	Patan	18.06.2007	APMC Hall, Jira Mandi, Unjha	5	6	90	2
	Mahesana	20.06.2007	Sarvojanic Kewari Mondal Sanchalit Gujrati BalbariKamlaba Hall	35	11	150	1
	Gandhinagar	22.06.2007	Ambedkar Hall, Sector 13	8	8	90	1
	Ahmedabad	25.06.2007	Mehndi Nawaz Ae Jung Hall, Paladi	18	9	120	2
	Kheda	27.06.2007	APMC Hall, Kheda	13	11	220	1
	Anand	29.06.2007	Arya Samaj Hall,	28	7	75	1
	Vadodara	02.07.2007	Patel Bari, Kalali	29	9	110	1
	Bharuch	20.07.2007	Sri Neelkanth Mahadev Temple,	27	12	100	-
	Surat	17.07.2007	Sports Club, Vakil Vadi, Surat	35	8	110	-
	Navsari	15.07.2007	Thakore Bari Hall	21	14	130	1
	Valsad	16.07.2007	Sri Ganesh Hall	47	16	100	-
	Maharashtra	Thane	18.07.2007	Lions Club, Palghar	55	18	130
Total				352	141	1,625	22

Gujarat State is located at the west coast zone of Indian subcontinent, with relatively fertile lands, which makes landowners reluctant to relinquish their agricultural properties. Following is a description of the major opinions collected from the stakeholder meetings that were held.

- The land in Palanpur is fertile for the agriculture activity. Thus resettlement area should be located within 5 km from the actual owned lands;
- The railway must hire local people;
- The new alignment should pass through forests and waste-lands owned by the government instead of agricultural lands;
- The affected families must be compensated for the suspension of their activities not only for the head of family but for each adult member of the family;
- The cost of land for acquisition must be evaluated by market value as against government assessed value. The difference is up to 20 times in some urban development areas while it would be 4 to 8 times in agricultural areas;
- There will be objections on the Project if the farmers are not going to be benefited;
- The compensation must consider the hidden costs inherent to the resettlement;
- Calculation of the compensation rates should not be based on the methodology of depreciation which will unreasonably reduce the amount of compensation;
- In the past experiences, the compensation from the government was not paid properly. The Project can start after full payment of compensation;
- DFC Project must avoid resettlement and land acquisition in the agricultural area. Instead, the works should take place in parallel to the existing railway alignment.

The purpose of the SHM in the Gujarat was previously notified to the local media so that the meeting sessions were covered by the local TV and newspapers in Gujarat-language.

(2) Package 2 Area

The SHMs in the Package 2 area were conducted as shown in Table 10-62.

Table 10-62 Second Stage SHM (Package 2)

State	District	Date of 2nd Stage Meeting	Meeting Place	No. of Affected Villages	Participated No. of Villages	Total No. of Participants	Participated No. of Towns
Haryana	Rewari	29.06.2007	Secretariat Meeting Hall R.No-203	24	17	110	1
	Mehendragarh	27.06.2007	Panchyat bhawan Narnauul Haryana	24	23	115	-
Rajasthan	Alwar	22.06.2007	Shakti Resort, Behror, Dist-Alwar	1	2	95	1
	Sikar	19.06.2007	Shri Madhopur Panchayat Samity	37	19	148	1
	Nagaur	28.06.2007	Gram Panchyat Minda, Block Nawa	2	4	84	-
	Jaipur	22.06.2007	Community Hall Nagar Nigam, Phulera	41	17	136	1
	Ajmer	20.06.2007	Raj Palace, Near Nagina Bagh, Ajmer	40	9	135	1
	Pali	20.06.2007	Sri Badri Bhawan, Murli Manohar	60	6	127	-
	Sirohi	29.06.2007	Senior Railway Institution, Sirohi	31	4	126	-
Total				260	101	1,076	5

Rajasthan is characterized by its traditional commercial activities and the area directly affected by the Project is relatively non-fertile lands. Thus major opinions of the local residents were mainly not related to land as can be noted below:

- Alwar Districts a national capital region similar to Gurgaon of Haryana State. Accordingly, the area is expected to grow with industrial and commercial activities. Thus DFC Project should construct a detour from the existing Khori Station in Haryana State to Narnawar crossing Behlor. It should then go to Nimurana for the purpose of contributing to the development of Behlor.
- Ajmer is the second urban largest area of Rajasthan and welcomes the DFC Project;
- The section between Rewari and Ajmer is under construction to change the existing narrow gauge to broad gauge. It was heard that because of the works there is a plan to acquire 100 m of land on each side of the railway totalling to 200 m wide. However, there was also information that required land is only 26-30 m, while during the meeting it was said that only 13 m of land alongside the existing railway line is to be acquired. The different information relayed caused general confusion.
- For the land acquisition process, market price must be applied as against government assessed price.
- Explanation was asked on the maximum speed of the freight train, their frequency, and their impact of the vibration to the local residents;
- It was inquired if the DFC Project is considering adjustment of the sharp curves on the existing railway line.
- Method of payment for the compensation fee was also asked.

10.6.3 Results of Second Stage SHM in Eastern Corridor

(1) Package 3 Area

The SHMs in the Package 3 area were conducted as shown in Table 10-63. The following is a description of the principal opinions collected from the stakeholder meeting.

- In what way will the compensation fee be paid?;
- In what way did you analyse the alignment in order to avoid the resettlement?;
- For land acquisition, market price must be applied;

- In order to avoid railway accident at crossing points, construct ROBs every 1-3 km;
- In case of replacing agricultural lands, consideration to be made not only on the same quantity but also on the same quality of land;
- Offer opportunities of employment of the railway exclusive to the PAFs;
- Employ local farmers for the construction stage of the Project;
- What is the level of noise and vibration inherent to the realization of the Project; and
- How about the health effects of the magnetic field generated by the new railway project?

Table 10-63 Second Stage SHM (Package 3)

State	District	Date of 2nd Stage Meeting	Meeting Place	No. of Affected Villages	Participated No. of Villages	Total No. of Participants	Participated No. of Towns
Uttar Pradesh	Chandauli	18.6.07	Aggarwal Sewa Sansthan , Nai Basti , Mughal Sarai	9	27	202	2
	Mirzapur	20.6.07	Rahi lodge, Mirzapur	107	34	143	1
	Allahabad	22.6.07	Hindustan Acdamy,12- D Civil Lines, Allahabad	61	22	151	2
	Kaushambi	24.6.07	Kesharvani Dharmashala, Sirathu, Kaushambi	62	25	203	3
	Fatehpur	26.6.07	Ashoka Palace,near Old Tahseel, Fatehpur	66	21	135	1
	Kanpur Nagar	29.6.07	Shri Hari Guest House,near Naubasta Police Station , Kanpur Nagar	37	24	152	1
	Kanpur Dehat	1.07.07	Ram Ratan Audyogik Krishi Inter College,Jhinhak	36	22	321	2
	Auraiya	4.07.07	BSP.Office,near railway Station Dibivanur	21	19	439	1
	Etawah	6.07.07	Narayan Banquet Hall, Etawah	47	20	179	1
	Firozabad	9.07.07	Seth Chhadamilal Jain Mandir,Firozabad	54	28	189	1
	Agra	11.07.07	Sri Mahendrabhan Vimla Devi Balika Vidyalaya, Etmadpur, Agra	12	10	153	1
	Hathras	14.7.2007	Shiv Durga Marriage Hall, Near Police Station, Sikandra Rao Junction Road, Hathras	41	24	267	1
	Aligarh	16.7.2007	Shivam Bakaner House, Samaroh Bhawan, Janakpuri, Aligarh	36	25	152	1
	Bulandshahar	18.7.2007	Rai Bahadur Nathimal, Ram Sahai Mal, Dharamshala , Near JAS Inter College , Khurja, Bulandshahar	29	20	203	2
Gautam Budh Nagar	21.07.07	Mohan Kunj Dharmashala, Dadri, Gautam Budh Nagar	11	14	203	1	
Total				629	335	3,092	21

10.6.4 Feed-back Meeting

(1) Feed-back of Project Information at the Village Level

Feed-back meeting in each package is held with the following context:

- Verification of the information presented at the second stakeholder meeting at least talka level unless otherwise the village level is not achieved;
- Briefing on the framework of Resettlement and Rehabilitation Plan (RRP) by meeting facilitator of local consultant (NGO);
- Election of the members of Village Resettlement and Rehabilitation Committee (VRRC);
- Discussions on resettlement issues by the members of VRRC;
- Verification of the opinion of villagers on the issues of compensation, resettlement arrangement, and land acquisition; and

- Information for the third stage of stakeholder/public consultation meeting.

At each feed-back meeting held in the villages affected by the Project, records of the discussion are made by the meeting facilitator of local consultant (NGO) as reference.

(2) Feed-back Meeting in Package 1 Study Area

Table 10-64 shows the numbers of affected villages and the attendance of the villages to the second stage of stakeholder meetings of Package 1 area.

Table 10-64 Affected Villages in Western Corridor (Package 1)

No.	District	No. of Affected Villages	No. of Villages Feed-back Meeting was held		Attendance of the No. of Villages to the 2nd Stage of S/PC Meeting		Attendance of the No. of Villages to the 3rd Stage of S/PC Meeting		Railway Alignment
			No.	%	No.	%	No.	%	
1	Banas Kantha	31	31	100.0	12	38.7	13	41.9	Parallel Section and Detour Section
2	Patan	5	5	100.0	6	120.0	4	80.0	Parallel Section
3	Mahesana	35	34	97.1	11	31.4	10	28.6	Parallel Section and Detour Section
4	Gandhi Nagar	8	7	87.5	8	100.0	2	25.0	Detour Section
5	Ahmedabad	18	18	100.0	9	50.0	20	111.1	Detour Section
6	Kheda	13	13	100.0	11	84.6	14	107.7	Detour Section
7	Anand	28	27	96.4	12	42.9	28	100.0	Detour Section
8	Vadodara	29	29	100.0	14	48.3	17	58.6	Parallel Section and Detour Section
9	Bharuch	27	27	100.0	9	33.3	14	51.9	Parallel Section and Detour Section
10	Surat	35	35	100.0	14	40.0	0	0.0	Parallel Section and Detour Section
11	Navasari	21	21	100.0	23	109.5	14	66.7	Parallel Section
12	Valsad	47	46	97.9	17	36.2	14	29.8	Parallel Section
13	Thane	55	50	90.9	18	32.7	16	29.1	Parallel Section
	Total	352	343	97.4	164	46.6	166	47.2	

Discussions that took place at the village level for those who could not attend the Second Stage Stakeholder/Public Consultation Meeting as well as those who attended have been essentially the same as those topics discussed during the second stage of meeting.

Villagers are quite concerned about the rate of compensation of the loss of their asset as market rate as well as the land-for-land compensation scheme. They are also concerned with the employment and educational facilities as well as tuition fees for their children after the resettlement. Provision of ROB and RUB, better drainage system at the time of project implementation are also the concern of the villagers.

(3) Feed-back Meeting in Package 2 Study Area

Table 10-65 shows the numbers of affected villages and the attendance of the villages to the Second Stage SHM of Package 2 area.

Table 10-65 Affected Villages in Western Corridor (Package 2)

No.	District	No. of Affected Villages	No. of Villages Feed-back Meeting was held		Attendance of the No. of Villages to the 2nd Stage of S/PC Meeting		Attendance of the No. of Villages to the 3rd Stage of S/PC Meeting		Railway Alignment
			No.	%	No.	%	No.	%	
1	Rewari	24	24	100.0	17	70.8	13	54.2	Detour Section
2	Mahendragarh	24	24	100.0	23	95.8	3	12.5	Parallel Section
3	Alwar	1	1	100.0	2	200.0	1	100.0	Parallel Section
4	Sikar	37	37	100.0	19	51.4	25	67.6	Parallel Section and Detour Section
5	Nagaur	2	2	100.0	4	200.0	2	100.0	Parallel Section and Detour Section
6	Jaipur	41	39	95.1	10	24.4	21	51.2	Parallel Section and Detour Section
7	Ajmer	40	30	75.0	7	17.5	7	17.5	Parallel Section and Detour Section
8	Pali	60	49	81.7	9	15.0	3	5.0	Parallel Section
9	Sirohi	31	30	96.8	6	19.4	16	51.6	Parallel Section
	Total	260	236	90.8	97	37.3	257	98.8	

Discussion took at the village level of meeting in Rajasthan and Haryana appears to be the continuation of the topics discussed during the 2nd Stage SHM.

Almost the same as those topics discussed during the meetings held in the Package 1 study area, villagers are quite concerned about the rate of compensation of the loss of their asset as market rate as well as the land-for-land compensation scheme. They are also concerned with the employment and educational facilities as well as tuition fees for their children after the resettlement. Provision of ROB and RUB at the time of project implementation is also the concern of the villagers.

Since broad gauge conversion works are in progress, majority of villagers in the section from Rewari to Ajmer are confused if the currently undertaken broad gauge conversion works are a part of DFC Project. They also had an impression that Final Location Survey carried out by RITES for 200 m wide on each side of the existing railway is for land acquisition i.e. 400 m wide with the existing railway line in the centre. Meeting facilitators of Package 2 for ESIMMS works clarified the matter during the meeting.

(4) Feed-back Meeting in Package 3 Study Area

Table 10-66 shows the numbers of affected villages and the attendance of the villages to the 2nd Stage STM of Package 3 area.

Table 10-66 Affected Villages in Eastern Corridor (Package 3)

No.	District	No. of Affected Villages	No. of Villages Feed-back Meeting was held		Attendance of the No. of Villages to the 2nd Stage of S/PC Meeting		Attendance of the No. of Villages to the 3rd Stage of S/PC Meeting		Railway Alignment
			No.	%	No.	%	No.	%	
1	Chandauli	9	9	100.0	27	300.0	9	100.0	Parallel Section and Detour Section
2	Mirzapur	107	57	53.3	34	31.8	34	31.8	Parallel Section
3	Allahabad	61	36	59.0	22	36.1	45	73.8	Parallel Section and Detour Section
4	Kaushambi	62	30	48.4	25	40.3	35	56.5	Parallel Section
5	Fatehpur	66	32	48.5	21	31.8	45	68.2	Parallel Section
6	Kanpur Nagar	38	30	78.9	24	63.2	18	47.4	Parallel Section and Detour Section
7	Kanpur Dehat	36	30	83.3	22	61.1	20	55.6	Parallel Section and Detour Section
8	Auraiya	21	20	95.2	19	90.5	20	95.2	Parallel Section
9	Etawah	47	36	76.6	20	42.6	25	53.2	Parallel Section and Detour Section
10	Firozabad	54	51	94.4	28	51.9	35	64.8	Parallel Section
11	Agra	12	12	100.0	10	83.3	12	100.0	Parallel Section and Detour Section
12	Hathras	41	31	75.6	24	58.5	20	48.8	Parallel Section and Detour Section
13	Aligarh	37	31	83.8	25	67.6	42	113.5	Parallel Section and Detour Section
14	Bulandsharh	25	23	92.0	20	80.0	25	100.0	Parallel Section
15	Gautam Budh Nagar	11	11	100.0	14	127.3	11	100.0	Parallel Section
	Total	627	439	70.0	335	53.4	396	63.2	

Discussions that took place at the village level for those who could not attend the 2nd Stage SHM. Those who attended have also attended the meeting. Topics of discussion have been essentially the same as those topics discussed during the second stage of meeting in the Package 3 study area.

Villagers are quite concerned about the rate of compensation of the loss of their asset as market rate as well as the land-for-land compensation scheme. They are also concerned with the employment and educational facilities as well as tuition fees for their children after the resettlement. Provision of ROB and RUB is not so much of concern while better drainage system at the time of project implementation are the important topic of the villagers engaging agriculture.

10.6.5 Third Stage Stakeholder/Public Consultation Meeting

(1) Package 1 Area

The SHMs in the package 1 area were conducted as shown in Table 10-67.

Table 10-67 Schedule of the Third Stage SHM (Package 1)

State	District	Date of Third Stage SPC Meeting	Place of Meeting	Affected No. of Villages	Participated No. of Villages	Total No. of Participants	Participated No. of Towns
Gujarat	Banas Kantha	21.8.2007	Thakkar Baba Hall, Palanpur	31	12	205	1
	Patan	22.8.2007	APMC Hall, Unjha	5	3	107	1
	Mahesana	23.8.2007	Balbari Kamlaba Hall, Mahesana	35	9	120	1
	Gandhinagar	25.8.2007	Ambedkar Hall, Gandhinagar	8	2	150	-
	Ahmedabad	6.9.2007	Mehndi Nawaz-e-Jung Hall, Ahmedabad	18	20	110	-
	Kheda	6.9.2007	APMC Hall, Kheda	13	14	90	-
	Anand	8.9.2007	Arya Samaj Hall, Anand	28	28	145	-
	Vadodara	26.8.2007	Patelwadi Hall, Kaloli	29	16	105	1
	Bharuch	27.8.2007	Neelkanth Mahadev Hall, Bharuch	27	13	115	1
	Surat	Cancelled	-	35	-	-	-
	Navasari	29.8.2007	Thakurbari Hall, Navsari	21	13	110	1
Valsad	30.8.2007	Sri Ganesh Hall, Valsad	47	14	101	-	
Maharashtra	Thane	2.9.2007	Lions Club Hall, Palgarh	55	16	125	-
Total				352	160	1,483	6

Because of the recent road construction project taking place in the northern part of Gujarat, villagers studied the way land acquisition and compensation of the loss of their asset. As a result villagers in Banas Kantha made a resolution that the detour route in Palanpur should not be constructed because it would cause severe social upheaval in terms of agricultural land acquisition.

On the other hand, participants of the meeting held in Unjha suggested that their local industrial area is in need of cargo handling facilities. Thus they suggested to make detour at the section between Mahesana and Palanpur including junction station and ICD.

In Surat, since some of local residents are quite excited, the 3rd Stage Stakeholder/Public Consultation Meeting was not allowed by District Office to hold unless otherwise the final location survey is shown to them. Thus, 3rd Stage SHM in Surat was cancelled.

In Valsad, because of three temples are affected in the area adjacent to Amalsad Station, local people suggested to construct a detour section further away from the town. They are also concerned with the employment and educational facilities as well as tuition fees for their children after the resettlement.

As seen in Banas Kantha, there are many peasants in Gujarat and there were some cases where the peasants have not been able to recover their livelihood after the land acquisition in the previous public infrastructure projects due to inadequate compensation and assistance in terms of the livelihood recovery.

(2) Package 2 Area

The SHMs in the Package 2 area were conducted as shown in Table 10-68.

Table 10-68 Schedule of the Third Stage SHM (Package 2)

State	District	Date of 3rd Stage Meeting	Meeting Place	No. of Affected Villages	Participated No. of Villages	Total No. of Participants	Participated No. of Towns
Haryana	Rewari	8.08.2007	Secretariat Meeting Hall R.No-203	24	13	80	-
	Mehendragarh	7.08.2007	Panchyat bhawan Narnaul Haryana	24	1	85	2
Rajasthan	Alwar	16.08.2007	Govt.Primary School Village,Kathuwas	1	1	52	-
	Sikar	6.08.2007	Panchyat Samiti Hall ,Neem Ka Thana	37	23	107	2
	Nagaur	8.08.2007	Secondary School Gym, Ateli	2	2	40	-
	Jaipur	2.08.2007	Bagar Bhawan ,Dadu,Vill.Naraina	41	18	137	3
	Ajmer	13.08.07	Agresen Bhawan,N.H-8 ,Kishangarh	40	5	100	2
	Pali	14.08.2007	Govt.Secondary School No.2,Sojat Road,Soj	60	1	105	2
	Sirohi	12.08.2007	Panchyat Samiti Hall distt,Pindwara	31	14	80	2
Total				260	78	786	13

Other than the major topic of compensation for the loss of asset, land acquisition and the employment after the resettlement including educational facilities for their children, people in Haryana and Rajasthan are concerned with the facilities of the village as follows:

1) Mahendragarh (Haryana)

In Unindhra, there are three village wells for water supply and the community centre for meeting. They all are in the right of way. Thus all of them should be re-constructed.

2) Rewari (Haryana)

- Kalwas Village and Chandawas Village are receiving water from the near-by village. It should be maintained during and after the implementation of the Project.
- The land a villager owns is 0.45 ha and a portion of it would be affected. However, the villager demands MOR to purchase the entire land.
- There must of an RUB at the section of detour route that passes through Chakbandi Village for the local farmers to go across the railway.

3) Sikar (Rajasthan)

- In Ajari Patack, community road is in the right of way. It is an important road for the local economy. Thus, it has to be maintained as it is now.
- There is enough space of about 30 m wide within the railway. Thus DFC Project should be implemented in this area, which is on the western side of the existing railway line. No part on the western side should be disturbed by the Project because of a large number of people living on this side of the railway.

4) Nagaur (Rajasthan)

- The level crossings in Patack and Minda should be re-constructed as ROB for the convenience as well as for the safety of the local people.

(3) Package 3 Area

The SHMs in the Package 3 area were conducted as shown in Table 10-69.

Table 10-69 Schedule of the Third Stage SHM (Package 3)

State	District	No. of Affected Villages	Meeting Place	Affected No. of Vilages	Participated No. of Villages	Total No. of Participants	Participated No. of Towns
Uttar Pradesh	Chandauli	22.8.2007	Aggarwal Sewa Sansthan , Nai Basti , Mughal Sarai	9	8	79	1
	Mirzapur	23.8.2007	Rahi lodge, Mirzapur	107	32	185	2
	Allahabad	24.8.2007	Hindustan Acdamy,12- D Civil Lines,	61	43	217	2
	Kaushambi	25.8.2007	Kesharvani Dharmashala, Sirathu, Kaushambi	62	35	211	-
	Fatehpur	26.8.2007	Ashoka Palace,near Old Tahseel, Fatehpur	66	44	234	1
	Kanpur Nagar	27.8.2007	Shri Hari Guest House,near Naubasta Police Station , Kanpur Nagar	37	17	91	1
	Kanpur Dehat	30.8.2007	Ram Ratan Audyogik Krishi Inter College,Jhijnjhak	36	20	168	-
	Auraiya	31.8.2007	BSP.Office,near raliway Station,Dibiyapur	21	19	157	1
	Etawah	01.9.2007	Narayan Banquet Hall, Etawah	47	24	245	1
	Firozabad	02.9.2007	Seth Chhadamilal Jain Mandir,Firozabad	54	34	165	1
	Agra	03.9.2007	Sri Mahendrabhan Vimla Devi Balika Vidyalaya, Etmadpur, Agra	12	11	90	1
	Hathras	06.9.2007	Shiv Durga Marriage Hall, Near Police Station, Sikandra Rao Junction Road,	41	20	68	-
	Aligarh	07.9.2007	Shivam Bakaner House, Samaroh Bhawan, Janakpuri, Aligarh	36	41	99	1
	Bulandsharh	08.9.2007	Rai Bahadur Nathimal, Ram Sahai Mal, Dharamshala , Near JAS Inter College , Khurja, Bulandshahar	29	25	99	-
	Gautam Budh N	10.9.2007	Mohan Kunj Dharmashala, Dadri, Gautam Budh Nagar	11	11	79	-
Total				629	384	2,187	12

Topics of the meeting were essentially the same as other study areas. The major topics of concern are the compensation for the loss of asset, land acquisition at appropriate market rate and the provision of employment after the resettlement including educational facilities for their children.

On the whole, low participation rates for the stakeholder/public consultation nettings and feedback meetings are seen in some districts and villages, because of low concerns for the participation due to the situation which details have not yet been decided on the Project, especially on the land acquisition and resettlement issues.

10.6.6 Central Level of Stakeholder Meeting

Result of draft final survey was released during the central stakeholder/public consultation meeting held in Delhi on 28th September 2007. A group of PAFs in Firozabad, Agra, Hathras, Aligarh, Brandshahar, Gautam Budh Nagar of Uttar Pradesh, Sikar, Jaipur, and Alwar of Rajasthan, ADB, World Bank, JBIC, JICA India Office, three NGOs based in Delhi, MOR and DFCCIL have participated. The following is the major points of concern that the PAFs from Rajasthan and Uttar Pradesh stated:

- Proper Representation of the PAFs in each village should be considered to establish. Appropriate compensation for the loss of land should be made.
- Not enough land is available in Utter Pradesh Thus PAFs loosing agricultural areas are aware of no alternative areas of farming.
- Construction of DFC railway lines on the parallel section will cause the areas already bisected by the existing railway. There must be further difficulties on the farming practice.
- Because of the lack of farming area for the farmers losing the land, resettlement colony should be constructed.

- Appropriate compensation for the loss of land and structures should be made.
- Assessment of the structures in the right of way should be properly made and its policy should be presented.

Table 10-71 Result of Stakeholder/Public Consultation Meeting (Western Corridor: Haryana and Rajasthan, Gujarat, Maharashtra) (2/3)

	Haryana		Rajasthan							Gujarat													Maharashtra	Total	%
	Rewari	Mehendragadh	Alwar	Sikar	Nagaur	Jaipur	Ajmer	Pali	Sirohi	Banas Kantha	Patan	Mahesana	Gandhinagar	Ahmedabad	Kheda	Anand	Vadodara	Bharuch	Surat	Navsari	Valsad	Thane			
1 Summary of DFC Project																									
Parallel Section (km)	0.0	48.0	1.0	75.0	7.0	64.0	87.0	200.0	60.0	57.0	10.0	21.0	0.0	0.0	0.0	49.0	36.0	7.0	41.0	70.0	140.0	973.0			
Detour Section (km)	28.0	0.0	0.0	11.0	0.0	19.0	14.0	0.0	0.0	18.0	0.0	59.0	20.0	30.0	24.0	56.0	21.0	19.0	35.0	0.0	0.0	354.0			
Length of Passing the District (km)	28.0	48.0	1.0	86.0	7.0	83.0	101.0	200.0	60.0	75.0	10.0	80.0	20.0	30.0	24.0	56.0	70.0	55.0	42.0	41.0	70.0	1,327.0			
Number of Village passed through by DFC	24	24	1	37	2	41	40	60	31	31	5	35	8	18	13	28	29	27	35	21	47	55			
Number of PAFs	115	117	0	61	0	36	185	51	149	22	65	15	10	15	10	-	10	30	53	43	12	302			
Number of Squatters	20	-	-	-	-	-	-	-	-	-	110	-	-	-	-	-	-	15	30	105	41	371			
2 SHM: 2nd Stage																									
1) Date	6/29	6/27	6/22	6/19	6/28	6/22	6/20	6/20	6/29	6/15	6/18	6/20	6/22	6/25	6/27	6/29	7/2	7/21	7/17	7/15	7/16	7/18			
2) Number of Attended Village	17	23	2	19	4	10	7	9	6	12	6	11	8	9	11	12	14	9	13	23	17	18			
Proportion of Attended Village to Village Passed through by DFC	(70.8%)	(95.8%)	(200.0%)	(51.4%)	(200.0%)	(24.4%)	(17.5%)	(15.0%)	(19.4%)	(38.7%)	(120.0%)	(31.4%)	(100.0%)	(50.0%)	(84.6%)	(42.9%)	(48.3%)	(33.3%)	(37.1%)	(109.5%)	(36.2%)	(32.7%)			
3) Number of Attendants	110	115	95	148	84	136	135	127	126	200	90	150	90	120	220	75	110	108	110	150	100	124			
4) Discussion Summary																									
<Project Design>																									
<Final Alignment>																									
48 Question on ROW including Detour																								8	36.4%
49 Construction of ROB/RUB																								11	50.0%
50 Cancellation of Detour																								4	18.2%
51 Providing Detour																								3	13.6%
52 Changing Alignment to Avoid Religious Facilities																								0	0.0%
53 Adding Crossing Point																								0	0.0%
54 Proposal for Additional Detour																								1	4.5%
55 Construction of Junction Station																								0	0.0%
56 Provision of Container Depot (Others)																								7	31.8%
57 Split of Local Communities by Construction of Detour																								0	0.0%
58 Negative Impacts by construction of ROB/RUB																								8	36.4%
59 Degradation of Water Quality by Construction of Detour																								1	4.5%
60 Flood caused by Construction of Detour																								7	31.8%
61 Rehabilitation of affected Irrigation Canals																								0	0.0%
62 Relocation of Affected utilities including Community Road																								0	0.0%
<Information Disclosure>																								0	0.0%
63 Release of Project Information through Mass Media																								0	0.0%
64 Preparing Project Pamphlet																								0	0.0%
65 Release of Information on Land Acquisition (Others)																								0	0.0%
66 Protesting the Implementation of the Project																								5	22.7%
67 Understanding on DFC Project																								11	50.0%
68 Acceptance of DFC Project																								1	4.5%
69 Appreciation on SHM																								7	31.8%
70 Necessity of Consultation among Related Agencies																								0	0.0%
71 Complaints on MOR/DFCCL																								5	22.7%
No. of major points of discussion	21	18	19	17	19	18	18	18	19	18	18	19	23	19	19	18	20	27	20	21	19	20			
%	75.0%	64.3%	67.9%	60.7%	67.9%	64.3%	64.3%	64.3%	67.9%	64.3%	64.3%	67.9%	82.1%	67.9%	67.9%	64.3%	71.4%	96.4%	71.4%	75.0%	67.9%	71.4%			
3 SHM: 3rd Stage																									
1) Date	8/08	8/07	8/13	8/06	8/08	8/02	8/13	8/14	8/12	8/21	8/22	8/23	8/25	9/06	9/06	9/8	8/26	8/27	*	8/29	8/30	9/02			
2) Number of Attended Village	13	3	1	25	2	21	7	3	16	27	5	15	3	17	13	11	15	10	-	15	40	16			
Proportion of Attended Village to Village Passed through by DFC	(54.2%)	(12.5%)	(100.0%)	(67.6%)	(100.0%)	(51.2%)	(17.5%)	(5.0%)	(51.6%)	(87.1%)	(100.0%)	(42.9%)	(37.5%)	(94.4%)	(100.0%)	(39.3%)	(51.7%)	(37.0%)	-	(71.4%)	(85.1%)	(29.1%)			
3) Number of Attendants	80	85	52	87	40	137	100	105	80	205	107	120	150	110	95	145	105	115	-	110	101	125			
4) Discussion Summary																									
<Compensation>																									
(Basic Policies)																									
1 Assistance for the Affected Small Scale Farmers																								0	0.0%
2 Consideration on Vulnerable group (SC, ST, Widow)																								0	0.0%
3 System of Returning the Profit of DFC to Local Communities																								3	13.6%
4 Complaints on Land Acquisition Process																								0	0.0%
5 Following up the Existing Practice of Land Acquisition Procedure																								0	0.0%
6 Holding Village Level SHM																								0	0.0%
7 Appropriate Compensation (Transparency of the Process)																								0	0.0%
8 Implementation Plan of DFC																								0	0.0%
9 Complaints on Land Acquisition Process																								0	0.0%
10 Consistency in Local Development Plan																								0	0.0%
11 Provision of Pension to PAFs																								0	0.0%
12 Provision of Free Railway Ticket to PAFs (Decision Process)																								0	0.0%
13 Establishment of PAF Committee																								0	0.0%
14 Individual Negotiation with PAFs																								0	0.0%
15 Conduct of Field Survey with Attendance of Local People																								0	0.0%
16 Involvement of Grampanchayat in Process of Consultation on																								0	0.0%
17 Involvement of PAFs in Process of Consultation on Compensation (Subjects for Compensation)																								0	0.0%
18 Compensation for Annual Crops (Rices etc.)																								0	0.0%
19 Compensation for Perennial Crops including Tress and Fruits																								0	0.0%

Table 10-72 Result of Stakeholder/Public Consultation Meeting (Western Corridor: Haryana and Rajasthan, Gujarat, Maharashtra) (3/3)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total	%
	Chandauri	Mirzapur	Allahabad	Kaushambi	Fatehpur	Kanpur Nagar	Kanpur Dehat	Auraiya	Etawah	Firozabad	Agra	Hathras	Aligarh	Bulandsharh	Gautam Buddha Nagar		
1 Summary of DFC Project																	
Parallel Section (km)	40.1	81.4	46.5	54.4	88.3	11.6	49.6	33.3	49.4	56.4	16.0	30.5	21.1	61.4	46.0	686.0	
Detour Section (km)	0.3	4.6	26.3	0.0	0.0	44.8	2.9	0.0	16.3	9.7	9.2	10.2	25.9	0.0	0.0	150.2	
Length of Passing the District (km)	40.4	86.0	72.8	54.4	88.3	56.4	52.5	33.3	65.7	66.1	25.2	40.7	47.0	61.4	46.0	836.2	
Number of Village passed through by DFC	9	107	61	62	66	37	36	21	47	54	12	41	36	29	11	629	
Number of PAFs	5	354	107	510	129	17	152	69	98	244	40	110	48	317	78	2,278	
Number of Squatters	0	185	2	0	33	0	0	0	0	0	0	0	0	0	0	220	
2 SHM: 2nd Stage																	
1) Date	6/18	6/20	6/22	6/24	6/26	6/29	7/1	7/4	7/6	7/9	7/11	7/14	7/16	7/18	7/21		
2) Number of Attended Village	27	34	22	25	21	24	22	19	20	28	10	24	25	20	14	335	
Proportion of Attended Village to Village Passed through by DFC	(300.0%)	(31.8%)	(36.1%)	(40.3%)	(31.8%)	(64.9%)	(61.1%)	(90.5%)	(42.6%)	(51.9%)	(83.3%)	(58.5%)	(69.4%)	(69.0%)	(127.3%)	(53.3%)	
3) Number of Attendants	176	151	163	212	135	161	331	346	182	194	153	275	125	211	215	3,030	
4) Discussion Summary																	
<Compensation>																	
(Basic Policies)																	
1 Assistance for the Affected Small Scale Farmers		○	○		○			○		○	○			○	○	8	53.3%
2 Consideration on Vulnerable group (SC,ST,Widow)																0	0.0%
3 System of Returning the Profit of DFC to Local Communities		○											○			3	20.0%
4 Complaints on Land Acquisition Process									○							1	6.7%
5 Following up the Existing Practice of Land Acquisition Procedure									○							1	6.7%
6 Holding Village Level SHM						○									○	2	13.3%
7 Appropriate Compensation (Transparency of the Process)																0	0.0%
8 Implementation Plan of DFC	○		○													2	13.3%
9 Complaints on Land Acquisition Process																0	0.0%
10 Consistency in Local Development Plan																0	0.0%
11 Provision of Pension to PAFs																0	0.0%
12 Provision of Free Railway Ticket to PAFs																0	0.0%
(Decision Process)																	
13 Establishment of PAF Committee										○	○			○	○	4	26.7%
14 Individual Negotiation with PAFs				○		○					○					3	20.0%
15 Conduct of Field Survey with Attendance of Local People																0	0.0%
16 Involvement of Granpanchayat in Process of Consultation on Compensation																0	0.0%
17 Involvement of PAFs in Process of Consultation on Compensation (Subjects for Compensation)																0	0.0%
18 Compensation for Annual Crops (Rices etc.)																0	0.0%
19 Compensation for Perennial Crops including Tress and Fruits (Compensation Rate)																0	0.0%
20 Compensation based on Market Price	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	13	86.7%
21 Assessment for Land Price based on each Land use																0	0.0%
22 Compensation based on Tax Payment Standard									○							1	6.7%
23 Sufficient Time before Land Acquisition (About 5 years)							○									1	6.7%
24 Land Acquisition based on "Land for Land"	○	○				○		○			○		○	○	○	8	53.3%
25 Land Acquisition based on Lease system (Involuntary Resettlement)																0	0.0%
26 Explanation on Compensation Package	○		○						○				○	○		5	33.3%
27 Providing Resettlement Site for Squatters/Non-title Holder																0	0.0%
28 Securing Job Opportunity of Small Scale Retailer																0	0.0%
29 Provision of Resettlement Site							○	○	○			○		○	○	6	40.0%
30 Appropriate Infrastructure at Resettlement Site																0	0.0%
31 Supporting on Expenses for Education																0	0.0%
32 Provision of Resettlement Site at Convenient Place																0	0.0%
33 Provision of Resettlement Expense																0	0.0%
34 Ensuring Enough Time for Resettlement																0	0.0%
35 Consideration on Tax Aspect for Resettlement (Job Opportunities)																0	0.0%
36 One Job Provision for each PAF	○			○		○		○	○	○	○	○	○	○	○	10	66.7%
37 Job Provision to All Sons																0	0.0%
38 Provision of Official Job (DFCCIL)																0	0.0%
39 Job Training for Ensuring Stable Life Standards																0	0.0%

Table 10-74 Result of Stakeholder/Public Consultation Meeting (Eastern Corridor: Uttar Pradesh) (2/4)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total	%
	Chandauri	Mirzapur	Allahabad	Kaushambi	Fatehpur	Kanpur Nagar	Kanpur Dehat	Auraiya	Etawah	Firozabad	Agra	Hathras	Aligarh	Bulandsharh	Gautam Buddha Nagar		
1 Summary of DFC Project																	
Parallel Section (km)	40.1	81.4	46.5	54.4	88.3	11.6	49.6	33.3	49.4	56.4	16.0	30.5	21.1	61.4	46.0	686.0	
Detour Section (km)	0.3	4.6	26.3	0.0	0.0	44.8	2.9	0.0	16.3	9.7	9.2	10.2	25.9	0.0	0.0	150.2	
Length of Passing the District (km)	40.4	86.0	72.8	54.4	88.3	56.4	52.5	33.3	65.7	66.1	25.2	40.7	47.0	61.4	46.0	836.2	
Number of Village passed through by DFC	9	107	61	62	66	37	36	21	47	54	12	41	36	29	11	629	
Number of PAFs	5	354	107	510	129	17	152	69	98	244	40	110	48	317	78	2,278	
Number of Squatters	0	185	2	0	33	0	0	0	0	0	0	0	0	0	0	220	
2 SHM: 2nd Stage																	
1) Date	6/18	6/20	6/22	6/24	6/26	6/29	7/1	7/4	7/6	7/9	7/11	7/14	7/16	7/18	7/21		
2) Number of Attended Village	27	34	22	25	21	24	22	19	20	28	10	24	25	20	14	335	
Proportion of Attended Village to Village Passed through by DFC	(300.0%)	(31.8%)	(36.1%)	(40.3%)	(31.8%)	(64.9%)	(61.1%)	(90.5%)	(42.6%)	(51.9%)	(83.3%)	(58.5%)	(69.4%)	(69.0%)	(127.3%)	(53.3%)	
3) Number of Attendants	176	151	163	212	135	161	331	346	182	194	153	275	125	211	215	3,030	
4) Discussion Summary (Payment)																	
40 Payment of Compensation before Implementation									○	○	○	○		○	○	6	40.0%
41 Compensation Payment before Implementation of Land Acquisition																0	0.0%
42 Payment in a Lump or by Installment?																0	0.0%
43 Providing Establishment of Life Bases																0	0.0%
44 Payment Target (Husband or Wife?)																0	0.0%
<Environmental and Safe Issues>																0	0.0%
45 Forestation for Environmental Improvement																0	0.0%
46 Concern on Vibration and Noise Pollution		○			○		○	○								4	26.7%
47 Proper Safety Measures				○	○											2	13.3%
<Project Design>																	
(Final Alignment)																	
48 Question on ROW including Detour	○	○	○	○	○		○		○		○		○	○		10	66.7%
49 Construction of ROB/RUB		○		○			○	○						○	○	6	40.0%
50 Cancellation of Detour									○	○					○	3	20.0%
51 Providing Detour								○		○		○		○	○	4	26.7%
52 Changing Alignment to Avoid Religious Facilities										○	○					2	13.3%
53 Adding Crossing Point																0	0.0%
54 Proposal for Additional Detour																0	0.0%
55 Construction of Junction Station																0	0.0%
56 Provision of Container Depot (Others)																0	0.0%
57 Split of Local Communities by Construction of Detour										○						1	6.7%
58 Negative Impacts by construction of ROB/RUB																0	0.0%
59 Degradation of Water Quality by Construction of Detour																0	0.0%
60 Flood caused by Construction of Detour																0	0.0%
61 Rehabilitation of affected Irrigation Canals			○	○												2	13.3%
62 Relocation of Affected utilities including Community Road																0	0.0%
<Information Disclosure>																	
63 Release of Project Information through Mass Media						○										1	6.7%
64 Preparing Project Pamphlet																0	0.0%
65 Release of Information on Land Acquisition																0	0.0%
<Others>																	
66 Protesting the Implementation of the Project																	
67 Understanding on DFC Project																0	0.0%
68 Acceptance of DFC Project																0	0.0%
69 Appreciation on SHM																0	0.0%
70 Necessity of Consultation among Related Agencies																0	0.0%
71 Complaints on MOR/DFCCIL				○		○			○							3	20.0%
	18	19	18	20	17	19	18	20	22	21	21	17	16	22	24		
	60.0%	63.3%	60.0%	66.7%	56.7%	63.3%	60.0%	66.7%	73.3%	70.0%	70.0%	56.7%	53.3%	73.3%	80.0%		

Table 10-75 Result of Stakeholder/Public Consultation Meeting (Eastern Corridor: Uttar Pradesh) (3/4)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total	%
	Chandauri	Mirzapur	Allahabad	Kaushambi	Fatehpur	Kanpur Nagar	Kanpur Dehat	Auraiya	Etawah	Firozabad	Agra	Hathras	Aligarh	Bulandsharh	Gautam Buddha Nagar		
1 Summary of DFC Project																	
Parallel Section (km)	40.1	81.4	46.5	54.4	88.3	11.6	49.6	33.3	49.4	56.4	16.0	30.5	21.1	61.4	46.0	686.0	
Detour Section (km)	0.3	4.6	26.3	0.0	0.0	44.8	2.9	0.0	16.3	9.7	9.2	10.2	25.9	0.0	0.0	150.2	
Length of Passing the District (km)	40.4	86.0	72.8	54.4	88.3	56.4	52.5	33.3	65.7	66.1	25.2	40.7	47.0	61.4	46.0	836.2	
Number of Village passed through by DFC	9	107	61	62	66	37	36	21	47	54	12	41	36	29	11	629	
Number of PAFs	5	354	107	510	129	17	152	69	98	244	40	110	48	317	78	2,278	
Number of Squatters	0	185	2	0	33	0	0	0	0	0	0	0	0	0	0	220	
2 SHM: 3rd Stage																	
1) Date	8/22	8/23	8/24	8/25	8/26	8/27	8/31	9/1	9/2	9/3	9/7	9/7	9/8	9/9	9/10	-	
2) Number of Attended Village	9	34	40	35	45	18	20	20	25	35	12	20	42	25	11	391	
Proportion of Attended Village to Village Passed through by DFC	(100.0%)	(31.8%)	(65.6%)	(56.5%)	(68.2%)	(48.6%)	(55.6%)	(95.2%)	(53.2%)	(64.8%)	(100.0%)	(48.8%)	(116.7%)	(86.2%)	(100.0%)	(62.2%)	
3) Number of Attendants	79	185	217	211	234	91	168	157	245	165	90	68	99	99	79	2,187	
4) Discussion Summary																	
<Compensation>																	
(Basic Policies)																	
1 Assistance for the Affected Small Scale Farmers		○				○				○			○			5	33.3%
2 Consideration on Vulnerable group (SC,ST,Widow)		○				○	○				○					5	33.3%
3 System of Returning the Profit of DFC to Local Communities																0	0.0%
4 Complaints on Land Acquisition Process			○					○								2	13.3%
5 Following up the Existing Practice of Land Acquisition Procedure																0	0.0%
6 Holding Village Level SHM			○			○										2	13.3%
7 Appropriate Compensation (Transparency of the Process)					○	○	○	○								4	26.7%
8 Implementation Plan of DFC																0	0.0%
9 Complaints on Land Acquisition Process																0	0.0%
10 Consistency in Local Development Plan																0	0.0%
11 Provision of Pension to PAFs													○			1	6.7%
12 Provision of Free Railway Ticket to PAFs (Decision Process)								○								1	6.7%
13 Establishment of PAF Committee																0	0.0%
14 Individual Negotiation with PAFs																0	0.0%
15 Conduct of Field Survey with Attendance of Local People																0	0.0%
16 Involvement of Granpanchayat in Process of Consultation on Compensation			○	○		○										3	20.0%
17 Involvement of PAFs in Process of Consultation on Compensation (Subjects for Compensation)																1	6.7%
18 Compensation for Annual Crops (Rices etc.)			○													1	6.7%
19 Compensation for Perennial Crops including Tress and Fruits (Compensation Rate)		○	○				○			○	○					5	33.3%
20 Compensation based on Market Price	○	○	○	○		○	○	○	○	○	○	○	○	○	○	14	93.3%
21 Assessment for Land Price based on each Land use		○					○									2	13.3%
22 Compensation based on Tax Payment Standard																0	0.0%
23 Sufficient Time before Land Acquisition (About 5 years)																0	0.0%
24 Land Acquisition based on "Land for Land"	○	○				○		○		○	○	○			○	8	53.3%
25 Land Acquisition based on Lease system (Involuntary Resettlement)																0	0.0%
26 Explanation on Compensation Package								○								1	6.7%
27 Providing Resettlement Site for Squatters/Non-title Holder																0	0.0%
28 Securing Job Opportunity of Small Scale Retailer																0	0.0%
29 Provision of Resettlement Site										○						1	6.7%
30 Appropriate Infrastructure at Resettlement Site	○		○	○												3	20.0%
31 Supporting on Expenses for Education																0	0.0%
32 Provision of Resettlement Site at Convenient Place										○						1	6.7%
33 Provision of Resettlement Expense	○															1	6.7%
34 Ensuring Enough Time for Resettlement					○											1	6.7%
35 Consideration on Tax Aspect for Resettlement													○			1	6.7%

Table 10-76 Result of Stakeholder/Public Consultation Meeting (Eastern Corridor: Uttar Pradesh) (4/4)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total	%
	Chandauri	Mirzapur	Allahabad	Kaushambi	Fatehpur	Kanpur Nagar	Kanpur Dehat	Auraiya	Etawah	Firozabad	Agra	Hathras	Aligarh	Bulandsharh	Gautam Budh Nagar		
1 Summary of DFC Project																	
Parallel Section (km)	40.1	81.4	46.5	54.4	88.3	11.6	49.6	33.3	49.4	56.4	16.0	30.5	21.1	61.4	46.0	686.0	
Detour Section (km)	0.3	4.6	26.3	0.0	0.0	44.8	2.9	0.0	16.3	9.7	9.2	10.2	25.9	0.0	0.0	150.2	
Length of Passing the District (km)	40.4	86.0	72.8	54.4	88.3	56.4	52.5	33.3	65.7	66.1	25.2	40.7	47.0	61.4	46.0	836.2	
Number of Village passed through by DFC	9	107	61	62	66	37	36	21	47	54	12	41	36	29	11	629	
Number of PAFs	5	354	107	510	129	17	152	69	98	244	40	110	48	317	78	2,278	
Number of Squatters	0	185	2	0	33	0	0	0	0	0	0	0	0	0	0	220	
2 SHM: 3rd Stage																	
1) Date	8/22	8/23	8/24	8/25	8/26	8/27	8/31	9/1	9/2	9/3	9/7	9/7	9/8	9/9	9/10	-	
2) Number of Attended Village	9	34	40	35	45	18	20	20	25	35	12	20	42	25	11	391	
Proportion of Attended Village to Village Passed through by DFC	(100.0%)	(31.8%)	(65.6%)	(56.5%)	(68.2%)	(48.6%)	(55.6%)	(95.2%)	(53.2%)	(64.8%)	(100.0%)	(48.8%)	(116.7%)	(86.2%)	(100.0%)	(62.2%)	
3) Number of Attendants	79	185	217	211	234	91	168	157	245	165	90	68	99	99	79	2,187	
4) Discussion Summary (Job Opportunities)																	
36 One Job Provision for each PAF	○	○	○		○	○	○	○	○	○		○	○	○		12	80.0%
37 Job Provision to All Sons							○									1	6.7%
38 Provision of Official Job (DFCCIL)	○															1	6.7%
39 Job Training for Ensuring Stable Life Standards (Payment)	○								○		○		○			4	26.7%
40 Payment of Compensation before Implementation																0	0.0%
41 Compensation Payment before Implementation of Land Acquisition	○	○	○	○	○		○		○		○	○		○	○	11	73.3%
42 Payment in a Lump or by Installment?		○														1	6.7%
43 Providing Establishment of Life Bases																0	0.0%
44 Payment Target (Husband or Wife?)																0	0.0%
<Environmental and Safe Issues>>																	
45 Forestation for Environmental Improvement																0	0.0%
46 Concern on Vibration and Noise Pollution		○	○					○								3	20.0%
47 Proper Safety Measures																0	0.0%
<Project Design>																	
(Final Alignment)																	
48 Question on ROW including Detour	○	○		○	○	○	○	○	○			○	○	○	○	12	80.0%
49 Construction of ROB/RUB		○	○	○	○		○	○	○		○			○	○	9	60.0%
50 Cancellation of Detour																0	0.0%
51 Providing Detour																0	0.0%
52 Changing Alignment to Avoid Religious Facilities																0	0.0%
53 Adding Crossing Point					○					○				○	○	5	33.3%
54 Proposal for Additional Detour						○		○	○							3	20.0%
55 Construction of Junction Station																0	0.0%
56 Provision of Container Depot (Others)																0	0.0%
57 Split of Local Communities by Construction of Detour																0	0.0%
58 Negative Impacts by construction of ROB/RUB																0	0.0%
59 Degradation of Water Quality by Construction of Detour																0	0.0%
60 Flood caused by Construction of Detour																0	0.0%
61 Rehabilitation of affected Irrigation Canals																0	0.0%
62 Relocation of Affected utilities including Community Road			○	○	○		○	○	○	○	○			○		9	60.0%
<Information Disclosure >																	
63 Release of Project Information through Mass Media																0	0.0%
64 Preparing Project Pamphlet									○	○			○			3	20.0%
65 Release of Information on Land Acquisition			○	○		○						○				3	20.0%
<Others >																	
66 Protesting the Implementation of the Project																0	0.0%
67 Understanding on DFC Project																0	0.0%
68 Acceptance of DFC Project																0	0.0%
69 Appreciation on SHM														○		1	6.7%
70 Necessity of Consultation among Related Agencies																0	0.0%
71 Complaints on MOR/DFCCIL		○						○			○					3	20.0%
	21	25	25	20	20	23	23	26	21	22	22	19	19	20	18		
	70.0%	83.3%	83.3%	66.7%	66.7%	76.7%	76.7%	86.7%	70.0%	73.3%	73.3%	63.3%	63.3%	66.7%	60.0%		

10.7 FRAMEWORK OF RESETTLEMENT AND REHABILITATION PLAN

10.7.1 Resettlement and Rehabilitation Policy of the Government of India

(1) National Rehabilitation Policy-2006

In terms of Land Acquisition and Resettlement Plan for infrastructure projects carried out in India, the Land Acquisition Act of 1894 has been the applicable law. However, according to lessons learned through the previous projects funded by the international funding agencies extended to India, there have been various opinions for the improvement of the policy on land acquisition and resettlement of the people directly affected by the project. Thus in 2003, the Ministry of Rural Development issued “National Policy on Resettlement and Rehabilitation–2003” and this has been amended to “National Rehabilitation Policy–2006 (NRP-2006)”. It appears that the policy is in the parliament session for formal enactment. Thus JICA Study Team assumes that NRP-2006 would have been enacted at the time of project implementation. Therefore, elaboration of the resettlement and rehabilitation plan for DFC Project would become compulsory with views stated as follows at minimum requirement for resettlement and rehabilitation plan:

- Environmental impacts and loss of properties caused by the project to the local population should be appropriately studied and discussed with those directly affected;
- Mitigation measures of the adverse impacts caused by the project should be considered under the framework of laws and regulations as well as the designing practice;
- In case of resettlement, the standard of living and the livelihood of the PAFs should be maintained or even improved from the standard before resettlement;
- Socially disadvantaged people should be clearly identified and their livelihood recovery after the resettlement should be properly planned;
- PAFs are entitled to the loss of asset and properties including crops improvements on land as well as loss of business and remuneration; and
- Responsibility of organizations related to each item of works of the resettlement plan should be clearly defined and implemented.

Entitlement of the PAFs as stated in NRP–2006 is summarised in Table 10-80, and the mechanism of Resettlement and Rehabilitation Plan based on NRP-2006 is shown in Figure 10-31.

(2) Land Acquisition of Each State

Each state has its own amendment to the Land Acquisition Act of 1894. In some cases, it is elaborated into details. Since a railway project is considered as a linear infrastructure development, land acquisition is exclusively carried out in India with the MOR as the central government agency responsible for land acquisition. It notifies the district collector of pre-gazette activities for land acquisition based on the final location survey. General procedure of land acquisition is as follows:

- MOR notifies the District Collector the area necessary for land acquisition for railway development;
- MOR notifies to District Collector concerned with the land acquisition for DFC Project;
- District Collector prepares and carries out a survey of the land and asset subject to acquisition or relocation. Number of households for resettlement and rehabilitation is

- also surveyed and their inventory and valuation are duly made before the District Collector notifies the state government;
- State government notes the contents of inventory made by District Collector on the official gazette as public notice. The date of notice usually becomes the official cut-off date for resettlement and rehabilitation arrangement;
 - Any person intending to enter the area has to notify the District Collector in writing seven days in advance in order to obtain permission;
 - State government publishes the notification on two newspapers in circulation within the state, one in the local language and the other in English;
 - At the time of land acquisition and resettlement operation, MOR has to pay 50% of the assessed cost of land to District Collector;
 - Notification for land acquisition should be published at the District Collector's office. In Bihar State, such notification should also be published at sub-district, gram Panchayat, and village offices;
 - At the end of notification period which is usually 30 days, District Collector finalises the full inventory survey and the result is disclosed to the general public;
 - Based on the final full inventory, District Collector notifies for disbursement of compensation to all the PAFs.

(3) Price of Land Subject to Acquisition

As a result of stakeholder/public consultation meetings held in each district directly affected by the Project, there have been a chorus of opinion that the price of land acquisition for the infrastructure project does not reflect the actual price in the market. Table 10-1a-c exemplifies a large difference of land price registered at the District Collector and the land price prevailing in the market. The indicated market price of land does not necessarily reflect the actual price of land but the price the land owners hope to sell.

As is shown, difference of land price varies from one state to the other or from one district to the other, or from the prices registered at District Collector to the so-called "Market Price". In places, the difference between the prices registered at District Collector to the so-called "Market Price" greater than 20 times. Because of the recent commercial and industrial activities, speculative increase of land price is unprecedented and the inflation of land price is excessively high comparing to 5 – 10 years ago. Thus, price of land for DFC Project could further be speculatively increased. This is one of the reasons that JICA Study Team has suggested to establish a unit dedicated for study on the price of land within the PMU of RRP of DFCCIL.

For the area of land acquisition in each state the following assumption has been made:

- Agricultural area: 72% of the total area necessary to acquire for DFC Project;
- Residential area: 13% of the total area necessary to acquire for DFC Project;
- Commercial area: 9% of the total area necessary to acquire for DFC Project; and
- Industrial area: 6% of the total area necessary to acquire for DFC Project.

(4) Comparison of the Guidelines of International Funding Agencies and NRP-2006

1) General Outlines of the Environmental Guideline of International Funding Agencies

General outline of the environmental guidelines of the international funding agencies is summarised as follows:

- Land Acquisition should take place after a number of alternatives are considered and the number of resettlement is minimised;
- All PAFs are properly compensated based on the prevailing market rate of land and structures to be replaced by the same quality and quantity.
- PAFs are entitled to avail of a programme for rehabilitation of their livelihood and the standard of living before the resettlement;
- Those below poverty line, land-less families and others classified as socially disadvantaged should be properly addressed within the framework of the resettlement and rehabilitation of the project;
- In the event that the directly affected families are subject to resettlement, there must be a way to minimise the impacts and provide programmes or compensation that will rehabilitate or even improve the living standard of PAFs from before project implementation.

2) Comparison of NRP-2006 with Guidelines of International Funding Agencies

As the contents of guidelines of international funding agencies are compared to the contents of NRP-2006, the following is noted:

- NRP-2006 states that the prevailing market rate should be the basis of land acquisition. However, actual price is so-called “Market Rate Assessed by District Collector”. In actuality, current transaction rate for land acquisition as well as compensation for the loss of asset is not explicitly applied. Therefore a mechanism for negotiating between the market rate assessed by district collector and the actual transaction cost including inflated rate of land should be sought;
- There is no provision of resettlement for the squatters within the framework of NRP-2006. There is no other explicit policy that addresses resettlement of squatters on the right of way. There are a large number of squatters in the section between Surat and Vasai Rd. of the Western Corridor and some of them have been long-time residents of the area. Thus provision of the resettlement and rehabilitation plan for these squatters should be formulated within the framework of the Project;
- Provision of the resettlement and rehabilitation plan for those below poverty line and socially disadvantaged people are not explicitly addressed within the framework of NRP-2006. However, provision for them should be closely examined and should be compatible to the policy of the international funding agencies;
- Compensation in terms of loss of income for those who are running family business or are self-employed should also be considered;
- Procedure of compensation should be uniform throughout the affected areas of DFC Project i.e. there should not be any differences between district. Thus a mechanism to coordinate such procedure should be established within the project execution body; and
- The establishment of an organization as project execution body for the implementation of resettlement and rehabilitation plan, environmental management and monitoring, and coordination for grievance redress on land acquisition and compensation is not clearly stated.

Organization of project execution body of DFCCIL has not been clearly established to date. The organizational structure of DFCCIL should therefore be examined and ensured that it caters effectively to stakeholder/public consultations, environmental management and monitoring and grievance redress system.

Table 10-77 Average Land Price in Gujarat and Maharashtra

District	Agricultural Area		Residential Area						Commercial Area		Industrial Area	
	Irrigated		Unirrigated		Center of Village/Town		Extention/Sub-urban		Gov. Rate (Rs./ha)	Market Rate (Rs./ha)	Gov. Rate (Rs./ha)	Market Rate (Rs./ha)
	Gov. Rate (Rs./ha)	Market Rate (Rs./ha)	Gov. Rate (Rs./ha)	Market Rate (Rs./ha)	Gov. Rate (Rs./ha)	Market Rate (Rs./ha)	Gov. Rate (Rs./ha)	Market Rate (Rs./ha)				
1 Gujarat												
1) Banaskantha	82,900	1,947,000	59,000	1,508,000	1,153,000	3,370,000	1,014,000	3,734,000	1,535,000	3,854,839	4,857,000	8,667,000
Ratio (Govt Rate 1 to Market Rate)		23.5		25.6		2.9		3.7		2.5		1.8
2) Patan	271,700	4,484,000	224,000	3,130,000	10,040,000	16,250,000	6,497,500	15,000,000	6,497,500	15,000,000	18,900,000	35,000,000
Ratio (Govt Rate 1 to Market Rate)		16.5		14.0		1.6		2.3		2.3		1.9
3) Mahesana	368,000	4,580,000	256,000	3,488,625	3,200,000	5,652,857	1,765,000	3,545,000	4,484,000	3,134,000	2,297,000	3,134,000
Ratio (Govt Rate 1 to Market Rate)		12.4		13.6		1.8		2.0		0.7		1.4
3) Mahesana	389,000	4,580,000	256,000	3,488,625	3,200,000	5,652,857	1,765,000	3,545,000	4,587,000	3,134,000	2,297,000	3,134,000
Ratio (Govt Rate 1 to Market Rate)		11.8		13.6		1.8		2.0		0.7		1.4
5) Ahmedabad	245,800	4,328,000	148,000	2,506,000	3,256,000	3,370,000	1,897,000	3,734,000	4,897,000	5,680,000	6,010,000	11,700,000
Ratio (Govt Rate 1 to Market Rate)		17.6		16.9		1.0		2.0		1.2		1.9
6) Kheda	210,000	3,458,000	152,000	2,890,000	3,987,000	3,370,000	1,675,000	3,734,000	4,765,000	6,754,000	6,754,000	17,800,000
Ratio (Govt Rate 1 to Market Rate)		16.5		19.0		0.8		2.2		1.4		2.6
7) Anand	390,000	4,367,000	239,000	2,980,000	3,987,000	3,370,000	1,670,000	3,734,000	4,678,000	7,659,000	5,678,000	12,000,000
Ratio (Govt Rate 1 to Market Rate)		11.2		12.5		0.8		2.2		1.6		2.1
8) Vadodara	268,000	4,789,000	195,000	3,011,000	2,560,000	3,370,000	1,567,000	3,734,000	3,987,000	8,010,000	6,547,000	11,500,000
Ratio (Govt Rate 1 to Market Rate)		17.9		15.4		1.3		2.4		2.0		1.8
9) Bharuch	312,000	4,458,000	223,000	3,349,000	2,340,000	3,370,000	1,850,000	3,734,000	6,759,000	9,865,000	18,780,000	46,700,000
Ratio (Govt Rate 1 to Market Rate)		14.3		15.0		1.4		2.0		1.5		2.5
10) Surat	300,000	7,659,000	157,000	3,850,000	5,900,000	10,000,000	12,700,000	21,300,000	7,658,000	20,000,000	24,800,000	20,000,000
Ratio (Govt Rate 1 to Market Rate)		25.5		24.5		1.7		1.7		2.6		0.8
11) Navasari	341,000	7,800,000	218,000	8,000,000	4,960,000	7,000,000	1,890,000	3,890,000	8,750,000	20,500,000	9,870,000	28,900,000
Ratio (Govt Rate 1 to Market Rate)		22.9		36.7		1.4		2.1		2.3		2.9
12) Valsad	300,000	7,659,000	157,000	3,850,000	5,900,000	10,000,000	15,700,000	20,000,000	5,900,000	20,000,000	5,900,000	20,000,000
Ratio (Govt Rate 1 to Market Rate)		25.5		24.5		1.7		1.3		3.4		3.4
2 Maharashtra												
13) Thane	789,000	25,000,000	247,000	8,000,000	16,000,000	36,000,000	10,200,000	20,200,000	3,850,000	7,050,000	89,500,000	206,000,000
Ratio (Govt Rate 1 to Market Rate)		31.7		32.4		2.3		2.0		1.8		2.3

Table 10-78 Average Land Price in Rajasthan and Haryana

District	Agricultural Area		Residential Area				Commercial Area		Industrial Area			
	Irrigated		Unirrigated		Center of Village/Town		Extention/Sub-urban		Gov. Rate (Rs./ha)	Market Rate (Rs./ha)	Gov. Rate (Rs./ha)	Market Rate (Rs./ha)
	Gov. Rate (Rs./ha)	Market Rate (Rs./ha)	Gov. Rate (Rs./ha)	Market Rate (Rs./ha)	Gov. Rate (Rs./ha)	Market Rate (Rs./ha)	Gov. Rate (Rs./ha)	Market Rate (Rs./ha)				
3 Rajasthan												
14) Sirohi	-	-	564,000	1,587,000	2,450,000	4,765,000	-	-	3,565,000	7,654,000	-	-
Ratio (Govt Rate 1 to Market Rate)				2.8		1.9				2.1		
15) Pali	-	-	523,000	1,514,700	1,258,000	3,289,000	-	-	2,467,000	3,876,000	-	-
Ratio (Govt Rate 1 to Market Rate)				2.9		2.6				1.6		
16) Ajmer	-	-	596,700	1,790,100	8,491,500	25,245,000	-	-	11,245,500	16,065,000	-	-
Ratio (Govt Rate 1 to Market Rate)				3.0		3.0				1.4		
17) Jaipur	-	-	765,000	2,457,000	2,430,000	4,569,000	-	-	3,468,000	6,589,000	-	-
Ratio (Govt Rate 1 to Market Rate)				3.2		1.9				1.9		
18) Nagaur	-	-	200,000	430,000	1,345,000	2,789,000	-	-	2,890,000	4,890,000	-	-
Ratio (Govt Rate 1 to Market Rate)				2.2		2.1				1.7		
19) Sikar	-	-	650,000	2,500,000	2,135,000	4,387,000	-	-	3,472,000	6,543,000	-	-
Ratio (Govt Rate 1 to Market Rate)				3.8		2.1				1.9		
20) Alwar	-	-	1,250,000	2,950,000	3,467,000	8,769,000	-	-	4,879,000	9,789,000	-	-
Ratio (Govt Rate: Market Rate)				2.4		2.5				2.0		
4 Haryana												
21) Mahendranagarh	-	-	1,976,000	3,714,000	3,679,000	9,765,000	-	-	4,578,000	10,976,000	-	-
Ratio (Govt Rate 1 to Market Rate)				1.9		2.7				2.4		
22) Rewari	-	-	3,952,000	6,500,000	3,769,000	9,779,000	-	-	4,875,000	11,567,000	-	-
Ratio (Govt Rate 1 to Market Rate)				1.6		2.6				2.4		

Table 10-79 Average Land Price in Uttar Pradesh

District	Agricultural Area		Residential Area				Commercial Area		Industrial Area			
	Irrigated		Unirrigated		Center of Village/Town		Extention/Sub-urban		Gov. Rate (Rs./ha)	Market Rate (Rs./ha)	Gov. Rate (Rs./ha)	Market Rate (Rs./ha)
	Gov. Rate (Rs./ha)	Market Rate (Rs./ha)	Gov. Rate (Rs./ha)	Market Rate (Rs./ha)	Gov. Rate (Rs./ha)	Market Rate (Rs./ha)	Gov. Rate (Rs./ha)	Market Rate (Rs./ha)				
5 Uttar Pradesh												
23) Chandauli	1,358,000	2,222,000	864,000	1,728,000	22,000,000	40,000,000	-	-	30,000,000	50,000,000	25,000,000	45,000,000
Ratio (Govt Rate 1 to Market Rate)		1.6		2.0		1.8		-		1.7		1.8
24) Mirzapur	617,000	1,111,000	494,000	864,000	33,000,000	45,000,000	-	-	66,000,000	80,000,000	66,000,000	66,000,000
Ratio (Govt Rate 1 to Market Rate)		1.8		1.7		1.4		-		1.2		1.0
25) Allahabad	445,000	741,000	716,000	1,235,000	30,000,000	45,000,000	-	-	40,000,000	80,000,000	40,000,000	80,000,000
Ratio (Govt Rate 1 to Market Rate)		1.7		1.7		1.5		-		2.0		2.0
26) Kaushambi	679,000	1,111,000	622,000	1,049,000	12,000,000	30,000,000	-	-	40,000,000	80,000,000	40,000,000	80,000,000
Ratio (Govt Rate 1 to Market Rate)		1.6		1.7		2.5		-		2.0		2.0
27) Fatehpur	494,000	865,000	370,000	617,284	28,000,000	42,500,000	-	-	25,000,000	48,000,000	22,500,000	46,750,000
Ratio (Govt Rate 1 to Market Rate)		1.8		1.7		1.5		-		1.9		2.1
28) Kanpur Nagar	617,000	865,000	4,938,000	6,913,000	35,000,000	60,000,000	-	-	74,000,000	180,000,000	65,000,000	148,000,000
Ratio (Govt Rate 1 to Market Rate)		1.4		1.4		1.7		-		2.4		2.3
29) Kanpur Dehat	494,000	865,000	481,000	740,000	21,000,000	35,000,000	-	-	23,000,000	40,000,000	32,500,000	76,500,000
Ratio (Govt Rate 1 to Market Rate)		1.8		1.5		1.7		-		1.7		2.4
30) Auraiya	900,000	865,000	481,000	740,000	22,500,000	45,000,000	-	-	21,500,000	41,000,000	27,560,000	65,780,000
Ratio (Govt Rate 1 to Market Rate)		1.0		1.5		2.0		-		1.9		2.4
31) Etawah	657,000	975,000	459,000	876,000	24,500,000	45,000,000	-	-	23,500,000	43,500,000	31,580,000	76,510,000
Ratio (Govt Rate 1 to Market Rate)		1.5		1.9		1.8		-		1.9		2.4
32) Firozabad	621,000	1,235,000	459,000	987,000	20,000,000	40,000,000	-	-	30,500,000	47,000,000	28,800,000	68,900,000
Ratio (Govt Rate 1 to Market Rate)		2.0		2.2		2.0		-		1.5		2.4
33) Agra	1,482,000	2,469,000	1,235,000	1,975,000	20,000,000	30,000,000	-	-	40,000,000	60,000,000	27,650,000	54,210,000
Ratio (Govt Rate 1 to Market Rate)		1.7		1.6		1.5		-		1.5		2.0
34) Hathras	786,000	976,000	654,000	1,238,000	21,500,000	42,500,000	-	-	45,000,000	65,000,000	32,570,000	47,850,000
Ratio (Govt Rate 1 to Market Rate)		1.2		1.9		2.0		-		1.4		1.5
35) Aligarh	654,000	750,000	765,000	1,459,000	26,700,000	37,890,000	-	-	42,000,000	67,500,000	28,900,000	43,280,000
Ratio (Govt Rate 1 to Market Rate)		1.1		1.9		1.4		-		1.6		1.5
36) Bulandshahr	765,000	975,000	765,000	1,456,000	32,500,000	39,700,000	-	-	51,000,000	69,000,000	42,560,000	54,780,000
Ratio (Govt Rate 1 to Market Rate)		1.3		1.9		1.2		-		1.4		1.3
37) Gautam Budh Nagar	876,000	1,450,000	879,000	2,190,000	37,890,000	45,700,000	-	-	49,500,000	76,500,000	38,960,000	58,790,000
Ratio (Govt Rate 1 to Market Rate)		1.7		2.5		1.2		-		1.5		1.5

10.7.2 Framework of Resettlement and Rehabilitation Plan

(1) General Provision of the Resettlement and Rehabilitation Plan

As mentioned above, contents of NRP-2006 in terms of its application to DFC Project should be laid out as an explicit framework for resettlement and rehabilitation plan before the project is carried out. Resettlement and rehabilitation plan for DFC Project is the only document catering to involuntary resettlement of the Project. It is therefore important to present if the livelihood of PAFs are not adversely affected after the resettlement so that the funding agencies are able to assess the feasibility of the Project from the natural and social environment viewpoints.

It is the Indian Government's intention that resettlement and rehabilitation plan for the Project should be carried out on the basis of NRP-2006. However, it is still necessary to improve in terms of its contents explained in the following sections.

(2) Mitigation Measures for the Impacts on Land Acquisition and Resettlement

As is explained in the Section 10.1, it is important to stress that the alignment of DFC Project is already the result of a study aimed at reducing the a number of PAFs. Following the review, the number of PAFs have already been minimised for some of the detour routes.

(3) Standardization of Compensation Scheme

1) Explicit Application of Replacement Cost

Entitlement of compensation should be classified as follows:

- Classification of PAFs and their entitlement within the framework of the Project i.e. those with land title and those without differs in compensation package;
- Standardised compensation package is formulated for each classified PAFs;
- Application of replacement cost for each compensation package;

The key point is that application of replacement cost for each compensation package should be explicitly laid out and that it should be compatible to the standards of resettlement and rehabilitation plan specified under the safeguard policy of international finding agencies.

Replacement cost should allow salvaging of lost asset and depreciation cost is not used in calculating the compensation package. The cost of land acquisition to replace the lost property plus stamp duty and other costs should be included. Any hidden cost incurred as a result of resettlement arrangement should also be calculated as a part of compensation package.

On the other hand, such compensation package of the Project may be applied for the PAFs of DFC Project only and compensation packages for other domestic projects may not be the same. Thus as a whole, Indian Government may have to use a "Double Standard" of resettlement and rehabilitation plan, one for internationally funded project and one for domestically funded project. This may become a point of concern in terms of policy making.

a) Loss of Land

- There would be a major land requirement within the detour route of DFC Project. Land replacement would therefore imply that the same amount and quality of land has to be found in the vicinity of the detour route and the costs

associated with the loss of land such as the stamp duty for land registration have to be considered.

- NRP-2006 is a relatively new policy for resettlement and rehabilitation for PAFs directly affected by economic development project and its actual application has not been established to date. Thus, the lack of mechanism embedded in NRP-2006 has not been tested by the time of project implementation.

b) Loss of Structures and Others

- Loss of structures and any improvements on land should be compensated based on the following framework:
- Quantity and quality of lost structures as a result of the implementation of the Project to be replaced with in the same vicinity;
- Cost of the construction materials including labour and other cost incurred to replace the structure as a result of the implementation of the Project in terms of quality and quantity;
- Transportation for the salvaged materials and personal effects of the PAFs including any other cost necessary to implement resettlement.
- During the second stage of stakeholder meetings that are held within the districts directly affected by the Project, there have been a number of cases where depreciation was used in calculating compensation. Indian Government's policy on this matter should therefore be rectified at the time of the implementation of the Project.

2) Inventory of the PAFs

It is important to have a 100% inventory of PAFs before the implementation of the Project. As stated before, each classified category of PAFs should be determined after the cut-off date is established and that their entitlement should be listed, including their classification, identification, name, age, bank account, asset and income lost due to the Project.

3) Double Standard on the Compensation Scheme

The compensation packages identified in a project like DFC, is compared to that of a domestic project. If the compensation scheme of the international project is more advantageous than that of the domestic project, either the standard of compensation scheme for domestic project should be raised, or any other adjustment unique to each project may have to be made. One way is to study the appropriateness of so-called government assessed market rate against actual transaction rate at the time of land acquisition. Appropriate formula should be developed taking into account of elimination of land speculation that will shoot-up the price of land at the same time that the oppressive government rate of land is eliminated.

(4) Compensation Scheme for Non-title Holders

There will be a large number of non-title holders directly affected by the implementation of the Project. Upon resettlement, these PAFs are forced to lower their standard of living and linger on the lower level of the local society. It is one of the long term aims of internationally funded projects that reduction of poverty of the borrowing country is achieved through funding of the economic development project. This has to be consistently exercised at the time of resettlement and formulation of the rehabilitation plan.

Title holders or not it is important if they would loose their livelihood as a result of the implementation of the Project. In the case of DFC Project, a number of squatters live around the existing stations of the parallel sections of Project. NRP-2006 states that those occupying ROW as title holder may be entitled to one-time payment of the actual cost of

transportation of goods and construction materials upon resettlement. Provision for the resettlement package for non-title holder is suggested within the framework of the Project.

(5) Compensation Scheme for those on Poverty Line

Compensation package for those on the poverty line of the society has been provided in NRP-2006. Upon resettlement, they should be given opportunities for skill training, temporary or permanent employment, and any other options including low cost housing. Within the framework of the Project, it would therefore be sensible if such compensation package is provided as a part of poverty reduction measures as a whole.

(6) Enforcement of Other Supporting Measures

NRP-2006 provides ex-gratia payment for the PAFs subject to resettlement. Depending on the level of present standard of living and type of business, there will be supporting mechanism during the period until one becomes able to make a living and it is also advised that such supporting mechanism is provided as a part of poverty reduction measures.

(7) Budget Allocation

Budget allocation for the resettlement and rehabilitation plan of DFCCIL should be made by a body dedicated for the purpose. Based on the resettlement and rehabilitation plan proposed by the JICA Study Team, DFCCIL is requested to undertake an inventory survey for 100% of the PAFs and a study on land replacement cost. Consequently, budget is to be allocated not only for the total cost of resettlement and rehabilitation including holding stakeholder/public consultation meeting but also for the personnel cost of the office responsible for resettlement and rehabilitation.

(8) Dissemination of Information

Dissemination of information on the Project, especially that of the resettlement and rehabilitation plan is mandatory not only by the international consultants for the Project but also by the project implementation body of the Government of India. It is important to disclose project information at the time of implementation as follows:

- Outline of the Project and its final alignment;
- Number of PAFs of each district and its classification for compensation package;
- Expected social impacts of the PAFs;
- Contents of compensation package and the rate of each item of compensation;
- Schedule of resettlement and the payment of compensation; and
- Grievance Redress system.

The current phase of stakeholder/public consultation meeting is the laying out of the manner by which information dissemination is to be carried out. It is particularly important to specify how full scale inventory study is to be undertaken for implementation of the Project.

(9) Grievance Redress System

Grievance redress system is to hear and elaborate an action plan if the resettlement and rehabilitation plan was not correctly carried out. There is a district level grievance committee that caters to complaints made by the local residents on various aspects of grievances on a variety of projects. Similar grievance redress system at state level also exists. DFCCIL should therefore make a request to each district and state in order to establish a mechanism that any grievances specifically addressed to DFC Project is taken care of.

It is important that any grievance addressed to DFC Project is solved at district level as appropriate advice are to be provided by the state level grievance redress system before it is taken up to the central government level.

10.7.3 Monitoring and Evaluation

Resettlement monitoring plan is one of the important components of the resettlement and rehabilitation plan. It is designed to monitor the implementation of the plan so that there will be no short-fall on the entitlement of PAFs. Periodical monitoring would also be able to identify problem areas. It is also designed to monitor if the resettlement and rehabilitation plan was implemented as intended and that the livelihood rehabilitation programme functions well for the PAFs.

DFCCIL is requested to establish monitoring and evaluation section within the office that will be responsible for the resettlement and rehabilitation plan. It has two functions as follows:

1) Internal Monitoring System

In liaison with the district level grievance redress section for collecting information, it has to elaborate further action plan;

2) External Monitoring System

It has to employ a group of NGOs as it is mandatory based on NRP-2006 and carry out periodical monitoring works for the PAFs over 3–5 years. In addition to the NGO, international funding agency (IFA) and international consultant procured by IFA should be members of the external monitoring. Periodical monitoring works should be carried out on following:

- The appropriateness of the implementation of the resettlement and rehabilitation plan;
- The compensation schemes based on the replacement cost;
- Transparency of the inventory survey based on the classification of PAFs;
- Compensation scheme appropriate to each classified PAFs;
- Appropriateness of the procedure of compensation scheme;
- Timeliness of the payment of compensation; and
- Stakeholder/public consultation meeting that should disclose information or accept grievances of the PAFs.

10.7.4 Schedule of Finalisation for RRP by DFCCIL

(1) Review of Alignment

Finalisation of the alignment of DFC Project in order to identify exact location and the number of PAFs is important in order to properly disseminate the information as well as to minimise the number of PAFs. It will also ease the minds of the PAFs in view of the uncertainty that lingers until such time that the PAFs have been clearly identified and notified. Furthermore, it is not possible to estimate the exact budget allocation until the final alignment has been identified which will affect the process of loan agreement.

(2) Cut-off Date

Cut-off date is the time limit for which any part of the project area will no longer be allowed for residential or commercial and industrial purposes. Within the present procedure of land

acquisition, cut-off date is scheduled as soon as final location survey is completed and the notification for land acquisition is made to the district collector. It is also important at this stage that inventory study for 100% of PAFs is carried out so that those covered by the inventory study are officially entitled for compensation.

(3) Inventory for Resettlement and Rehabilitation Plan

1) Micro Plan for Resettlement and Rehabilitation Plan

It might be termed as a census study of the PAFs. As soon as cut-off date is established, 100% of PAFs are listed in terms of their demographic characteristics, standard of living, possession of movable asset at the time of survey for entitled for compensation, occupation and its remuneration or annual turn-over of any business being conducted at the time of survey, improvement on land such as crops, trees and any other relevant data for compensation. In other words, it is a listing of all the PAFs and their particulars. Thereby any person not listed in the micro plan will not be entitled for compensation.

Micro plan has to be accompanied with cadastral map showing the identification number of each PAF that are further classified for eligibility of different compensation packages not only for title holders but also for non-title holders.

Appropriate TOR for micro plan study has to be designed by experienced local NGOs. Time and cost over-run of the study shall then be carried out by the NGOs active in each district or state.

2) Inventory of Title Holders

Land Acquisition Act of each state defines the inventory of title holders as “Full Inventory Survey”. It is a list of land owners and the cost of land acquisition that is considered as a list of entitlement for land compensation by the project owner.

3) Study on Replacement Cost of Land

Each district collector maintains up-dated price of land within its boundaries. DFCCIL may depend on the information provided by the district collector on the price of government-assessed price of land. However, at the same time, DFCCIL has to study actual transaction of land alongside the railway for determining appropriate land compensation costs.

4) Identification of Resettlement Areas

Identification of resettlement areas in each district for the PAFs should be carried out by DFCCIL. Resettlement area for individual families should be identified, if, within the framework of DFC Project, it was found that following review of the alignment of detour routes as explained in the Section 10.1 there will be no local community as a whole, or a large group of people, subject to resettlement.

Where agricultural community demands replacing farming area within 5 km of radius for farming activities, replacement land should also be identified and acquired in the district where the farming area is acquired for ROW.

(4) Finalisation of Resettlement and Rehabilitation Plan

Finalisation of Resettlement and Rehabilitation Plan is required in order to allocate appropriate amount of budget for land acquisition and compensation for resettlement. The following are therefore identified:

- Inventory of PAFS;
- Matrix of eligibility for resettlement and the compensation package for each eligible class of PAFs;
- Establishment of livelihood rehabilitation programme; and
- Resettlement plan for each PAF.

As mentioned above, authorization of the finalised resettlement and rehabilitation plan for appropriate budget allocation is necessary.

10.7.5 Organization of Resettlement and Rehabilitation Plan

(1) Outline of the Organizational Structure

It is advisable that the policy on the resettlement and rehabilitation plan should be uniform throughout the alignment of DFC Project i.e. each district and state should prepare resettlement and rehabilitation plan according to the layout of DFC Project. DFCCIL shall then take the initiatives for its implementation.

It is important to note that resettlement and rehabilitation plan for railway development project at feasibility study level has not yet been carried out. Thus it is important to identify how organizational structure will be laid out for an effective implementation of the resettlement and rehabilitation plan.

On the other hand, DFCCIL has just been recently formed. It is a very new concept and a new experience to start organizing the structure of DFCCIL for implementation of the resettlement and rehabilitation plan for an internationally funded project. The organizational structure will include but not limited to the following:

- DFCCIL will have to take initiatives and responsibility for the entire process of laying out an internationally accepted resettlement and rehabilitation plan;
- A section dedicated for land acquisition and resettlement plan should be established;
- For the initial stage of implementation for resettlement and rehabilitation plan, international consultants should be hired for monitoring of the process;
- Elaboration of TOR for resettlement and rehabilitation action plan should be carried out by experienced NGOs with a help of international consultants;
- Implementation of inventory survey as a whole should be carried out by the local NGOs;
- At the time of detailed study, or even before, full scale resettlement plan should be elaborated and carried out for each district directly affected by the Project;
- Carry out resettlement and rehabilitation plan where it is feasible to start well before the implementation of the Project.

(2) Suggested Organizational Structure

1) RRP Management Unit

Figure 10-31 shows current mechanism of the organization for resettlement and rehabilitation plan based on NRP-2006. It shall in turn be the basis for establishing the succeeding organization within DFCCIL

The management dedicated for resettlement and rehabilitation plan should oversee performance of the sections in the lower hierarchy such as land acquisition, resettlement, assessment of land and compensation schemes, rehabilitation and monitoring. The RRP Management Unit of DFCCIL will then manage the following tasks:

- Hold dialogues with PAFs and the districts directly affected by the Project;
- Make presentation of the outline of the Project;
- Function as a central organization for acquisition of authorization issued by MOR and pass on to each district affected by the Project for implementation;
- Identify PAFs and determine the rate of compensation in conjunction with the other section established for assessment of land and compensation rate;
- Formulate plans for inventory study as well as for those related to resettlement and rehabilitation plan and review of the inventory study result;
- Conduct valuation of the asset lost to the Project;
- Suggest contents of each compensation and livelihood rehabilitation programmes;
- Identify other options for the resettlement and rehabilitation plan if necessary;
- Obtain authorization of resettlement and rehabilitation plan from the central government agencies for implementation;
- Plan budget allocation for implementation of resettlement and rehabilitation activities;
- Carry out payment of the compensation according to the inventory survey;
- Manage grievance of the PAFs made on the implementation of the resettlement and rehabilitation plan;
- Plan and carry out internal and external monitoring works;
- Disseminate information on the result of inventory study and stakeholder/public consultation meetings held in each village, district and state related to the Project on the home page accessible to the general public.

2) Suggested Units Subject to Establishment within DFCCIL

The following is suggested to be established as support to the RRP Management Unit:

- Asset Evaluation Unit;
- Resettlement Policy/Standard of Compensation Unit;
- Internal/External Monitoring and Evaluation Unit;
- Information Disclosure/Public Consultation Unit;
- Grievance Redress Unit;
- Budget/Accounting Unit; and
- Land Acquisition Policy Unit.

3) Suggested Units Subject to Establishment at District and State Level

The following is suggested to be established at district and state level:

- District Land Acquisition Unit for implementation of land acquisition; and
- State Acquisition Unit for coordination between DFCCIL and District Land

Acquisition Unit.

4) External Monitoring Unit

Upon completion of each compensation package, NGO for external monitoring works will be hired. This has to be supervised by the External Monitoring Unit of DFCCIL.

Table 10-80 Entitlement of the PAFs: National Rehabilitation Policy – 2006

Type of Loss	Application	Definition of PAFs	Entitlement of National Resettlement Policy - 2006	Expected Results
Loss of agricultural/ or any other type of land by owners	Land on the ROW	(i) Legal owners; and (ii) PAFs with traditional land rights	<ul style="list-style-type: none"> On replacement cost basis, agricultural land or cultivable wasteland to the extent of actual land loss subject to a max of 1 ha of irrigated land or 2 ha of unirrigated land/cultivable wasteland. If re-categorized to the status of marginal farmer (owning up to 1 ha of un-irrigated land, or 1/2 ha of irrigated land) as a consequence of land acquisition, PAF is entitled to the above rule of the provision of land. In case of allotted land being wasteland/degraded land, PAF shall be entitled to one-time financial assistance of Rs.10,000/ha for land development, or Rs.5,000 for agricultural land. 	Replacement of agricultural land or the value to the PAFs
Loss of homestead and commercial land	Land on the ROW	(i) Legal owners of land; (ii) PAFs with traditional land rights	<ul style="list-style-type: none"> Not more than 150 sq.m in rural area and not more than 75 sq.m in urban area. Every nuclear family of adult husband/wife and minor children is entitled to an additional entitlement of 10 sq.m. Each PAF of Below Poverty Level(BPL) category shall get one-time financial assistance not less than what is given under any programme of house construction by the GOI. 	Replacement of homestead/commercial land
Loss of residential/ commercial structures by owners and informal	Structure on the ROW	(i) Owner(s) of structures identified by DC; (ii) owners of structure identified by R&R	<ul style="list-style-type: none"> PAF is entitled for financial assistance as transportation cost for shifting of building materials, belongings and cattle etc. from the affected zone to the resettlement area on the actual cost basis. 	Reconstruction of structure and relocation to new sites
Loss of trees, crops, perennials	Standing crops, trees on ROW land	Owners and beneficiaries of land	<ul style="list-style-type: none"> Each PAF having cattle is entitled to a financial assistance of Rs.3,000 for construction of cattle shed. 	Compensation for standing crops and trees
Loss of income and work days due to displacement	Households affected by ROW	Head of households identified by the DC list	<ul style="list-style-type: none"> PAF of rural artisan, small trader, or self-employed person is entitled for one-time financial assistance of Rs.10,000 for construction of shop/shed. Each PAF is entitled to employment subject to availability of vacancies and suitability of the affected person per PAF. PAFs of groups and cooperative in outsourced contract is given priority of providing employment. PAF of landless labourers and unemployed are given priority for providing employment at the construction works of the Project. PAFs not given agricultural land or employment are entitled to a rehabilitation grant to 750 days minimum agricultural wages. Each PAF is in addition 20 % of the above amount in the form of share at the book value of the organization/company. In all cases where loss of agricultural land or displacement takes place on account of land development projects, in lieu of land-for-land or employment, PAFs would be given a site or apartment within the development project. Each displaced PAF is entitled to a monthly subsistence allowance equivalent to 20 days minimum agricultural wages per month for a period of 1 year. In the case PAFs involved in urgent land acquisition, each PAF is entitled to a transit accommodation before the benefit of resettlement and rehabilitation is PAFs is entitled for necessary training facilities for development of entrepreneurship skills to take up self-employment projects at the resettlement area. 	Subsistence and income in post-displaced period and poverty reduction
For project affected Scheduled Tribes and Scheduled Castes	Community as a whole	Affected communities and groups	<ul style="list-style-type: none"> In case 200 or more tribal families are displaced, except linear acquisitions of land such as railway development project, a Tribal Development Plan should be prepared. Tribal Development Plan should include development of alternative fuel, fodder and non-timber forest produce resources on non-forest lands within five years sufficient to meet requirements of tribal communities who are denied access to forests. Tribal Development Plan should also include resettlement area of the same scheduled area in compact block in order to retain their ethnic, linguistic and cultural identity Each PAF of scheduled tribe is entitled for one-time financial assistance 25 % higher rate in monetary terms of the resettlement and rehabilitation benefits. Each PAF of scheduled tribe is entitled for the benefits of resettlement and rehabilitation explained in the National Resettlement and Rehabilitation Policy - 2006. Each PAF of scheduled tribe is entitled for one-time financial assistance equivalent to 500 days minimum agricultural wages for loss of customary rights/usages forest produce. 	
Loss of community structure and common property resources	structures and other resources (e.g., communal land, water supply system, and access to social services)	Affected communities and groups	<ul style="list-style-type: none"> In all cases involving resettlement of 400 families, comprehensive infrastructure facilities and amenities should be provided. If the resettlement takes place in an existing settlement, additional comprehensive infrastructure facilities and amenities should be provided to the host community. In case entire population of village/area becomes subject to resettlement, entire population should be resettled in order to maintain socio-cultural relations. In the case PAFs of Scheduled Caste resettlement, they should be resettled in sites close to the villages. PAFs are provided with basic infrastructural facilities and amenities at the resettlement sites such as the provision of drinking water, electricity, schools, 	Restoration of community structures and common property resources

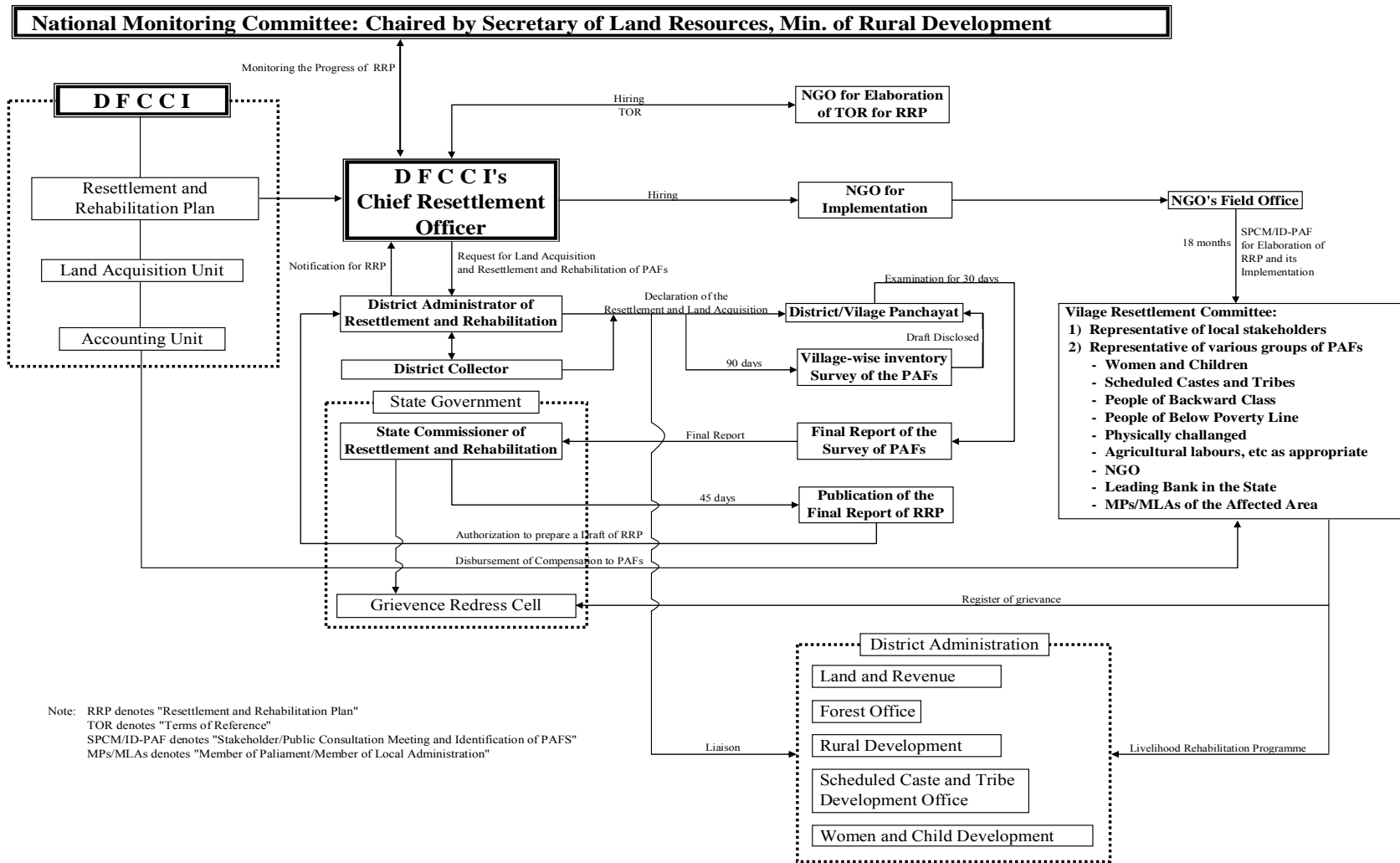


Figure 10-31 Mechanism of Resettlement Plan (National Rehabilitation Policy – 2006)

10.8 MITIGATION MEASURES

10.8.1 Social Considerations

(1) Land Acquisition and Compensation Package

1) Principle of Replacement Cost

As suggested in the Section 10-7, concept of land acquisition and compensation associated with it should be the replacement basis. It is also important to note that the recent economic growth of India has made land price as well as the cost of construction materials pushed to an unprecedented level. Thus appropriate market price reflecting actual cost of transaction should be studied and the information should be provided to the land owners at the time of negotiation.

2) Negotiation Basis of Land Acquisition

Negotiation basis for determination of the price of land subject to acquisition for the right of way of DFC Project should be strictly observed as mandatory for internationally funded project.

3) Compensation for Perennial Crops and Other Improvements

Compensation of the improvements on land, such as annual and perennial crops, ornamental trees and object should all be duly assessed and properly compensated. In the case of perennial crops, replacement cost should include the investment made to date and the expected yield of such perennial crops of its life time, or appropriate life time for compensation should be established with the owner of such crops.

(2) Resettlement

1) Completion of Resettlement Arrangement before Construction Works

Resettlement arrangement should be made prior to start of the construction works. No single person as a result of resettlement arrangement should degrade his/ her living standard. Any other provisions on resettlement should be based on the resettlement policy suggested to adapt for DFCCIL as proposed in "Volume 4 Technical Working Paper Task 2, 10-(7)".

2) Higher Rate of Compensation for the Families below Poverty Line

The poorest of the poor usually experience more hardship than those with titles and/or permanent nature of employment. Thus compensation package should be so considered that the rate of it has to be at higher percentage than those with titles and employment. In general, the "The more one has lower income the more one could receive higher rate of compensation" at the time of resettlement should be the basis of resettlement arrangement.

3) Provision of Resettlement Arrangement for Squatters

There are three major locations in the State of Maharashtra, Boisar and Palghar, where a large number of squatters are subject to resettlement. Thus the following principle should be applied:

- Nearest government land should be provided for the squatters subject to resettlement;
- Not more than 75 m² of land per family should be provided with appropriate land title;
- Sale of such land for the following 5 years should be banned;
- Any structures subject to construction should be arranged by each PAF; and

- Appropriate community facilities should be provided based on the community plan drawn before PAFs resettled.

As above those who are affected by the Project could be well lifted off the present conditions of living.

(3) Livelihood Rehabilitation

1) Shop Owners Affected by the Project

In the parallel sections of the Project, local shops established near the railway stations are adversely affected. These shop owners demand to maintain their shops close to the existing railway stations for continuing their business. However, re-opening of their business around the railway station should make further congestion and disorganization of the adjacent areas. Thus, the following is suggested:

- Appropriate “Small urban planning” for the area around the railway station should be carried out;
- Construct “Station building” containing small shop spaces in the area belonging to the railway; and
- The organization of Railway Land Development Authority established by MOR last year could plan and run such place on the rental basis.

2) Farmers Continuing Farming

In India, a farmer is hereditary a land owner. As soon as he/she sells the land he/she owns, he/she loses identity, thus “Certificate” as farmer. Thus farmers who are in demand of continuing farming practice cannot sell land which is in the right of way. It is therefore important to find alternative land area suitable for his practice of agriculture and MOR/DFCCIL should purchase such alternative land in the name of the farmer selling the land for the Project. Thereby the land in the right of way is processed for land acquisition. Any farmer who are not sure of continuing his/her farming practice may be consulted with NGO staff working for inventory of compensation, or MOR/DFCCIL staff for compensation package.

3) Provision of Employment

Where appropriate, as much local residents should be employed preferred to others mobilised by the contractors. It should be particularly so arranged that a number of local residents affected by the Project of a district should be employed as skilled and un-skilled labour at the time the DFC Project’s railway line is constructed in the district.

4) Education for the Family Members of PAFs

At the time of resettlement PAF’s family members, particularly school children and students of higher education suffer until such time that the head of family recovers his normal income. It usually takes 2-3 years. Thus up to three members of PAF’s family should be given a benefit of tuition waver. Thereby they can continue their education.

5) Other Benefit of PAFs

There are other benefits that PAFs could enjoy at the time as well as after the resettlement as shown in “Volume 4 Technical Working Paper Task 2, 10-(7)”. Thereby the PAFs would become supporters of the implementation of Project.

6) Community Planning

There are a large number of local residents, both title holders and non-title holders, subject to resettlement in the parallel section of the Project. Their resettlement area should be prepared within 5 km of the present living area. Thus such group of local residents could resettle in a place where a community planning with necessary infrastructure is drawn before the resettlement takes place.

(4) Engineering Measures

As a result of a series of stakeholder/public consultation meeting throughout the alignment of DFC Project, it would be sensible to suggest a provision of typical cross section of detour route as is shown in Figure 10-32. The following is proposed to prove:

- On both side of detour route, 4 m wide community road is constructed;
- Each road crossing the detour route is provided with RUB;
- Approximately every 1 km, a foot path RUB is provided;
- Irrigation canal is provided with culverts; and
- Drainage is provided in order to avoid flood event of the area bisected by the detour route.

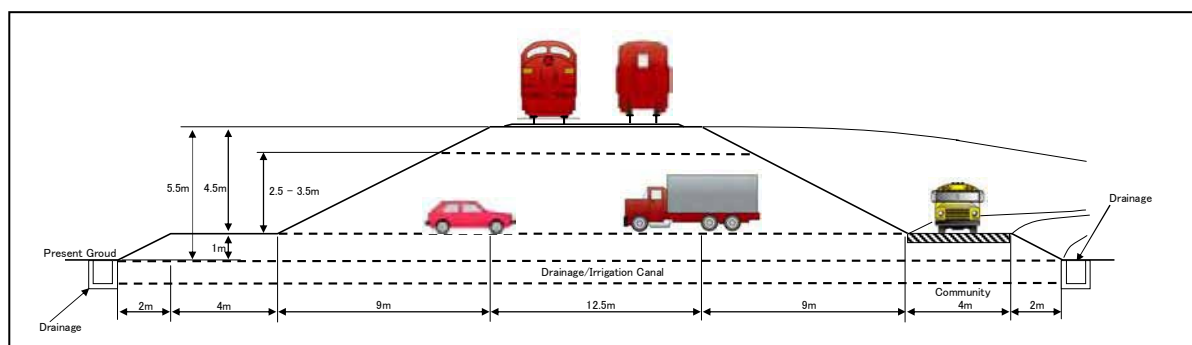


Figure 10-32 Suggested Typical Cross Section of Detour Routes

10.8.2 Natural Environment

(1) Flora and Fauna related to Protected Area and Recorded Forest

Under Indian law, National Parks, the Wildlife Sanctuaries and Eco-Sensitive Area are protected requiring the prior permission for the project or even survey. At the section between Ajmer-Palanpur and also Palanpur-Ahmedabad, Mount Abu, Jossore, Balaram Ambaji, Thol Lake Wildlife Sanctuaries are closely located to the corridor, though those are not directly affected only by track installation.

1) Pre-construction stage

- The protected areas are not allowed any survey without prior permission within the area. Adequate procedure will be carried out prior to the field survey within the protected areas such as national parks and wildlife sanctuaries and recorded forests such as reserved forests and protected forests.
- Any disturbance such as tree cutting or collection of animal bodies including eggs will be avoided through adequate instruction to surveyors within protected area or of protected wild species provided by Wildlife Conservation Act 1972 associate with the land survey.

- Pre-identified location for the material procurement such as location of borrow pits and waste dump yard and amount of material, method of excavation will be planned adequately based on the field survey.
 - Minimum affected area to be converted from forest and also minimum number of tree felling will be considered.
- 2) Construction phase
- Any material procurement in the protected area such as national parks, wildlife sanctuaries and recorded forests will be avoided within those boundaries obtaining adequate geological information from concerned authorities.
 - Any worker's camp will not be located within the protected area or recorded forest through adequate instruction to them.
 - Any waste dumping will be avoided within the boundaries through adequate instruction to the contractors/workers.
 - Any harmful waste water will not be dumped in any water body such as rivers and ponds.
 - Separation of the animal from the railway will be considered through fencing and not planting fodder trees near the railway if the areas are closely located to the forest/protected area.
 - Tree removal will be conducted following the legislation of the Central and State Forest Authorities.
 - Adequate Compensatory Afforestation will be carried out for tree removal in the recorded forest following the instruction of the Central Empowerment Committee under the Supreme Court.
 - The process on the tree species selection is recommended to involve opinion of local residents at the area for the maintenance purpose.
- 3) Operation phase
- The domestic disposal or any waste dumping will be avoided through adequate instruction to the railway operational workers.

(2) Topography, Geology and Soil erosion related to earth works.

- 1) Pre-construction phase
- Pre-identified location for the material procurement such as location of borrow pits and waste dump yard and amount of material, method of excavation will be planned adequately based on the field survey.
- 2) Construction phase
- Construction material will be obtained with adequate manner following the legislation of central/local authorities such as IRC: 10-1961(Recommended Practice for Borrow pits for Road Embankments Constructed by Manual Operation by Indian Road Congress).
 - Waste dumping will be carried out only at pre-identified locations based on plan where the area is legally allowed.
 - Adequate number of drainage will be installed at the embankment not to disturb surface water flow in the area causing water logging and flood.
 - Enough water flow area will be applied for all bridges not to cause water flood in the

area.

- Soil erosion will be prevented on the long slope embankments or cuttings applying adequate slope protection such as greening.
- Associated to the earth works, water quality of existing river and pond will be considered installing temporary sedimentation traps or adequate work schedule avoiding the earth work on heavy rainy season.

10.8.3 Pollution Control

Overall, awareness of environmental management and conservation for railway construction, operation and maintenance is not yet raised since railway development is not subject to EIA and the ROW is not under the jurisdiction of MOEF. Although some environmental issue such as waste and odour are not only caused by railway operation but also customers' manner, it is suggested for MOR to take actions to implement environmental management of railway related facilities and to raise environmental awareness of railway for both related staff and customers.

(1) Air Pollution

1) During Construction Phase

- Adequate suppression measures such as regular water sprinkling shall be conducted to control fugitive dust over the bared soil surface at construction sites, such as unpaved roads particularly near habitation.
- Use of construction machines, generator and vehicles with lower emissions of SPM and NOx is suggested.
- Plantation activities are suggested at the construction sites.
- It is suggested that Workers are provided with mask to prevent breathing problems.
- Trucks carrying soil, sand and stone shall be duly covered to avoid spilling.
- Air quality monitoring is suggested at construction sites.

(2) Water Pollution

1) During Construction Phase

- Proper retaining wall and/or silt fence shall be provided to prevent intrusion and dispersion of soil and silt generated from excavation and dredging works of the river bank and river bed during construction of important railway bridges.
- Avoid engineering works at the site where sluice gates of drinking water and irrigation are located.
- Shift the engineering work period to the dry season to minimise adverse impacts to turbidity and SS.
- Minimise surface-runoff of wastewater from construction sites and sewerage generated from workers camps, and prevent spillage/leakage from construction equipments.
- Proper sanitation facilities shall be provided in workers camps.
- Construction methodologies with minimum or no impact on water quality may be adopted; disposal of construction wastes at designated sites and adequate drainage system is suggested.

- Water quality monitoring is suggested during the construction phase.

(3) Solid Waste

1) During Construction Phase

- Minimise generation of construction waste and general waste, reuse and recycle effectively within construction sites and surrounding areas based on 3-R principle (Reduce, Reuse and Recycle). Ensure proper treatment, transportation and final disposal sites.
- It is suggested to establish a closed-system for waste treatment. All the construction work must be carried out in such a way that minimum or no solid waste is generated at the site. Extra earth material produced shall be utilised for refilling of borrow pits.
- Rainy season may be avoided to minimise spreading of loose materials.
- Proper solid waste management may be framed for workers camps areas. Dust bins may be provided in the camps.

2) During Post-construction Phase

- Proper solid management program must be formed (i) to establish a closed system within railway land areas and related facilities and (ii) to ensure proper treatment and disposal of solid waste generated from freight trains and related facilities.

(4) Noise and Vibration

1) During Construction Phase

Proper noise and vibration data on construction machinery in India is not available at the present stage. Therefore, those in Japan are shown in Table 10-81 as a reference. In general, following measures are suggested to avoid and to minimise noise and vibration.

- At the source level: use machines and vehicles equipped with lower noise and vibration devices, muffler, sound-proofing cover, vibration-proofing cover, etc.
- Prevention of sound propagation: keep the distance, change the direction and location of machines, and provide a sound proofing fence, planting trees. Thus, temporary noise barriers shall be installed at settlements, and planting trees to absorb noise.
- Regulating night-time construction work: Near settlement and forest areas, construction activities may be conducted only during daytime, and noise generating activity may be prohibited during night hours.
- Headphones and ear plugs to be provided to the workers at construction sites.
- Noise level monitoring shall be conducted during the construction phase.

Table 10-81 Typical Noise and Vibration Levels of Construction Machines and Vehicles of Japan

	Construction machine	Sound Power level(dB)	Vibration level(dB)	Remarks
1	Vibration Roller	107	74	3t
2	Rafter Crane	102	42	25t
3	Rafter Crane	102	40	16t
4	Bulldozer	104	63	32t
5	Bulldozer	114	63	21t
6	Bulldozer	112	66	11t
7	Backhoe	106	63	0.6m ³
8	Truck Crane	102	42	
9	Truck Shovel	109	66	2.3m ³
10	Scraper (pulled type)	100	64	17m ³
11	Concrete Pumping Car	115	-	
12	Crane	102	35	40t(hang up)
13	Jib-crane	102	40	2.8t
14	Cram-shell	109	66	0.6m ³
15	Compressor	106	-	17m ³
16	Concrete breaker	120	74	
17	Oil Compressor	101	43	
18	Oil Shovel	106	63	

Source: Japan Construction Mechanisation Association and Others

Table 10-82 Causes and Factors of Railway Noise

Source of Noise	Cause and Part of Noise Generation	Factor Contribute to Generation of Noise
Traction movement	Vibration of wheel and rail resulted from contact interaction between wheel and rail surface. In general, vibration of rail, generated at joint space between rails is main source of noise.	Roughness of wheel surface and rail surface, type of track, running speed of train, etc.
Structures (railway bridge, elevated track)	Vibration from materials of steel bridge girder and/or concrete of elevated railway bridge	Roughness of wheel surface and rail surface, type of track, running speed of train, etc.
Machines equipped to train	Passenger train: rotating sound due to cooling fan of engine motor of locomotive. Cooling fan rotates with the same axle of the cooling fan and was found to be higher noise generation with higher gear ratio of gearwheel.	Passenger train type of motor, revolutions per minute of cooling fan, running speed of train, etc.

Source: Railway Technical Institute, 1997 and other studies

As mentioned in Chapter 7 of Preliminary Engineering Design of Facilities and Equipment, with respect to structures and rolling stocks, new technologies resulting from a recent innovation are suggested to incorporate into DFC Project. Therefore, it is an expected considerable reduction in generation of railway noise and vibration.

a) Traction Movement

Rail: Rail joint connected with fishplate is a weak point of the track. Use of long welded rails that have no fishplate joint is suggested. This would reduce the track maintenance cost

and improve riding quality. Other wheel-rail technologies would reduce rail corrugations, rolling contact fatigues and thermal/mechanical defects.

Wheel: The surface of wheel may be smoothed and shall be properly maintained.

b) Structure

Track: Crushed stone shall be used for ballast materials, and accumulation of crushed ballast by passing trains are to be removed through frequent ballast cleaning.

Railway Bridge Girder: Steel may be replaced by concrete material such as PC and RC to minimise oscillation of the bridge girder which generates noise and vibration.

c) Machines Equipped in the Train

Noise and vibration due to machines equipped in a locomotive are expected. However, these are negligible by considering that noise would be generated more from the rails for 40 to 60 wagons.

Generation of noise from an electric locomotive is considered as negligible, compared with those from a diesel locomotive.

d) Others

- Provide appropriate maintenance of locomotives, tracks and structures
- Running speed of freight trains in the urban area and the railway station shall be controlled, if required.
- Fences and structures to shelter and absorb noise and vibration are duly provided to the sections where houses and Sensitive Receptors are located near railway tracks, if required.
- Monitoring of railway noise and vibration generated from dedicated freight trains shall be conducted.

(5) Bottom Sediment

Avoid construction works at the river site where the bottom sediment could be contaminated by toxic substances such as heavy metals and hazardous chemicals by conducting the pre-survey.

10.9 ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

10.9.1 Environmental Management Plan

(1) Framework of Environmental Management Plan

During implementation of the ESIMMS, it is important to identify environmental requirements that are needed to conduct in the environment management activities for both construction and operation stages of the DFC Project. Thus the environment and social impacts mitigation measures are suggested within the framework of JICA Study. Furthermore if these management works of environmental parameters will have to be carried out by the project owner, it is important to provide an explicit lay-out of

implementation plan. Based on the past experiences and the prevailing practices in India, the environmental management plan is formulated.

While DFCCIL is main responsible administrative body for the implementation of the environmental management plan, there are a number of governmental organizations related to the environmental management. Present laws and regulations should be studied to define the active participation of the various governmental agencies in the implementation of environmental management plan.

(2) Outline of Social Environment Management Plan

Social Environment Management Plan for the DFC Project is divided into two categories as follows:

1) Resettlement and Rehabilitation Plan

Resettlement and Rehabilitation Plan is prepared for those who are subject to involuntary resettlement both on the parallel and detour sections. General framework of resettlement and rehabilitation plan is explained in detail in Section 10.7.

2) Other Social Environmental Management Plan

Social environment management plan in other areas of the Project should include:

- General disturbances during the construction period and the measures of mitigation against noise, vibration, dust, solid waste and others;
- Railway noise and vibration in operation stage of the DFC Project;
- Interruption of the existing agriculture, commerce and industrial activities during and after the construction works of the Project;
- Establishment of action plan of DFCCIL to tackle grievance and social issues related to the DFC Project.

(3) Outline of the Natural Environment Management Plan

Natural Environment Management Plan should be prepared as follows:

- Mitigation measures such as compensatory tree planting with respect to the disturbances to Balaram Ambaji Wildlife Sanctuary and other important natural environmental protected areas;
- Compensatory tree planting plan with respect to disturbances to reserved and protected forest areas;
- Establishment of action plan of DFCCIL to tackle grievance and natural issues related to the DFC Project.

The Environmental Management Plan by Project phase is summarized as shown in the following tables.

Table 10-83 Environmental Management Plan Prior to Construction

Environmental Issues	Management Measures	Responsibility	
		Planning and Execution	Supervision/ Monitoring
(1) Land Acquisition	<i>The acquisition of land and private properties will be carried out in accordance with the RAP and entitlement framework for the project approved by DFCCI. Environmental Management Unit (EMU) has to ascertain that any additional environmental impacts resulting from acquisition of land shall be addressed and integrated into the EMP and other relevant documents.</i>	Land Acquisition Unit, Revenue Dept., EMU, NGOs	Revenue Dept, DFCCIL
(2) Preservation of Trees	<i>All efforts will be made to preserve trees including evaluation of minor design adjustments/alternatives (as applicable) to save trees. Specific attention will be given for protecting giant trees and green tunnels. Tree cutting is to proceed only after all the legal requirements including attaining of In-principle and Formal Clearances from the State Forest Department are completed and subsequently a written order is issued to the Contractor. Stacking, transport and storage of the wood will be done as per the relevant norms. Systematic corridor level documentation for the trees cut and those saved will be maintained by the EMU.</i>	EMU, Forest Department	DFCCIL
(3) Relocation of Common Property Resources	<i>All community utilities and properties will be relocated before construction starts, on any section of the project corridor. The EMU will relocate these properties in consultation and written agreement with the agency/ owner/community. The relocation sites will be identified in accordance with the choice of the community.</i>	EMU	DFCCIL
Field verification and Modification of the Contract Documents			
(4) Joint Field Verification	<i>The Environmental Expert of EMU and the Contractor will carry out joint field verification to ascertain the possibility to saving trees, environmental and community resources. The verification exercise should assess the need for addition or changes in design/scale/nature of protection measures including the efficacy of enhancement measures suggested in the EMP. Proper documentation and justifications/reasons shall be maintained in all such cases where deviation from the original EMP is proposed.</i>	The Contractor & EMU	DFCCIL
(5) Construction vehicles, equipment and machinery	<i>All vehicles, equipment and machinery to be procured and brought to site for construction will confirm to the relevant Bureau of India Standard (BIS) norms and the manufacturer's specifications. The discharge standards promulgated under the Environment Protection Act, 1986 will be strictly adhered to. Noise limits for construction equipment to be procured such as compactors, rollers, front loaders concrete mixers, cranes (moveable) will not exceed the value specified in the Environment (Protection) Rules, 1986. The equipment proposed to be used for bridge and culvert construction and installed close to waterway/streams, must be checked and certified fit, especially with respect to the potential leakage of oil and grease. The inspection should verify that: Equipment is clean (free of mud, dirt and oil) Equipment is in good working order. A drip pan is available for equipment that will be stored on site. Contractor has a spill kit Operator is trained on the refuelling, maintenance and emergency spill procedures. A log book will be maintained documenting all fuelling and maintenance events (date, time, location, condition of site, weather conditions, amount of fuel on maintenance event, issues). Adequate inspections will be conducted during the construction period.</i>	The Contractor	Environmental Expert of EMU
(6) Borrow Areas	<i>Finalizing borrow areas for borrowing earth and all logistic arrangements as well as compliance to environmental requirements, as applicable, will be the sole responsibility of the contractor. The Contractor will not start borrowing earth from select borrow area until the formal agreement is signed between the land owner and the Contractor and a copy is submitted to the Supervision Consultant (SC) and EMU. Locations finalized by the Contractor shall be reported to the</i>	The Contractor	Environmental Expert of SC and EMU

Environmental Issues	Management Measures	Responsibility	
		Planning and Execution	Supervision/ Monitoring
	<i>Environmental Expert of SC and who will in turn report to EMU. Format for reporting will be as per the Reporting Format for Borrow Area and will include a reference map. In addition to testing for the quality of borrow materials by the SC, the environmental experts of the SC will be required to inspect every borrow area location prior to approval.</i>		
(7) Quarry Areas	The quarry materials requirement of this project may be fulfilled from the existing quarries. However, detail investigation regarding the availability and suitability of quarry materials from these locations will be finalized by the DPR Consultant. In case the Contractor decides to use quarries other than recommended by DPR consultants, then it will be selected based on the suitability of the materials. The Contractor will obtain necessary permission for procurement of materials from Mining Department, District Administration and State Pollution Control Board and shall submit a copy of the approval and the rehabilitation plan to the EMU and Environmental Expert of SC.	The Contractor	Environmental Expert of SC and EMU
(9) Arrangement for construction water	The Contractor will provide a list of locations and type of sources from where water for construction will be used. To avoid disruption/disturbance to other water users, the Contractor will extract water from fixed locations and consult the Environmental Expert before finalizing the locations. The Contractor will not be allowed to pump from any irrigation canal and surface water bodies used by the community. The Contractor will need to comply with the requirements of the State Ground Water Department and seek its approval for doing so and submit copies of the permission to Environmental Expert of SC and EMU.	The Contractor	Environmental Expert of SC and EMU
(10) Site identification for disposal of unsuitable materials	The Contractor shall identify site(s) away from the project area where unsuitable materials (debris, solid waste) generated in the course of the construction can be safely disposed off. Such locations shall be inspected by the Environmental Expert of Supervision Consultant and approved in consultation with the EMU before construction work starts	The Contractor	Environmental Expert of SC and EMU
(11) Labour requirements	Local people will be given preference for unskilled and other jobs created during construction phase of the project. The contractor would notify requirement of unskilled labours in nearby/surrounding villages. In case local labours are not interested/available then a certificate/letter shall be issued by the Panchayat officials to the Contractors in this regard.	The Contractor	EMU
(12) Arrangements for temporary land	The Contractor as per prevalent rules will carry out negotiations with the landowners for obtaining their consent for temporary use of lands for workers camp, construction sites etc. The Environmental Expert will ensure that the clearing up of the site prior to handing over to the owner (after construction or completion of the activity) is duly carried out by the Contractor. From P.2 and From P.3 (given in Annex-8.1) shall be used for reporting status of temporarily acquired land to Environmental Expert	The Contractor	Environmental Expert of SC and EMU

Table 10-84 Environmental Management Plan during Construction

Sl.No.	Environmental Issues	Management Measures	Responsibility	
			Execution/ Civil Work	Supervision/ Monitoring
Activities to be carried out by the Contractor				
C.1	Site Clearance			
C.1.1	Clearing & Grubbing	<i>Vegetation will be removed from the construction zone before commencement of construction. All works will be carried out such that the damage or disruption to flora other than those identified for cutting is minimum. Only ground cover/shrubs that impinge directly on the permanent works or necessary temporary works will be removed with prior approval from the Environmental Expert. The Contractor, under any circumstances will not cut or damage trees. Trees identified under the project will be cut only after receiving clearance from the Forest Department of Maharashtra and after the receipt of written permission from EMU.</i>	The Contractor	Environmental Expert of SC and EMU
C.1.2	Stripping, stocking and	<i>The topsoil from all areas of cutting and all areas to be</i>	The Contractor	Environmental

Sl.No.	Environmental Issues	Management Measures	Responsibility	
			Execution/ Civil Work	Supervision/ Monitoring
	preservation of top soil	<p><i>permanently covered will be stripped to a specified depth of 150 mm and stored in stockpiles. A portion of the temporarily acquired area and/or Right of Way will be earmarked for storing topsoil. The locations for stock piling will be pre-identified in consultation and with approval of Environmental Expert. The following precautionary measures will be taken to preserve them till they are used:</i></p> <p><i>(a) Stockpile will be designed such that the slope does not exceed 1:2 (vertical to horizontal), and height of the pile is restricted to 2 m. To retain soil and to allow percolation of water, the edges of the pile will be protected by silt fencing</i></p> <p><i>(b) Stockpiles will not be surcharged or otherwise loaded and multiple handling will be kept to a minimum to ensure that no compaction will occur.</i></p> <p><i>Such stockpiled topsoil will be utilized for -</i></p> <ul style="list-style-type: none"> ▪ <i>covering all disturbed areas including borrow areas (not those in barren areas)</i> ▪ <i>top dressing of the embankment and fill slopes</i> ▪ <i>in the agricultural fields of farmers, acquired temporarily.</i> <p><i>Residual topsoil, if there is any will be utilized for the plantation.</i></p>		Expert of SC and EMU
C.2 Procurement of Construction Material				
C.2.1	Earth from Borrow Areas for Construction	<p><i>No borrow area will be opened without permission of the Environmental Expert. The location, shape and size of the designated borrow areas will be as approved by the Environmental Expert of SC.</i></p> <p><i>The Contractor will rehabilitate the borrow areas as soon as borrowing is over from a particular borrow area in accordance with the Borrow Area Rehabilitation/ Redevelopment Guidelines or as instructed by the Environmental Expert.</i></p>	The Contractor	Environmental Expert of SC and EMU
C.2.2	Quarry operation	<p><i>The Contractor will develop a Comprehensive Quarry Redevelopment Plan as per the Mining Rules of Maharashtra and submit a copy to EMU and SC prior to opening of the quarry site. The quarry operations will be undertaken within the rules and regulations in force.</i></p>	The Contractor	Environmental Expert of SC and EMU
C.2.3	Construction water	<p><i>The Contractor will arrange adequate supply and storage of water for the whole construction period at his own costs. The Contractor will submit a list of source/s from where water will be used for the project to SC and EMU.</i></p> <p><i>The Contractor will source the requirement of water preferentially from ground water but with prior permission from the relevant authority/ authorities, if required. A copy of the permission will be submitted to SC and EMU prior to initiation of construction.</i></p> <p><i>The Contractor will take all precaution to minimize the wastage of water in the construction process/ operation.</i></p>	The Contractor	Environmental Expert of SC and EMU
C.3 Construction Work				
C.3.1	Drainage & Flood Control	<p><i>The Contractor will ensure that construction materials like earth, stone are disposed off so as not to block the flow of water of any watercourse and cross drainage channels.</i></p> <p><i>The Contractor will take all necessary measures to prevent the blockage of water flow. In addition to the design requirements, the Contractor will take all required measures as directed by the Environmental Expert of SC to prevent temporary or permanent flooding of the site or any adjacent area, if any.</i></p>	The Contractor	Environmental Expert of SC and EMU
C.3.3	Slope Protection and Control of Soil Erosion	<p><i>The Contractor will take slope protection measures as per design, or as directed by the Environmental Expert of SC to control soil erosion and sedimentation through use of dykes, sedimentation chambers, basins, fibber mats, mulches, grasses, slope, drains and other devices. All temporary sedimentation, pollution control works and maintenance thereof will be deemed as incidental to the earth work or other items of work and as such as no separate payment will be made for them. The</i></p>	The Contractor	Environmental Expert of SC and EMU

Sl.No.	Environmental Issues	Management Measures	Responsibility	
			Execution/ Civil Work	Supervision/ Monitoring
		<p>Contractor will ensure the following safeguards:</p> <ul style="list-style-type: none"> ▪ During construction activities on embankment, the side slopes of all cut and fill areas will be graded and covered with stone pitching, grass and shrub. ▪ Turfing works will be taken up as soon as possible provided the season is favourable for the establishment of grass sods. Other measures of slope stabilization will include mulching, netting and seeding of batters and drains immediately on completion of earthworks. ▪ In borrow pits, the depth shall be so regulated that the sides of the excavation will have a slope not steeper than 1 vertical to 2 horizontal, from the edge of the final section of the bank. 		
10.9.2 C.4 Pollution				
C.4.1 Water Pollution				
C.4.1.1	Water pollution from construction wastes	<p>The Contractor will take all precautionary measures to prevent the wastewater generated during construction from entering into streams, water bodies or the irrigation system. He will avoid construction works close to streams or water bodies during monsoon. Silt fencing may be provided near water bodies to avoid spillage of construction material.</p> <p>All waste arising from the project is to be disposed off in the manner that is acceptable to the State Pollution Control Board or as directed by Environmental Expert. Construction activities near the river/water bodies will be prohibited during the rainy season.</p>	The Contractor	Environmental Expert of SC and EMU
C.4.1.2	Water pollution from fuel and lubricants	<p>The Contractor will ensure that all construction vehicle parking location, fuel/lubricants storage sites, vehicle, machinery and equipment maintenance sites are located at least 100 m away from any water body. The Contractor will also ensure that spillage of fuels and lubricants do not contaminate the ground.</p> <p>If fuel storage and refuelling areas are located on agricultural land or areas supporting vegetation, the top soil will be stripped, stockpiled and returned after cessation of such activities.</p> <p>All location and lay-out plans of such sites will be submitted by the Contractor prior to their establishment and will be approved by the Environmental Expert and EMU. The Contractor will arrange for collection, storing and disposal of oily wastes to the pre-identified disposal sites (list to be submitted to SC and EMU) and approved by the Environmental Expert. All spills and collected petroleum products will be disposed off in accordance with MoEF and state PCB guidelines.</p>	The Contractor	Environmental Expert of SC and EMU
C.4.2 Air Pollution				
C.4.2.1	Dust pollution	<p>The Contractor will take every precaution (water sprinkling etc.) to reduce the level of dust generating from construction site. All the plants will be sited at least 1 km in the downwind direction from the nearest human settlement.</p> <p>The Contractor will provide necessary certificates to confirm that all crushers used in construction conform to relevant dust emission control legislation. Alternatively, only crushers licensed by the PCB shall be used. The Contractor in such a case shall submit required certificates and consents. Hot mix plant will be fitted with dust extraction units.</p>	The Contractor	Environmental Expert of SC and EMU
C.4.2.2	Emission from construction vehicles, equipments and machineries	<p>The Contractor will ensure that all vehicles, equipments and machineries used for construction are regularly maintained and confirm that pollution emission levels comply with the relevant requirements of State Pollution Control Board (SPCB).</p> <p>The Contractor will submit PUC certificates for all vehicles/ equipment/ machinery used for the project and</p>	The Contractor	Environmental Expert of SC and EMU

Sl.No.	Environmental Issues	Management Measures	Responsibility	
			Execution/ Civil Work	Supervision/ Monitoring
		maintain a record of the same during the contract period. Monitoring results will also be submitted to SC and EMU as per the monitoring plan.		
C.4.3 Noise Pollution				
	Noise from vehicles, equipments and machineries	<p>The Contractor will confirm the following:</p> <ul style="list-style-type: none"> ▪ All plants and equipments used in construction shall strictly conform to the MoEF/CPCB/PPCB noise standards. ▪ All vehicles and equipment used in construction will be fitted with exhaust silencers. ▪ Servicing of all construction vehicles and machinery will be done regularly and during routine servicing operations, the effectiveness of exhaust silencers will be checked and if found defective will be replaced. <p>At the construction sites within 150 m of the nearest habitation, noisy construction work such as crushing, concrete mixing will be stopped during the night time between 9.00 pm to 6.00 am.</p> <p>No noisy construction activities will be permitted around educational institutions/ health centres (silence zones) up to a distance of 100 m from the sensitive receptors.</p> <p>Monitoring shall be carried out at the construction sites as per the monitoring schedule and results will be submitted to SC and EMU. Environmental Expert will be required to inspect regularly to ensure the compliance of EMP.</p>	The Contractor	Environmental Expert of SC and EMU
C.5 Safety				
C.5.1	Personal safety measures for labour	<p>The Contractor will provide:</p> <ul style="list-style-type: none"> ▪ Protective footwear and protective goggles to all workers employed on mixing asphalt materials, cement, concrete etc. ▪ Protective goggles and clothing to workers engaged in stone breaking activities ▪ Earplugs to workers exposed to loud noise, and workers working in crushing, compaction, or concrete mixing operation. ▪ Adequate safety measures for workers during handling of materials at site. <p>The Contractor will comply with all the precautions as required for ensuring the safety of the workmen as per the International Labour Organization (ILO) Convention No. 62 as far as those are applicable to this contract.</p> <p>The Contractor will make sure that during the construction work all relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Services) Act, 1996 are adhered to.</p> <p>The Contractor will not employ any person below the age of 14 years for any work and no woman will be employed on the work of painting with products containing lead in any form.</p> <p>The Contractor will also ensure that no paint containing lead or lead products is used except in the form of paste or readymade paint. He will provide facemasks for use to the workers when paint is applied in the form of spray or a surface having lead paint is rubbed and scraped. The Contractor will mark 'no smoking' in high risk areas and enforce non-compliance of use of PPE with zero tolerance. These will be reflected in the Construction Safety Plan to be prepared by the Contractor during mobilization and will be approved by SC and EMU.</p>	The Contractor	Environmental Expert of SC and EMU
C.5.2	Risk from electrical equipments	<p>The Contractor will take all required precautions to prevent danger from electrical equipment and ensure that –</p> <ul style="list-style-type: none"> ▪ No material will be so stacked or placed as to cause danger or inconvenience to any person or the public. 	The Contractor	Environmental Expert of SC and EMU

Sl.No.	Environmental Issues	Management Measures	Responsibility	
			Execution/ Civil Work	Supervision/ Monitoring
		<ul style="list-style-type: none"> ▪ All necessary fencing and lights is provided to protect the public in construction zones. <p>All machines to be used in the construction will conform to the relevant Indian Standards (IS) codes, are free from patent defect, are kept in good working order, regularly inspected and properly maintained as per IS provision and to the satisfaction of the Environmental Expert.</p>		
C.5.3	First aid	<p>The Contractor will arrange for –</p> <ul style="list-style-type: none"> ▪ A readily available first aid unit including adequate supply of sterilized dressing materials and appliances as per the Factories Rules in every work zone ▪ Availability of suitable transport at all times to take injured or sick person(s) to the nearest hospital ▪ Equipment and trained nursing staff at construction camp. 	The Contractor	Environmental Expert of SC and EMU
C.6 Labour Camp Management				
C.6.1	Accommodation	The Contractor will follow all relevant provisions of the Factories Act, 1948 and the Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction and maintenance of labour camp.	The Contractor	Environmental Expert of SC and EMU
C.6.2	Potable water	<p>The Contractor will also guarantee the following:</p> <ol style="list-style-type: none"> a) Supply of sufficient quantity of potable water (as per IS) in every workplace/labour camp at suitable and easily accessible places and regular maintenance of such facilities. b) If any water storage tank is provided, the bottom of the tank will be kept at least 1mt. from the surrounding ground level. c) If water is drawn from any existing well, which is within 30mt. proximity of any toilet, drain or other source of pollution, the well will be disinfected before water is used for drinking. d) All such wells will be entirely covered and provided with a trap door, which will be dust proof and waterproof. e) A reliable pump will be fitted to each covered well. The trap door will be kept locked and opened only for cleaning or inspection, which will be done at least once in a month. f) Testing of water will be done every month as per parameters prescribed in IS 10500:1991. <p>Environmental Expert will be required to inspect the labour camp once in a week to ensure the compliance of the EMP.</p>	The Contractor	Environmental Expert of SC and EMU
C.6.3	Sanitation and sewage system	<p>The Contractor will ensure that -</p> <ul style="list-style-type: none"> ▪ The sewage system for the camp will be designed, built and operated in such a fashion that it should not pollute the ground water or nearby surface water. ▪ Separate toilets/bathrooms, will be arranged for men and women ▪ Adequate water supply is to be provided in all toilets and urinals ▪ All toilets in workplaces are with dry-earth system (receptacles) which are to be cleaned and kept in a strict sanitary condition ▪ Night soil (human excreta) is to be disposed off by putting layer of it at the bottom of a permanent tank prepared for the purpose and covered with 15 cm. layer of waste or refuse and then covered with a layer of earth for a fortnight. 	The Contractor	Environmental Expert of SC and EMU
C.6.4	Waste disposal	The Contractor will provide segregated garbage bins (biodegradable and non- biodegradable) in the camps and ensure that these are regularly emptied and disposed off in a hygienic manner as per the Comprehensive Solid Waste Management Plan approved by the Environmental Expert of SC.	The Contractor	Environmental Expert of SC and EMU

Sl.No.	Environmental Issues	Management Measures	Responsibility	
			Execution/ Civil Work	Supervision/ Monitoring
		Unless otherwise arranged by local municipal authority, arrangements for disposal of night soils (human excreta) suitably approved by the local municipal authority or as directed by Environmental Expert, will be arranged by the Contractor.		
C.7 Contractor's Demobilization				
C.7.1	Clean-up operations, restoration and rehabilitation	The Contractor will prepare site restoration plans, which will be approved by the Environmental Expert of SC and PIU. The clean-up and restoration operations are to be implemented by the Contractor prior to demobilization. The Contractor will clear all temporary structures; dispose all garbage, night soils, POL waste and all construction zones as per Comprehensive Waste Management Plan and as approved by SC. All disposal pits or trenches will be filled in and effectively sealed off. Residual topsoil, if any will be distributed on adjoining/ proximate barren land or areas identified by Environmental Expert in a layer of thickness of 75 mm-150 mm.	The Contractor	Environmental Expert of SC and EMU

10.9.3 Environmental Monitoring Plan

(1) Outline of the Environmental Monitoring Plan

The Environmental Monitoring Plan considers the environmental parameters that would become significantly irreversible, cumulative or permanently changed and is carried out for both construction and operation stages of the DFC Project. Its general outline is suggested to be as follows:

- 1) Explicit measures taken within the framework of Environmental Management Plan are selectively carried out as monitoring becomes necessary;
- 2) Monitoring is undertaken periodically based on the laws and regulations of the Government of India. If not applicable, those of Japan may be applied; and
- 3) Appropriateness of the parameters of Environmental Management Plan is reviewed and alternative measures for environmental management are identified for implementation.

(2) Social Environment Monitoring Plan

1) Resettlement Monitoring Plan

Resettlement Monitoring Plan is a part of the Resettlement and Rehabilitation Plan. It is generally carried out for 3-5 years to monitor and ascertain that the standard of living is maintained or improved compared with the period before resettlement.

2) Social Environment Monitoring Plan

Within the framework of Environment Management Plan, there would be parameters related to social environment necessary to be monitored over a period. Since DFC Project is basically carried out alongside the existing railway line as well as new detour routes avoiding local cities, social environment alongside it is either lightly or heavily disturbed. Monitoring period should generally be 3-5 years.

(3) Natural Environmental Monitoring Plan

Some of the parameters within the framework of Natural Environment Management Plan will have to be monitored over 3-5 years in terms of sensitive natural environment alongside the DFC Project.

(4) Pollution Monitoring Plan

1) Monitoring during Construction Phase

a) Air Quality Monitoring

- Monitoring shall be conducted for SPM generated from bared surface soil, embankments and cuttings at construction sites during earth moving and engineering works.
- Monitoring for the emissions of air pollutants such as SPM, NO_x, and noise and vibration generated by construction machinery and vehicles shall be conducted.

b) Water Quality Monitoring

- Water quality monitoring of the downstream river shall be carried out, particularly on the increase in turbidity and SS concentration (mg/l) due to muddy water generated from earth moving and engineering works at the construction sites of important railway bridges.

c) Noise and Vibration Monitoring

- Monitoring shall be carried out for noise and vibration generated from construction machines and vehicles near the construction sites.

2) Monitoring during Post-construction Phase

a) Monitoring of railway noise and vibration due to new freight trains

- From the results of interview survey, it was found that at present railway noise and vibration annoy considerably the local residents especially residents live near the railway line. Therefore, monitoring at residences near railway lines, probably within 50 m from the centre of the railway track shall be considered in addition to SRs when the DFC alignment is decided in details.
- Select appropriate monitoring sites amongst Sensitive Receptors and residences located alongside railway lines in the parallel sections and the detour sections and monitor ambient noise and vibration levels as well as railway noise and vibration levels. The monitoring shall be carried out during both daytime and night time at least two times per year.

b) River Water Quality Monitoring in Construction of Important Bridges

- Regarding the impacts to river water quality and soil caused by construction of the important bridges, baseline survey prior to the construction and monitoring during the construction should be conducted as an environmental monitoring activity.
- It is suggested to monitor turbidity and SS concentration (mg/l) of river water for a certain period after the construction at the same sites.

A sample of the Environmental Monitoring Plan for Thane District is summarized as shown in the following table. For the rest of districts, the Environmental Monitoring Plan is shown in the ESIMMS report for respective district.

Table 10-85 Environmental Monitoring Plan (ex. Thane district, Maharashtra)

Environment Component	Project Stage	Environmental Monitoring Programme			Institutional Responsibility	
		Parameters	Location	Frequency	Implementation	Supervision
Air Quality	Construction	SPM, RSPM, SO ₂ , NO _x	Wherever the contractor decides to locate the batch mix plant	Continuous 1 working day, once in every season except monsoon	Contractor through approved monitoring agency	EMU/ Supervision Consultants
		SPM, RSPM, SO ₂ , NO _x	4 locations – settlement area (near DFC alignment) of Dahanu, Boisar, Palghar & Gokhivare	Continuous 1 working day, once in every season except monsoon	Contractor through approved monitoring agency	EMU/ Supervision Consultants
	Operation	SPM, RSPM, SO ₂ , NO _x	4 locations – settlement area (near DFC alignment) of Dahanu, Boisar, Palghar & Gokhivare	Continuous 1 working day, once in every season except monsoon season for once in every three years	EMU	DFCCIL
Water Quality	Construction	See Note	At 6 locations: Surface water from 2 locations –Surya & Tungareshwar Rivers Ground water (Tube well) from Dahanu, Boisar, Palghar & Gokhivare	4 times a year (preferably in each season)	Contractor through approved monitoring agency	EMU/ Supervision Consultants
	Operation	See Note	At 2 locations: Surface water from Surya & Tungareshwar Rivers	Pre-monsoon & post-monsoon, once in every three years	EMU	DFCCIL
Noise & vibration Level	Construction	Noise level & vibration in dB(A)	At equipment yard	Once a year	Contractor through approved monitoring agency	EMU/ Supervision Consultants
		Noise level in dB(A)	4 locations – settlement area (near DFC alignment) of Dahanu, Boisar, Palghar & Gokhivare	Once a year	Contractor through approved monitoring agency	EMU/ Supervision Consultants
	Operation	Noise & vibration level in dB(A)	4 locations – settlement area (near DFC alignment) of Dahanu, Boisar, Palghar & Gokhivare	Once in every three years.	EMU	DFCCIL
Sediment	Construction	pH, Conductivity, Texture, Total OM, Total N, Na SAR, K, and Oil content	At 2 locations: Surai & Tungareshwar Rivers	Once in a year	Contractor through approved monitoring agency	EMU/ Supervision Consultants
Soil Erosion	Construction	Visual observation	Visual observation at high	Pre-monsoon and	Environmental	EMU/

Environment Component	Project Stage	Environmental Monitoring Programme			Institutional Responsibility	
		Parameters	Location	Frequency	Implementation	Supervision
		& turbidity	embankments & crossing of all rivers	post-monsoon season	Specialist, Hydrologist, and Material Specialist of Supervision Consultants	Supervision Consultants
Haul Road	Construction	Maintenance of haul roads	Haul roads & hauling mode	At least twice a day i.e. midday and evening	Environmental Specialist of Supervision Consultants and Contractor	EMU/ Supervision Consultants
Plantation	Construction	No. of railway side plantation	Along the detour route	Comparison should be done for every six months	Environmental Specialist of Supervision Consultants	EMU/ Supervision Consultants
	Operation	Growth of railway side plantation	Along the detour route	Assess growth every year for initial five years	EMU	DFCCIL
Borrow Area Management	Construction	Borrow areas redevelopment	Identified borrow areas	Once a week during	Environmental Specialist of Supervision Consultants and Contractor	EMU/ Supervision Consultants

Note: pH, BOD, COD, TDS, TSS, DO, Oil & Grease, Total hardness, Total alkalinity, Cl, SO₄, NO₃, PO₄, F, Na, K, Ca, Mg, Fe, Zn, and Heavy Metals like As, Cd, Cr, Se, Pb, Hg

10.10 INDIAN GOVERNMENT'S INVOLVEMENT IN ENVIRONMENTAL STUDY

10.10.1 EWG Meeting

(1) Fifth EWG Meeting

Fifth EWG meeting was held on 22 May, 2007. Since it is the first of this fiscal year's EWG meeting, JICA Study Team made a presentation on the result of ESCS at the IEE level of environmental study carried out between December 2006 and March 2007.

The JICA study team stated that ESIMMS works at the EIA level of environmental study began in mid May 2007. In relation to the field works for ESIMMS, JICA Study Team requested EWG to issue official letter for secondary data collection, field measurement of noise and vibration, and stakeholder/public consultation meeting to be carried out in each district directly affected by the Project. EWG promptly issued the requested letters to facilitate the works.

(2) Sixth EWG Meeting

Sixth EWG Meeting was held on 26th July 2007. DFCCIL's General Manager for Engineering formally invited to attend the meeting from this time of EWG Meeting.

The following discussions took place as academic advisors made comments on the result of IEE study:

- Criteria of selecting stakeholders are not clearly presented;
- All of the PAFs should be invited for the first stakeholder/public consultation meeting;
- It is not clear if the final alignment of DFC Project was presented, the way EIA study is carried out, how the contents of the framework of resettlement is set up, and the role of each stakeholder;
- It is not clear if “women in development project” is studied;
- There are no measures studied for low-income families; and
- There is no primary data collection for the socio-economic survey.

JICA team replied that most of the comments are appropriate to ESIMMS works. Thus final report would contain the answers to the comments of academic advisors.

(3) Seventh EWG Meeting

Seventh EWG meeting was held on 17th August 2007. Local consultants engaging ESIMMS for packages 1, 2 and 3 have made presentation of each study area highlighting salient and significant impact area of each study area. Contents of the presentation are reproduced as illustrated in the Section 10-3.

(4) Eighth EWG Meeting

Eighth EWG Meeting was held on 26th September 2007 inviting representatives of Min. of Agriculture, Min. of Urban Development and Min. of Civil Justice in addition to the regular members of EWG Meeting. The meeting was intended to discuss on the issues on land acquisition and compensation policy for DFC Project if suggestions made by JICA Study Team could be implemented with legal background of the prevailing laws and regulations of the Government of India. If not what arrangement should be considered to adapt in order to meet the requirement of the guideline of international lending agencies. Due to other commitment, no other ministries than MOR attended the meeting. The following was the result of discussion:

- 1) There have been strong oppositions against the Project stated by a number of districts in Gujarat. These districts demand final location survey and clear-cut commitment of land acquisition on market rate and compensation based on the replacement basis. Thus MOR/ DFCCIL is in the position to hold further stakeholder meeting in those districts for persuasion on the necessity of the Project and agreement with local population;
- 2) What are the contents of suggestions within JICA Study for those affected by the Project?
- 3) What are the measures on the noise and vibration caused by the trains to the general public living alongside the railway?
- 4) Suggestions made by JICA Study Team are not based on NRP-2003. Without legal basis, MOR will not be able to carry out any resettlement and rehabilitation plan;
- 5) JICA/JBIC Guidelines for the Environment and Social Considerations are the basis of the implementation of the Project. Thus MOR/DFCCIL should consider the policy on resettlement and rehabilitation plan over and above the prevailing laws and regulations of the Government of India.

10.10.2 Field Inspection by Academic Advisors

(1) Western Corridor

1) First Field Inspection

Three academic advisors of IIT-Roorkee who are members of the EWG took a trip to the following sensitive sites within the study area of Rajasthan and Northern Gujarat of Western Corridor in the beginning of June 2007:

- Social Environment Sensitive Area: Parallel section in Ajmer
- Natural Environment Sensitive Area: Balaram Ambaji Wildlife Reserve

2) Second Field Inspection

Second field trip took place in August 2007 for observing the sensitive area of Central Gujarat as follows:

- Social Environment Sensitive area: Parallel sections and detour sections in Ahmedabad, Bharuch and Surat
- Natural Environment Sensitive Area: Mahi River's riparian environment

There was a comment from one of the academic advisors that dissemination of information through Panchayat system would be effective in reaching the grass-root level of rural society.

(2) Eastern Corridor

Field inspection to the following areas in the Eastern Corridor was conducted in July 2007:

- Social Environment Sensitive Area: Detour section in Kanpur
- Environmentally Sensitive Area: Detour section in Etawah with respect to the sewage plant as DFC Project's alignment go across the place with a bridge.

One of the academic advisors made a comment that the sewage treatment plant in Etawah is one of the JBIC Projects. Its design capacity is comparatively small for the amount of sewage put-out by Etawah. Thus, no disruption to its capacity should be made and that the DFC Project detour route should avoid passing over the sewage treatment by bridge.

10.10.3 DFCCIL's Participation to Stakeholder/Public Consultation Meeting

During a series of meeting with DFCCIL in May to June 2007, DFCCIL agreed to send one of the DFCCIL staff to the third stage of stakeholder/public consultation meeting. As is shown in Table 10-86, organization of DFCCIL is growing up and local offices have been opened with 1-3 staff stationed in each local office.

Table 10-86 Branch Office of DFCCIL

No.	Area	Name	Designation
1	Vadodara	Mr. Subhash Gupta	General Manager
2	Rewari- Ajmer	Mr. Vinod Khera	General Manager
3	Ahmedabad	Mr. Asutosh Rankawat	General Manager
4	Mumbai	Mr. D.S. Rana	General Manager
5	Corporate (New Delhi)	Mr. S.K.Raina	General Manager
6	Corporate (New Delhi)	Mr. Rakesh Goyal	G.M. (Engineering)
7	Khurja-Kanpur	Mr. C.P.Gupta	General Manager
8	Ludhiana-Khurja	Mr. P.K.Goyal	General Manager
9	Allahabad-Sonnagar	Mr. Ashok Kumar	General Manager

DFCCIL stated that a staff of each local office will try to attend the 3rd Stage Stakeholder/Public Consultation Meeting (SHM) as much as possible. The person in charge of the section between Rewari and Ajmer has attended the SHM held in Jaipur and Mahendragarh.

10.11 SUGGESTIONS FOR IMPLEMENTATION OF THE ENVIRONMENT AND SOCIAL CONSIDERATIONS

10.11.1 Principle of Organizational Structure

It is important that DFCCIL play a central role when the matters of environmental and social considerations are dealt with. It is particularly significant that the DFC Project as one of the most important national level of infrastructure projects clearly exposes its face of the central organization and that the policy in dealing with the natural environment and socio-economic environment is a consolidated and the same from one state to the other.

DFCCIL is a responsible government agency hitherto unprecedented scale of the national project of railway development and that it is yet to be exposed to the environmental matters of the project funded by international funding agencies with which guidelines of the environmental concern is stricter than that of in India. Thus DFCCIL is requested to play an important role in every aspect of environmental issues, particularly planning and implementation of the resettlement and rehabilitation plan as well as land acquisition.

Since DFCCIL is an organization came into being during the past year, its business model as well as its organization has not been in its final stage. Its members, originally from MOR as well as from the existing Zonal Railways on Indian Railways, have not been exposed to the environmental issues studied during the feasibility study stage of railway development project. Thus it is particularly important to understand EIA level of study and its role for the planning of the Project design. Thereby appropriate terms of reference for resettlement and rehabilitation plan is aptly drawn without cost and time over-run. Thus the following principle is suggested:

- DFCCIL plays a central role in every aspect of the resettlement and rehabilitation plan for DFC Project and that it takes whole responsibility in coordinating among the central and local government in terms of the process of implementation of the resettlement and rehabilitation plan including the process of land acquisition as well as for the mitigation measures for the natural environment affected by the Project;
- Establish a unit dealing specifically with resettlement and rehabilitation plan, land acquisition and the natural environment within DFCCIL;
- Establish a committee in each district specifically dealing with the alignment of DFC Project based on the final location survey i.e. "District Committee for Examination of

- DFC Project Alignment” in order to obtain consensus among the PAFs;
- In order to achieve internationally accepted level of resettlement and rehabilitation plan, employ international consultant for supervision of the whole process of the environmental matters of the Project;
 - Employ an NGO experienced with resettlement and rehabilitation plan for drawing a detailed TOR of the resettlement and rehabilitation plan of DFC Project; and
 - Employ an NGO for every 3-5 districts directly affected by DFC Project for elaboration of micro-plan and inventory survey of the lost asset of PAFs and all other details of the Resettlement Action Plan including assisting the moving operation of the PAF and monitoring of them after the resettlement.

10.11.2 Suggested Policy of the Resettlement and Rehabilitation Plan of DFCCIL

DFCCIL is suggested to adopt the suggested policy on resettlement and rehabilitation plan, as shown in “Volume 4 Technical Working Paper Task 2, 10-(7)”, as a government enterprise dealing with internationally funded project. It is based mainly on the government enterprise of National Thermal Power Corporation of India. Although NRP-2006 has not been enacted formally as an Act of the Government of India to date yet, it would be sensible to establish DFCCIL’s resettlement policy based on NRP-2006 since it is in the parliament session. Thereby its approach would bridge between the guidelines on the environment and social consideration of international funding agencies and the administrative practice of the Government of India.

The concept of the suggested resettlement policy is to define PAFs as “Voluntary resettling families” and that they are the “Supporters” for the implementation of the Project with a better provision of the resettlement packages. Thereby no single PAF suffers from the resettlement arrangement made by DFCCIL.

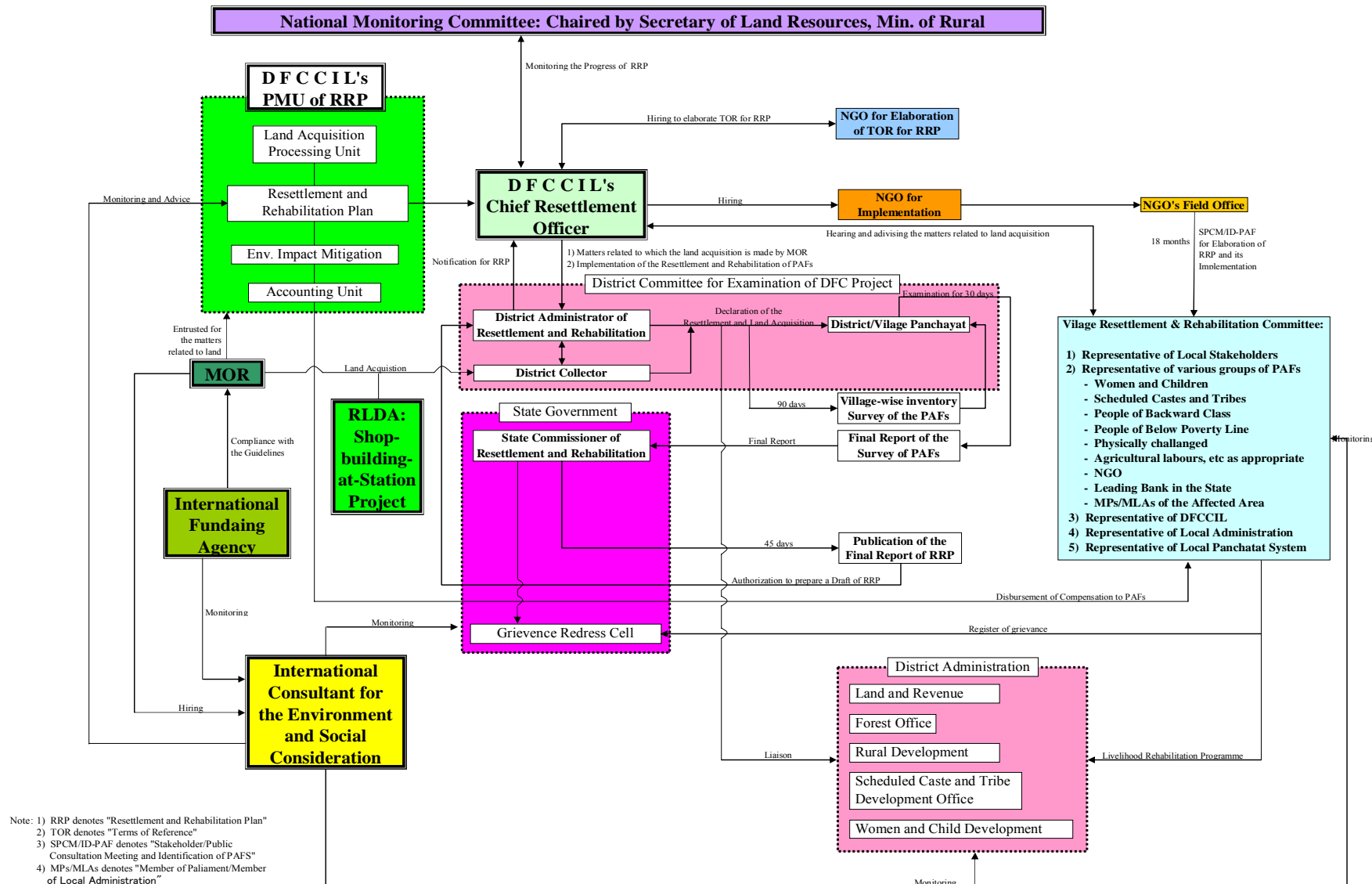
10.11.3 Suggested Organization for DFCCIL

(1) Project Management Unit

Figure 10-33 shows the entire mechanism of the implementation of resettlement and rehabilitation plan. Project Management Unit of Resettlement and Rehabilitation Plan (PMU of RRP) is suggested to establish in order to play a central role of the environmental issues of DFC Project and that it is a key factor for the successful implementation of the Project. PMU of RRP therefore takes initiatives and entire responsibility of the implementation of environmental issues related to DFC Project as follows:

- 1) Hold stakeholder/public consultation meeting and make presentation of the final design of the Project at district, sub-district, and Panchayat level as well as to the representative of each village’s PAFs directly affected by the Project;
- 2) Study the current market rate of compensation and land acquisition. Established appropriate method of calculation on the rate of each item subject to compensation. It is also suggested that “The more one has lower income the more one could receive higher rate of compensation” basis should be applied to those below the threshold of the poverty line;
- 3) Hold a series of stakeholder/public consultation meeting with the final location survey result and identify 100% of the PAFs
- 4) Sublet and supervise the works of inventory survey as follows;

- Supervise the works carried out by NGO in terms of elaborating TOR for RRP;
 - Conduct to inventory survey, by employing NGOs, of the loss of asset of the PAFs based on the prices determined by the District Collector; and
 - Negotiate with PAFs in terms of the agreement on the package of compensation and/or the price of land based on the replacement cost;
 - Supervise NGOs conducting to programme and suggest livelihood rehabilitation plan for the PAFs;
 - Supervise NGOs up-dating the list of PAFs and their inventory on the loss of asset; and
 - Supervise NGOs holding disseminating information on the Project.
- 5) Finalise RRP of each district and endorsement of it has to be obtained from the related government agencies;
 - 6) Elaborate to obtain necessary budget for RRP;
 - 7) Establish grievance redress system within the central and local government level;
 - 8) Conduct internal and external monitoring works related to RRP;
 - 9) Employ a third party organization for periodical external monitoring;
 - 10) Liaise with related ministries in terms of RRP and disseminate the information to the state government and district administration;
 - 11) Replacement basis of assessment on the compensation package for resettlement and land acquisition is the mandatory; and
 - 12) Coordinate between District Collector, State Government and MOR in terms of the compensation package and price of land based on the replacement cost.



Note: 1) RRP denotes "Resettlement and Rehabilitation Plan"
 2) TOR denotes "Terms of Reference"
 3) SPCM/ID-PAF denotes "Stakeholder/Public Consultation Meeting and Identification of PAFs"
 4) MPs/MLAs denotes "Member of Parliament/Member of Local Administration"
 5) PMU of RRP denotes "Project Management Unit of the Resettlement and Rehabilitation Plan"
 6) RLDA denotes "Railway Land Development Authority"

Figure 10-33 Suggested Mechanism of RRP

(2) Establishment of Supporting Units within DFCCIL

In order to support the functions of PMU for RRP, various sub-units as follows should be established:

- Sub-unit for Assessment of Asset of PAFs;
- Policy Making and Policy Criteria Study Sub-unit;
- Monitoring and Evaluation Sub-unit
- Information Dissemination and Public Consultation Sub-unit;
- Grievance Redress Sub-unit; and
- Budget and Treasury Sub-unit.

10.11.4 Organizing Local Bodies

(1) Village Resettlement and Rehabilitation Committee (VRRC)

It is imperative to organize PAFs and select representative among the PAFs in terms of coordination, negotiation, agreement and implementation of the resettlement and rehabilitation plan. During the 2nd and 3rd stage of stakeholder/public consultation meeting VRRC in most of the villages have been organized.

(2) District Committee for Examination of DFC Project

Since a number of Panchayats forms a district and that the views on the pros and cons of DFC Project are different from one village to the other, it is imperative to form an organization for discussing the alignment of DFC Project at district level. As soon as final location survey result is made available, the following members should form the committee:

- Representative of DFCCIL's local office;
- A member of State Commission for Resettlement and Rehabilitation;
- District Administrator of Resettlement and Rehabilitation;
- Representative of Panchayats;
- Representative of PAFs affected by the Project; and
- Members of NGOs active in the district.

With the above members, final alignment of DFC Project should be discussed among stakeholders and determined if the alignment is accepted. This has to take place before the detailed design works commence and that the alignment democratically discussed among stakeholders are final.

(3) State Resettlement and Rehabilitation Commission

State Resettlement and Rehabilitation Commission is the existing administrative body holding clear policy of resettlement and rehabilitation plan. DFCCIL plays an important role in terms of coordinating between the state and district in order to help smooth implementation of the land acquisition and the resettlement and rehabilitation plan.

10.11.5 Role of MOR

(1) Supporting Agency to the Local Government Organizations

In relation to the environmental issues, the role of MOR as a central government agency is to support DFCCIL as well as the state government and district administration directly

affected by the Project in terms of the smooth conduct of land acquisition and resettlement and rehabilitation of the PAFs. In principle, it has to be carried out within the jurisdiction of prevailing Indian laws and regulations.

On the other hand, guidelines imposed on the internationally funded project states that resettlement action plan should include supporting mechanism of the squatters directly affected by the Project. Such provision is normally not included in the prevailing laws and regulations. Although it is necessary, it might be time-consuming if request of changes on the prevailing laws and regulations was requested in order to meet the requirement of environmental guideline imposed by international funding agencies. However, MOR might play an important role for supporting the state government and district administration in terms of smooth conduct of the Project as follows:

- State government and District Collector are requested to work closely with DFCCIL in terms studying the market price of land and compensation for resettlement at most cooperation;
- Land acquisition and compensation for resettlement is agreed with individual PAF at the negotiation basis and that DFCCIL and district collector would meet together with PAFs;
- Confirm a Village Resettlement and Rehabilitation Committee (VRRC) is duly established in each village directly affected by the Project. It is the primary body that any claims should be registered and that it is solved at Panchayat level as much as possible with appropriate authorization backed up by the prevailing laws and regulations; and
- In the event that PAFs were not satisfied with the mediation at Panchayat level and that they would look for arbitration on the arrangement of resettlement to a higher level of authority, it is solved at state level, if not at district level, as much as possible with appropriate authorization backed up by the prevailing laws and regulations.

(2) Role of Parent Agency of the Government Enterprises

1) Cooperation between DFCCIL and RLDA

DFCCIL is a government agency playing a central role of the implementation of the Project while other government enterprises could work together with DFCCIL. One of the mitigation measures suggested within the framework of ESIMMS is to build shop building as station in order to house as many PAFs as possible who are running small shops around the railway stations at present while they lose their venue of business after the resettlement. Thus a project that could be termed as “Shop-building-at-station” using the surplus railway land around the existing railway stations on the parallel section of DFC Project could be made use of for shop building as much as possible. It is the Railway Land Development Authority (RLDA), which came into being in 2006, that could implement such project and that MOR plays a role of parent agency of the two.

2) Cooperation between Railway Enterprises and Municipal Corporation

It is further suggested that MOR would also play a role of central government agency when municipal corporations of major cities directly affected by the Project are consulted for provision of a small urban planning carried out for consolidation of the area around the railway stations affected by the Project.

10.11.6 Organization in Implementation of Project

Figure 10-34 shows a suggested organization during the implementation of the Project including the units working for the environment and social considerations. It is imperative to implement preparation works at the time of feasibility study to the detailed design stage of the Project. As soon as the land acquisition is complete, resettlement operation should commence. Thus the following organization is suggested to establish as soon as possible:

- Consultants for detailed design, bidding documents and construction supervision of the Project should provide personnel for socio-economic environment and natural environment;
- NGO experienced with planning and operation of the resettlement and rehabilitation plan in India should be employed for elaboration of TOR on the resettlement package of DFC Project;
- Based on the TOR for resettlement and rehabilitation plan, local NGOs who have adequate experiences and capability for implementing the resettlement and rehabilitation plan are employed and that each NGO is assigned a number of districts where DFC Project's railway line passes but not more than 200 km for implementation of the resettlement and rehabilitation action plan;
- A team of local consultants is assigned at each section of DFC Project implementation in collaboration with the detailed design team as well as to supervise NGOs implementing the resettlement and rehabilitation action plan;

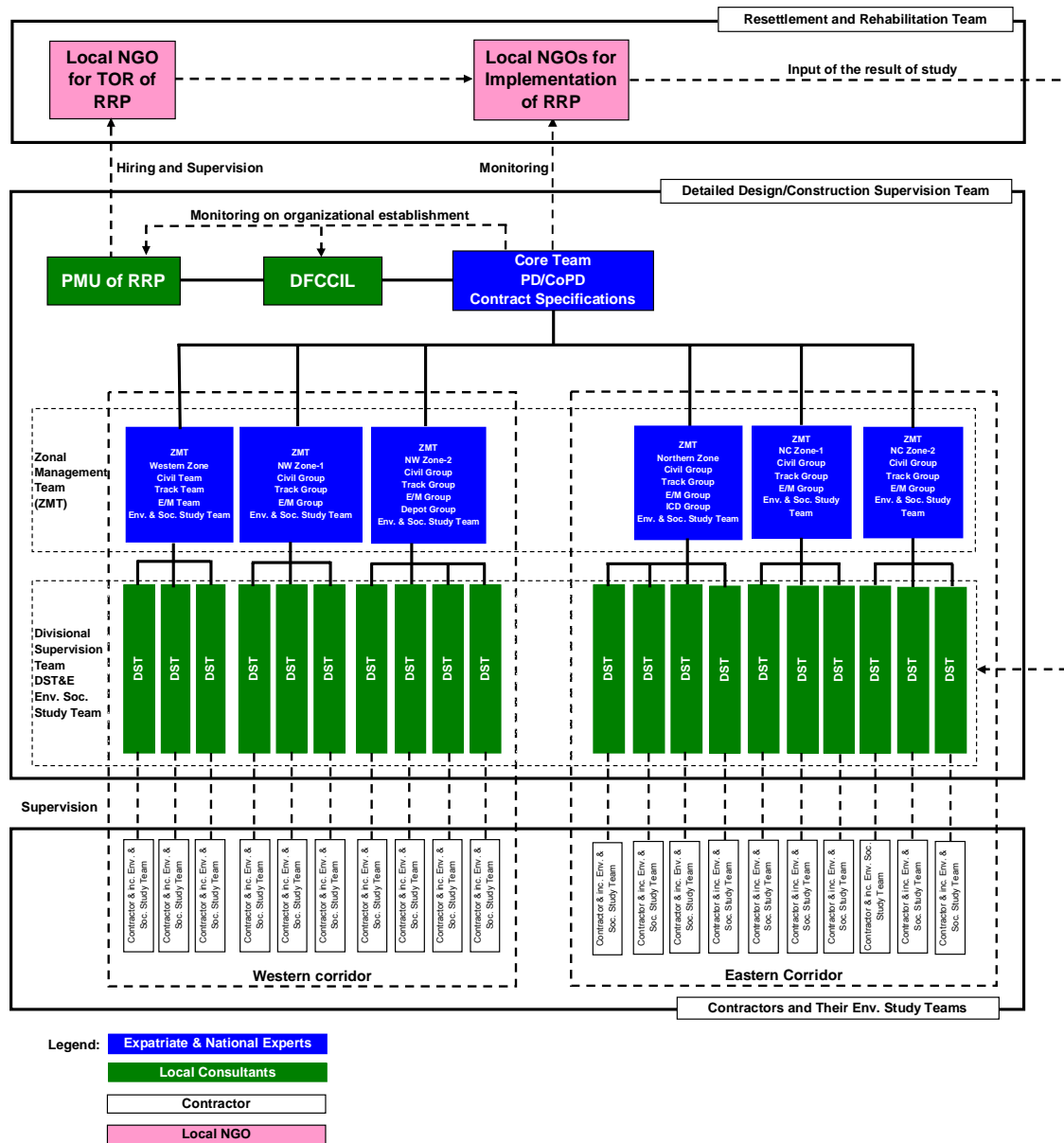


Figure 10-34 Organization of Supervision for Implementation of RRP

10.12 FURTHER STUDY ON THE ENVIRONMENT AND SOCIAL CONSIDERATIONS

10.12.1 Availability of the Final Alignment for the Stakeholders

As explained in the Section 10.1, the alignment of DFC Project has not been completed to date and its final location survey should take as soon as the final alignment is determined. Information available of environmental study has been that the centre line of the DFC Project is tentatively determined. Based on the information, latitude and longitude data have been obtained using Google Earth™ and GPS device. During the field survey, the following method is used:

- Each crossing point of DFC Project with local road is identified;
- Width of land acquisition for detour section of 43.5 m is identified on site;

- Width of 25 m from the existing track next to DFC Project is measured on site; and
- Affected structures and land areas are estimated.

As above, there has been no final location survey result was given for accurate information on the land acquisition and resettlement of the local residents. This is one of the reasons that the local residents are strongly opposing the Project. Thus as is explained in the following section that it is imperative to present the result of final location survey to the PAFs and discussion should take place at district basis for agreement of the alignment.

10.12.2 Result of Final Location Survey for Agreement with PAFs

(1) Western Corridor

- A detour section is considered to insert between Vasai Rd.–Vaitarna in Thane district of Maharashtra State. The length of the detour is approximately 16 km and 2-4 km to the east of existing. As soon as the final location survey is completed, including Sabarmati, Makarpur and Marwar as well as Rewari Junction Stations and associated connecting lines, local residents should be informed of the alignment and agreement should be reached among the PAFs and the local administrative bodies;
- There are a number of communities that are opposing detour routes or parallel sections depending on the local conditions. Final location survey result is necessary to present them and explain the technical and socio-economic reasons of the final alignment. Thereby final agreement is reached among the PAFs and the local administrative bodies; and
- As soon as the final location survey is completed, local administrative bodies should be informed of the alignment that it crosses over local roads, irrigation canals and the rivers. Thereby agreement is reached among the stakeholders of the Project.

(2) Eastern Corridor

- Detour section of Aligarh is in the process of reviewing as its southern portion goes through heavily populated area. As soon as the final location survey is completed, the PAFs and local administrative bodies should be informed of the alignment that it crosses over local roads, irrigation canals and the rivers. Thereby agreement is reached among the stakeholders of the Project.

(3) Borrow Areas

DFC Project passes through relatively flat area as a whole. While there are a number of detour sections with soil embankment, there are relatively few sections for cutting to provide materials forming embankment. There are also a number of areas for obtaining blanket material along the alignment of DFC Project. Thus a number of areas for borrow pits are necessary to develop while they are associated with adverse impacts on the natural environment. Further, there are a number of areas for obtaining aggregate for the bed of railway tracks as well as for concrete. These areas have not been identified to date. Thus as soon as the final location survey is completed cut and fill areas should be determined. Thereby appropriate area necessary for the material supply is determined hence the necessary areas and their distance from one borrow area to the other. It is the only after this work that the natural environment and social consideration study is carried out.

(4) Detailed Noise and Vibration Surveys

Detailed noise and vibration surveys should be conducted in the high populated area and SR sites in the further stage of the Project such as detailed design stage. Based on the survey, a

guidelines on necessary measures should be prepared to apply adequate measures throughout the project area.

10.13 CONCLUSION AND RECOMMENDATIONS

(1) Implementation of Environmental and Social Considerations under Responsibility of MOR and DFCCIL

Environmental and social considerations for the DFC project should be conducted with initiative of Indian Government in principle. However, comprehensive examinations on environmental and social considerations for the railway development have not so far been carried out by the Indian Government from the planning stage of the development since there is no provision of the Environmental Impact Assessment (EIA) for railway development under the Indian laws and regulations.

Adequate environmental and social considerations are mandatory in the case where the DFC Project is applied for the fund of donors such as JBIC, ADB and the World Bank. Therefore, in addition to the environmental and social considerations under the JICA Environmental Guidelines, various examinations and recommendations, which are required to be conducted by the Indian side in implementation of the DFC project, were made in the Study from viewpoints of possibility of fund by international donors. Thereby Indian Government should understand the extent of environmental and social considerations necessary to carry out in accordance with requirements of international donors' funded project. Based on the recommendations in the Study, it is expected that the Indian side implement recommended actions for the DFC project as earlier as possible with well understanding institutional framework for implementation of adequate environmental and social considerations for the DFC project.

(2) Adequate Implementation of Measures on Land Acquisition and Involuntary Resettlement

Railway route for the DFC project was basically designed with detouring urban area to avoid large-scale involuntary resettlement. On the other, since most of the detour routes pass through the existing farm area, acquisition of farm land and farmers' relocation will be occurred. In addition, relocation of illegal occupants or squatters who presently resides in and around the railway stations will also be subject to the relocation due to improvement of the station under the DFC project.

In a railway section between Vasai Road and Rewari, where is subject to the ESIMMS in the Western Corridor, while there are many and long detour sections passing through the farm area, some 1,300 structures are subject to the relocation with involuntary resettlement at both detour and parallel sections in total. On the other, in a railway section between Mughal Sarai and Dadri, where is subject to the ESIMMS in the Eastern Corridor, there are some sections where can not avoid to pass through urban area even in the detour route. As result, some 2,300 structures are subject to the relocation with involuntary resettlement at both detour and parallel sections in total. After finalization of the DFC routes, detailed resettlement and rehabilitation plans have to be prepared at district level with detailed inventory for the resettlers.

In the railway section subject to the ESIMMS in the Western Corridor, some 500 squatters who depend on railway station on their living and reside within impact range of construction for the DFC project, are seen along the DFC sections in total, especially in southern part of the Surat section. Appropriate support for the squatters will be one of crucial issues in the

resettlement and rehabilitation plan. Likewise, over 200 squatters will be subject to the resettlement in the Eastern Corridor in total.

In addition, impact to livelihood for farmers caused by the farm land acquisition will be expected to occur in the detour sections in Haryana, South part of Gujarat, and Maharashtra in the Western Corridor, and Uttar Pradesh in the Eastern Corridor. Since some affected farmers may face difficulty to purchase alternative farm land near their farm land due to lack of available land, the DFC project should support for such farmers to find alternative farm land, not only provide farm land compensation at replacement cost in cash, from viewpoint of livelihood recovery for the affected people.

(3) Implementation of Mitigation Measure and Environmental/Social Monitoring

In order to implement measures on environmental and social considerations adequately, environmental management has to be implemented in the pre-construction and construction phases based on the Environmental Management Plan (EMaP) proposed in the Study with implementing body and methods. In operation phase of the DFC project, effects of the measures including status of livelihood recovery of the project-affected people due to land acquisition and involuntary resettlement has to be monitored based on the Environmental Monitoring Plan (EMoP) proposed in the Study as well as establishing implementing body to implement necessary feedback actions based on the monitoring results.

(4) Continuous Implementation of Public Consultation Process after the Study

Stakeholders/Public Consultation Meetings (SHMs) were held during the Study. First Stage SHM was conducted between January and February 2007 at ten states along the whole DFC project area. Second and Third Stage SHMs were held between June and July 2007 and between August and September 2007, respectively, at 37 districts along the priority DFC project area. In addition, village-level meetings were held between the Second and Third Stage SHMs. In the end of the JICA Study, a central level stakeholder/public consultation meeting was held on 28th September to disseminate the results of ESIMMS to the stakeholders and the public. In the initial stage of the SHMs, though MOR as project proponent did not participate in the SHMs, the DFCCIL personnel were participated in the several SHMs in the Third Stage SHM after regional officers of DFCCIL were appointed.

Some objections to the Project were raised by local peoples in the SHMs conducted in the Study. By taking this fact into consideration, MOR/DFCCIL should make their efforts to obtain consensus to the Project from the stakeholders including project-affected peoples. In addition, the ESIMMS reports prepared in the Study should be opened to the public and obtain opinions from the public prior to the governmental approval of the reports.