Environmental and Social Impact Mitigation Measures Study (ESIMMS) of the DFC Project

Final Report

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LIST OF ABBREVIATIONS

AAQ	:	Ambient Air Quality
ADB	:	Asian Development Bank
AF _s	:	Affected Families
AIDS	:	Acquired Immunodeficiency Syndrome
ASI	:	Archaeological Survey of India
ASR	:	Ambient Noise & Vibration Measurement at Sensitive Receptors
BIS	:	Bureau of Indian Standard
BOD	:	Biological Oxygen Demand
сс	:	Cubic Centimeter
CF	:	Conservator of Forest
Cl	:	Chlorine
CO	:	Carbon Monoxide
CPCB	:	Central Pollution Control Board
CPRs	:	Common Property Resources
CS	:	Construction Supervision
CWC	:	Central Water Commission, India
dB	:	Decibel
DFC	:	Dedicated Freight Corridor
DFCCIL	:	Dedicated Freight Corridor Corporation of India Limited
DFO	:	Divisional Forest Offices
DO	:	Dissolve Oxygen
DPR	:	Detailed Project Report
DR	:	Detailed Railway
EA	:	Environmental Assessment
EAC	:	Expert Appraisal Committee
EIA	•	Environment Impact Assessment
EMAP		-
	:	Environmental Management Action Plan
EMP	:	Environment Management Plan
EMU	:	Environment Management Unit
ESIMMS	:	Environmental and Social Impact Mitigation Measure Study
EWG	:	Environmental Working Group
Fe	:	Iron (Ferrum)
GOI	:	Government of India
Hg	:	Mercury (Hydrargyrum)
HIV	:	Human Immunodeficiency Virus
ICD _S	:	Inland Container Depot
IS	:	Indian Standard
JARTS	:	Japan Railway Technical Services
JBIC	:	Japan Bank for International Cooperation
JICA	:	Japan International Cooperation Agency
JIS	:	Japanese International Standard
K	:	Potassium (Kalium)
LA	:	Land Acquisition
LA Act	:	Land Acquisition Act
LA_E	:	Exposure Noise Level
LAeq	:	Equivalent Noise Level
LPG	:	Liquefied Petroleum Gas
MLA	:	Member of Legislative Assembly
MOEF	:	Ministry of Environment and Forest

MP	:	Member of Parliament
MOR	:	Ministry of Railway
N	:	Nitrogen
Na	:	Sodium (Natrium)
NEP	:	National Environmental Policy
NGO	:	Non Government Organization
NK	:	Nippon Koei Co.Ltd.
NOx	:	Oxides of Nitrogen
NPRR	:	National Policy on Resettlement and Rehabilitation
NRCP	:	National River Conservation Plan
NRP	:	National Rehabilitation Policy
NTH	:	Non Titleholder
ОМ	:	Organic Matter
OP	:	Operational Policy
PAFs	:	Project Affected Families
PAPs	:	Project Affected Person
Pb	:	Lead (Plumbum)
PCCF	:	Principal Conservator of Forest
PCI	:	Pacific Consultants International
PCM	:	Public Consultation Meeting
PDA	:	Passenger Diesel A (Plain Route) Train
PIU	:	Project Implementation Unit
PUC	:	Pollution Under Control Certificate
RAP	:	Resettlement Action Plan
ROB	:	Railway Over Bridge
ROW	:	Right of Way
RPM	:	Respiratory Particulate Matter
R&R	:	Resettlement & Rehabilitation
RRP	:	Resettlement and Rehabilitation Plan
RS	:	Railway Station
RUB	:	Railway Under Bridge
SAR	:	Sodium Absorption Ratio
SC	:	Scheduled Caste
SDOE	:	State Department of Environment
SEIAA	:	State Environment Impact Assessment Authority
SGRY	:	Sampoorna Grammeen Rojgar Yojna
SHM	:	Stakeholder Meeting
SIA	:	Social Impact Assessment
SOx	:	Oxides of Sulphur
SPCB	:	State Pollution Control Board
SPM	:	Suspended Particulate Matter
SR	:	Sensitive Receptor
ST	:	Scheduled Tribe
TH	:	Title Holder
TOR	:	Term of Reference
VRC	:	Village Rehabilitation Committee
WB	:	World Bank
WHH	:	Women Headed Households
WHO	:	World Health Organization
WLS	:	Wild Life Sanctuaries
Zn	:	Zinc

CHAPTER 1 INTRODUCTION

1.1 BACKGROUND

Indian Railways, the prime movers of the nation, have the distinction of being one of the largest railway systems in the world under a single management. Its contribution to the nation's progress is immeasurable and it has a dual role to play as a commercial organization as well as a vehicle for fulfillment of aspirations of the society at large. It is an important catalyst to growth of trade, industry and the economy as a whole, with immense potential for providing indirect employment. Considering this, Indian Government attaches the highest priority to the development and expansion of railway infrastructure. The Golden Quadrilateral and diagonals of the railway system are heavily congested routes and strengthening/widening of these routes has been taken up as part of National Rail Vikas Yojana. Surveys and construction of gauge conversion and new lines have been undertaken with a view to provide alternate routes to decongest the heavily utilized ones. Delhi-Mumbai and Delhi-Howrah stretches of Quadrilateral railway system have been identified as heavily congested routes and need to be decongested on priority basis.

In view of this, on the request of Ministry of Railways (MOR), Japan International Cooperation Agency (JICA) has conducted the feasibility study for the "The Development of Dedicated Multimodal High Axle Load Freight Corridor with computerized Control for Delhi-Mumbai and Delhi-Howrah in India (JICA F/S)". Objective of JICA F/S was to review the PETS and Final Location Survey (FLS) of the Dedicated Freight Corridor (DFC) Project that was supposed to be prepared by the GOI. However, since the FLS could not be available during JICA F/S, Guideline Design (GLD) and General Arrangement Drawings (GAD) have been proposed for the preparation of FLS for both Eastern and Western Corridors during JICA F/S.

The Environmental and Social Considerations Study (ESCS), which was equivalent to Initial Environmental Examination (IEE) level study, was conducted from November 2006 to March 2007 in the First Year of JICA F/S. In the Second Year of JICA F/S, Environmental and Social Impact Mitigation Measures Study (ESIMMS), which is equivalent to Environmental Impact Assessment (EIA) level study, has been conducted base on GLD and GAD covering the development stage sections between Rewari, Haryana and Vasai Road, Maharashtra (approx. 1,262 km) for the Western Corridor and between Dadri and Mughal Sarai, Uttar Pradesh (approx. 756 km) for the Eastern Corridor. The overall study area of ESIMMS is shown in Figure 1-1.

For the Western Corridor, ESIMMS has been conducted for the DFC route from Rewari to JNPT Mumbai which includes 2 districts of Haryana, 7 districts of Rajasthan, 12 districts of Gujarat and 1 district of Maharashtra. However, this ESIMMS report elaborates environmental and social impact mitigation measures for the DFC route in Gujarat state upto Vadodara. The districts covered in this ESIMMS are Banaskantha, Patan, Mahesana, Gandhinagar, Ahmedabad, Kheda, Anand and Vadodara.

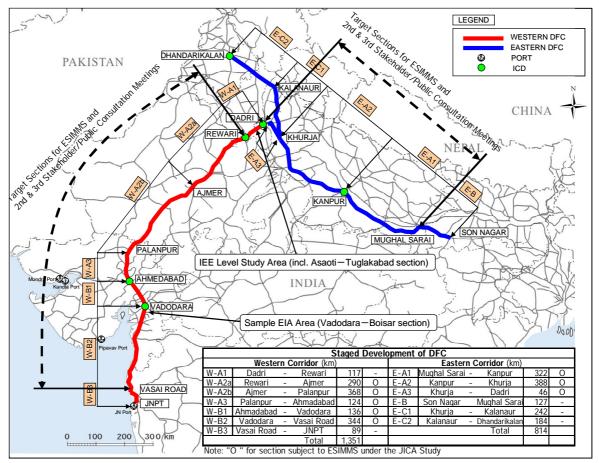


Figure 1-1 Overall Study Area of ESIMMS

1.2 OBJECTIVE OF ESIMMS

The specific objective of ESIMMS is to ensure that potential problems are foreseen and addressed at an early stage in the project's planning and design. Design, execution and operation of the project can be planned in the light of the findings of this ESIMSS, so that the expected benefits from the DFC project can be sustained with minimum and acceptable adverse environmental impacts. The main objectives of ESIMMS are given below:

- Identification of the project activities likely to cause potential significant impacts on the environment.
- Identification of the extent of environmental impacts caused by DFC Project activities to the environment.
- Prediction and analysis of intensity and nature of impacts whether they are permanent or temporary, cumulative, and/or irreversible.
- Consultation with the general public as well as those concerned with the DFC Project, which are ranging from the central and local government organizations to commercial and industrial sectors of the society as a whole by holding a series of stakeholder/public consultation meetings (PCMs). The broad objective of PCMs and its proper documentation is to verify opinions of the general public and other stakeholders that could be affected by the DFC Project.

1.3 SCOPE OF ESIMMS

In ESCS which was mainly conducted based on the collected secondary data as IEE level study, the major environmental and social consideration items were identified. Based on the results of ESCS, further EIA level study has been required for the following components.

(1) Natural Environment

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) **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 selected SRs. In addition, 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 and other components shall be conducted. The mitigation measures shall be proposed based on the analysis of the collected data.

(3) Social Environment

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

(4) Stakeholder/Public Consultation Meetings

- 1) The 2nd Stage PCM was planned to be conducted at each district to be directly affected by the DFC Project.
- 2) Targeted PCM participants shall be representatives of Panchayats, villages and towns.
- 3) After the 2nd Stage PCM participated representatives of Panchayats, villages and towns shall disseminate the information obtained from the PCM 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.
- 4) In the 3rd Stage PCM, 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 RRP Framework shall be agreed by the participants of the 3rd Stage PCM.

¹ 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.

(5) Formulation of the Resettlement and Plan Framework

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

(6) Environmental Management Plan (EMAP) and Environmental Monitoring Plan (EMOP)

EMAP and EMOP for construction of relevant railway facilities of each district shall be prepared.

Scope of ESIMMS as EIA level study has been elaborated in a well defined manner in Terms of Reference (TOR) as Technical Working Paper as part of JICA F/S. As per the TOR, major issues to be covered are summarized under four major heads as the details of major four components are discussed below:

- 1) Natural Environment Impact Assessment Study
- 2) Pollution Control Study
- 3) Social Impact Assessment Study
- 4) Stakeholder/Public Consultation Meeting
- 1) Natural Environment Impact Assessment Study

The significant environmental issues, particularly ecologically sensitive areas on natural environmental components such as topography, geology, soil, climate, land use, water bodies, and ecology etc. likely to be impacted due to proposed activities of DFC, were identified and a suitable and effective environmental management and monitoring plan to mitigate negative impacts and enhance positive impacts was prepared. Monitoring Plan was elaborated for construction period as well as spanning over 3-5 years covering locations sensitive to other pollution aspects as well as areas covering protected areas, wildlife sanctuary, eco-sensitive along DFC alignment. Effective and feasible measures were identified and elaborated necessary to take in order to mitigate, reduce, rectify or compensate adverse impacts caused by the project to the areas subject to protection of forest, wildlife, or any other species of fauna and flora and eco-sensitive areas. Baseline status of natural environmental components was prepared based on reconnaissance environmental survey and secondary data available. Detailed field survey was carried out to substantiate the findings focusing on forestry and railway side plantation using quadrate survey representing each forest by three minimum plots with size 10 m x 10 m. This was further supported by interview survey with relevant expert and local residents covering confirmation of the present situation in flora and fauna including avifauna.

2) Pollution Control Survey

The current status of water quality in rivers, air quality, noise, vibration along the proposed alignment was grasped based on mainly secondary data supported with reconnaissance field survey. Primary survey was carried out for ambient and railway noise and vibration including its attenuation at the selected sensitive receptors near proposed DFC alignment. Interview survey on noise and vibration with local residents living along the existing railway side at each monitoring location using suitable questionnaire was conducted so as to record the

surrounding land use and other activities as well as to get the feedback from the local people. Noise and vibration levels were predicted and evaluated.

3) Social Impact Assessment Study

Baseline regional socio-economic status such as demographic features, social stratification, occupational pattern, land holdings, cultural aspects was prepared using secondary data. No of Project Affected Families (PAFs) and its respective locations were identified in each district where resettlement of local people is necessary. Socio-economic primary survey on 10% of the population directly affected by the project in the respective district was conducted using a suitable questionnaire where construction of detours, junction/crossing stations, bridges, and other railway facilities so as to reflect baseline socio-economic status of PAFs. Based on the findings of socio-economic survey and extensive stakeholder/public consultation meetings, a Resettlement and Rehabilitation Plan (RRP) was elaborated for titled PAFs, non-titled PAFs, scheduled caste and tribes based on the provision of draft National Rehabilitation Policy, 2006. Social environment monitoring plan spanning 3-5 years was elaborated for PAFs after resettlement and R & R activities in a village or in a hamlet formed by bi-secting or fragmented by construction of DFC facilities.

4) Stakeholder/Public Consultation Meetings

Integrating valuable feedback from stakeholders from the conceptualizing and planning stage of the project has been recognized as important activities as part of EIA level study. In line with this, three rounds of PCMs have been planned in JICA F/S. The first round PCMs were hold in February 2007 during the First Year of JICA F/S, while the second and third rounds of PCMs have been conducted as part of ESIMMS. These two rounds of PCMs have been conducted in each project district. The key objective of second round consultation is to verify opinions of the general public that would be affected by the proposed alignment of DFC Project and elaborate with the PAFs a general framework of RRP. The key objective of third round consultation was to reach general agreement in principle with the identified PAFs in terms of the contents of RRP. During PCMs, a questionnaire is used to collect important feedback from all participants. Information on the DFC project as well as the record of the first round PCMs was disseminated through feedback meeting with head of each directly affected panchayat organization. All meeting proceedings were properly documented.

1.4 STUDY AREA

The project corridor which is covered by this ESIMMS starts from Aawal (Banaskantha District of Gujarat) and ends at Itola (Vadodara district of Gujarat). The area of this ESIMMS included 7 districts namely Banaskantha, Patan, Mahesana, Gandhinagar, Ahmedabad, Kheda, Anand and Vadodara consisting of 187 potentially affected villages by the DFC project.

District	No. of Villages Potentially Affected by the Project
Banaskantha	38
Patan	6
Mahesana	41
Gandhinagar	13
Ahmedabad	17
Kheda	34
Anand	11
Vadodara	27
Sub-total	187

Table 1-1 District and Village to be Covered by ESIMMS in Gujarat

CHAPTER 2 APPLICABLE GUIDELINES, POLICIES AND LAWS

2.1 APPLICABLE NATIONAL POLICIES AND REGULATIONS

This chapter describes applicable guidelines, policies and laws at national and international levels that ensure certain level of quality in the infrastructure projects for ensuring sustainable development. The objective is that the railway project should not lead to major ecological or other losses to the country and the people that could nullify the otherwise immediately available project benefits. The various regulations apply to the design (project preparation stage), construction (implementation stage) and post project stage (operational stage) are provided in details in this chapter.

The primary responsibility of administration and implementation of the GOI's policy with respect to environmental management, conservation, ecologically sustainable development, and pollution control rests with the Ministry of Environment and Forests (MoEF). The MoEF has agencies and institutions to implement the environmental polices such as:

- **Central Pollution Control Board (CPCB):** It is a statutory authority attached to Ministry of Environment and Forests (MoEF),
- **MoEF Regional Offices:** The country is divided into several regions, with each region having a Regional Office,
- State Pollution Control Board (SPCB): These play the role in environmental management at the state level, with emphasis on air and water qualities, and
- **State Department of Environment and Forests:** These perform function similar to MoEF only at the state level.

2.2 APPLICABLE REGULATIONS

List of all most important applicable GOI regulations are summarized in Table 2-1 below.

Applicable Policies & Regulations	Year	Objective	Applicability	
Environment (Protection) Act	1986	To protect and improve over-all		
		environment	in general	
Environment Impact	1994	Requirement of Environmental	Direct	
Assessment (EIA) Notification		Impact Assessment		
Air (Prevention and Control of	1974	To control air pollution by	Control of air	
Pollution) Act		controlling emission and air	pollution	
		pollutants according to prescribed	-	
		standards		
Water (Prevention and Control	1974	To control water pollution by	Control of Water	
of Pollution)		controlling emission and water		
,		pollutants according to prescribed		
		standards		
Indian Forest Act	1927	Protection and management of	Forests	
		forests		
Forest (Conservation) Act	1980	To regulate the conversion of	Forests	
		forests for non-forestry purposes		
The Wildlife (Protection) Act	1972	Protection of wildlife	Wildlife	
Ancient Monuments and	1958	Conservation of Cultural and	Archaeological	
Archaeological sites &		Historical Remains found in India	Remains	

 Table 2-1
 Summary of Applicable Regulations

Applicable Policies & Regulations	Year	Objective	Applicability	
Remains Act				
Land Acquisition Act	1894 & 1989	Set out rule for Acquisition of land by Government	Land acquisition	
Noise Pollution (Regulation and Control) Rules, 2000	2001	Noise pollution regulation and controls	Control of Noise pollution	
Public Liability Insurance Act	1991	Assessment of Hazardous materials and accidents hazards	Health and safety	
Biological Diversity Act	2002	Control of access to biodiversity	Biodiversity	
EIA Notification	2006	For environmental impact assessment of major development projects	Environmental clearance	
International environmental treaties to which India is a Party, such as Convention on Biological Diversity, Ramsar Convention on Wetlands, Bonn Convention on Migratory Species, UN Framework Convention on Climate Change and its Kyoto Protocol,, etc		1	Environmental protection	

Source: www.envfor.nic.in

The following sections elaborate relevant acts in the context of this project.

2.2.1 Environment Protection Act, 1986

The Environment Protection Act 1986 is an umbrella act providing for the protection and improvement of environment and for matters connected therewith. This act authorizes the central government to intervene directly in order to protect the environment and also allows public interest litigation for the same purpose. In terms of responsibilities, this Act and the associated Rules require obtaining environmental clearances for specific type of new/expansion projects addressed under EIA notification. Environmental clearance is not applicable for Railway Projects in India. Since Railway is one of the most environmental friendly mode of transport and basically non polluting in nature and do not involve any disposal of solid waste, effluents and hazardous substances on land, air and water, so limited requirements of Environmental (Protection) Act, 1986 are applicable particularly during construction stage of project.

2.2.2 EIA Notification in India

This is the Indian Government's guidelines for environmental impact assessment governing all of the development interventions that takes place within the boundaries of India. EIA notification was issued by Ministry of Environment and Forests (MoEF) in 1994 and later amended in 2002. Purpose of this was to impose restrictions and prohibitions on the expansion and modernization of any activity or new projects as specified in Schedule 1 in any part of India unless environmental clearance has been accorded by the Central Government or State Government in accordance with the procedure specified in the notification. The EIA notification was revised and notified on September 14, 2006 in order to make the EIA process more transparent and effective.

According to new latest gazette notification, there are two categories of projects via, category A and Category B. Category A will be cleared by the Ministry of Environment and forests at central level (Expert Appraisal Committee or EAC constituted by MOEF)) and the category B project will be cleared by the State Environmental Impact Assessment authority (SEIAA)

constituted by MoEF at State level. If there is no State level authority constituted, all categories of projects as spelt out in Schedule 1 would be dealt at central level.

The objective of the notification is:

- To formulate a transparent, decentralized and efficient regulatory mechanism to:
- Incorporate necessary environmental safeguards at planning stage
- Involve stakeholders in the public consultation process
- Identify developmental projects based on impact potential instead of the investment criteria

Differences between EIA Notifications, 1994 & 2006

- Public consultation structured; to be conducted by SPCB and presided by DM (within 45 days); proceedings to be videographed; MOEF to intervene if Public Hearing not held in time
- Time limits with consequences at each stage
- State Environment Impact Assessment Authority (SEIAA) at the state level and Expert Appraisal Committee (EAC) at central level

According to latest EIA notification, Railway and Bridge construction projects do not appear in the list of Schedule 1 and as such, are exempted from the Environmental Clearance.

2.2.3 Forest Conservation Act, 1980

This Act provides for the conservation of forests and regulating diversion of forestlands for non-forestry purposes. When any projects falls within forestlands, prior clearance is required from relevant authorities under the Forest (Conservation) Act, 1980. State governments cannot de-reserve any forestland or authorize its use for any non-forest purposes without approval from the Central government.

Applicability of Forest Conservation Act to Railway side Strip Plantations

In 1986, when MOEF enacted the Environmental Protection Act, the entire linear stretches of roadside, railway line and canal plantations were declared as protected forests. The February 18, 1998 MOEF circular on linear plantations on roadsides, canal and railway lines modified the applicability of provisions of Forest (Conservation) Act, 1980 to linear plantations. The new modification recognizes that the spirit behind the Forest (Conservation) Act was conservation of natural forests and not strips plantations. In the case of the "notified to be protected" railway side plantations, the clearance may be given by the concerned regional office of the MOEF, irrespective of the area of plantation lost. While issuing the approval, in place of normal provision for compensatory afforestation, the regional offices will stipulate a condition that for every tree removed at least two trees should be planted. If the concerned Regional office does not issue the decision within thirty days of the receipt of fully completed application, the project proponent may proceed with widening/expansion under intimation to the State Forest Department and the MOEF.

Central Rules, Guidelines and Acts related to forest are listed in Table 2-2.

Area/ Sector	Туре	Level of Control	
Forestry/ Forest	Acts	Govt. of India and	
Conservation	• Forest (Conservation) Act, 1980, amended 1988.	All State	
	 The Indian Forest Act, 1927. 	Government	
	State/Union Territory Minor Forest Produce		
	(Ownership of Forest Dependent Community)		
	Act, 2005 – Draft.		
	Rules	Govt. of India and	
	 Forest (Conservation) Rules, 2003. 	All State	
	• Forest (Conservation) Rules, 1981, amended	Government	
	1992.		
	Guide Lines	Govt. of India and	
	No.5-5/86-FC, [25/11/1994] – Guidelines for	All State	
	diversion of forest lands for non-forest purpose	Government	
	under the Forest (Conservation) Act, 1980.		

Table 2-2 Laws Relevant to Forestry

Source: <u>www.envfor.nic.in</u>

Definition of various forest related terminologies used in this report are provided below.

Term	Definition				
Forest	General term used to indicate all categories of forest reserves				
Reserved Forest	The reserved forests are those forests where all settlement of				
	rights has been completed. The Reserve Forests are always				
	notified and everything is prohibited in these forests except				
	is listed in the notification. (Chapter II of Forest Act) Most				
	protected forest category.				
Protected Forest	In the case of Protected Forests all activities listed are allowed				
	except what is not listed. (Chapter IV of Forest Act)				
Demarcated PF	Demarcation of all legal verification has been complete. Legally				
	protected				
Un demarcated PF	Demarcation of all legal verification not complete. Legally				
	protected				
Unclassified Forests	Forest areas (govt land) not notified as RF or PF (or Village				
	Forest). This is not a legal category of forests, but managed by				
	State Forest Departments.				
Wildlife Sanctuaries	Strictly protected natural habitats designated as per section 18 of				
	the Wildlife Protection Act.				
National parks	Critical wildlife habitats designated as per section 35 of the				
	Wildlife Protection Act. Stricter protective regulations than for				
	Sanctuary.				
Others (like cantonment	These are forest areas raised, conserved and protected by Military				
and municipal forests)	and municipal authorities. No major ecological significance but				
	protected.				
Sensitive ecosystem	Ecosystem that is significantly biodiverse, often comprising of				
	keystone species, and is vulnerable to external interventions.				
	Perturberations due to development activities can impair the				
	ecosystem and the natural processes therein.				

 Table 2-3
 Forest Terminologies

(Sources: relevant laws, etc)

In Banaskantha district of Gujarat State, the DFC alignment is passing through Reserved Forest at three locations. It is estimated that, about 13 hectares of forest land is to be diverted

for the use as ROW for construction of new track in detour section. Therefore, Forest Clearance from the Gujarat State Forest Department will be required in Banaskantha District.

2.2.4 Biological Diversity Act, 2002

To provide for conservation of biological diversity, sustainable use of its components and fair and equitable sharing of benefits arising out of the use of biological resources and knowledge, a convention, the United Nations Convention on Biological Diversity was formulated in 1992. India being a Party to the said Convention enacted the Biological Diversity Act in 2002 and it came onto force on 5th February 2003. The rules and orders issued under the Act on Biodiversity are given in Table 2-4.

Area /Sector	Туре	Level of Control
Biodiversity	Biological Diversity Act, 2002.	Govt. of India and All
	 NO. 18 of 2003, [5/2/2003] - The Biological Diversity Act, 2002. S.O.753 (E), [01/07/2004]- Coming in to force of 	
	sections of the Biodiversity Act, 2002.S.O.497 (E), [15/04/2004]- Appointment of non-	
	official members on NBA from 1st October, 2003. S.O.1147 (E)- Establishment of National	
	 Biodiversity Authority from 1st October, 2003. S.O.1146 (E)- Bringing into force Sections 1 and 	
	2; Sections 8 to 17; Sections 48,54,59,62,63,64 and 65 w.e.f. 1st October, 2003.	
	Rules	Govt. of India and All
	 G.S.R.261 (E), [15/04/2004] - Biological Diversity Rules, 2004. 	State Government

Table 2-4 Laws on Biodiversity

Source: www.envfor.nic.in

As per the provision of the Act certain areas which are rich in biodiversity and encompasses unique and representative ecosystems are to be identified and designated as biodiversity heritage sites facilitate their conservation. However, no site has been established in the country so far.

2.2.5 Wildlife Protection Act, 1972

The first comprehensive legislation relating to protection of wild life was passed by the Parliament and it was assented by the President on 9th September, 1972 and came to be known as The Wild life (Protection) Act, 1972 (53 of 1972). This law has given special importance for the protection of specified plants, control/ prohibition of trade or commerce in wild animals, animal article and trophies and hunting of animals, declaration of sanctuaries, national parks and closed areas etc.

Area /Sector	Туре	Level of Control
Wild life	Acts The Wildlife (Protection) Act, 1972 (amended in 1993 and 2002.)	Govt. of India and All State Government
	Rules	Govt. of India and Al
	 S.O.1092 (E), [22/9/2003] - The National Board for Wild Life Rules, 2003. 	
	 S.O.445 (E), [18/4/2003] - The Declaration of Wild Life Stock Rules, 2003. 	
	 G.S.R.350 (E), [18/4/1995] - The Wildlife (Specified Plant Stock Declaration) Central Rules, 1995. 	
	 G.S.R.349 (E), [18/4/1995] - The Wildlife (Specified Plants - Conditions for Possession by 	
	Licensee) Rules, 1995. G.S.R.348 (E), [18/4/1995] - The Wildlife (Protection) Rules, 1995.	
	 Recognition of Zoo Rules, 1992. 	
	 G.S.R.328 (E), [13/4/1983] - The Wildlife (Protection) Licensing (Additional Matters for Consideration) Rules, 1983. G.S.R.29 (E), [25/1/1973] - The Wildlife (Stock 	
	 G.S.R.29 (E), [23/11973] - The Wildlife (Stock Declaration) Central Rules, 1973. G.S.R.198 (E), [9/4/1973] - The Wildlife 	
	(Transaction and Taxidermy) Rules, 1973.	
	Wildlife Guidelines 1. Guidelines for Appointment of Honorary Wildlife Wardens.	Govt. of India and Al State Government

Table 2-5 Laws on Wildlife

Source: <u>www.envfor.nic.in</u>

2.2.6 Land Acquisition Act, 1894

In India land is acquired by the Government for a public purpose under the principles of eminent domain, that is, the Government has the first right to land. Land is acquired by Government most commonly under the Land Acquisition (LA) Act of 1894 modified in 1984. The amendment of 1984 extended the scope of the definition of public purpose and some of its norms related to time, amount and procedures of compensation were liberalized. However, the Act in essence remains unchanged. The Act is applicable to the whole of country except the State of Jammu and Kashmir. The land needed for the DFC project will be acquired under the LA Act of 1894 and compensated as per the provisions of Act unless decided otherwise by the Government. Land acquisition under the Act on an average takes two to three years time period. However, there is a provision of emergency clause under the LA Act but, in general. This clause is not invoked to acquire land. The compensation as per LA Act includes the award amount, 30% solatium and interest @ of 12% from the date of U/s 4A. The valuation of trees and other immovable properties on the land is based as per the rates decided by the competent authority in consultation with concerned departments for the purpose of payment of compensation.

Sections		Description
3	-	Definition
4	-	Publication of preliminary notification and powers of officers to
		enter for survey
5	-	Payment for damage
5A	-	Hearing of Objections
6	-	Declaration that land is required for a public purpose
7	-	After declaration, Collector to take order for acquisition
8	-	Land to be marked out, measured and planned
9	-	Notice to persons interested
10	-	Powers to require and enforce the making of statements as to
		names and interests
11	-	Enquiry into measurements, value and claims and award by
		Collector
12	-	Award of Collector when to be final
13A	-	Correction of Clerical Errors, etc.
16	-	Power to take possession
17	-	Special powers in cases of urgency
18	-	Reference to court
23	-	Matters to be considered in determining compensation
24	-	Matters to be neglected in determining compensation

2.2.7 Noise Pollution Regulation and Control Rules 2000

As a result of considering the deleterious and psychological effects of the noise pollution on the human well being, Ministry of Environment and Forest (MoEF) has drawn up the above rules, which have come to force with effect from February 14 2000. According to the provisions of the Rules notified, a person could make a complaint to the designated Authority in the event that the actual noise levels exceed the ambient noise standards by 10 db (A) or more as compared to the standards prescribed in the Schedule of the Rules. The designated authority will take action against violator in accordance with the provisions of these rules or other laws in force.

2.2.8 Air (Prevention and Control of Pollution) Act, 1981

This Act provides for the prevention, control and abatement of air pollution. It is applied when air polluting activity in an air pollution control area or when emissions of any air pollutants into the atmosphere exceed the standards set by the Central and State Boards.

2.2.9 Water (Prevention and Control Pollution) Act

The Water (Prevention and Control of Pollution) Act, 1974 resulted in the establishment of the Central and State level Pollution Control Boards whose responsibilities include managing water quality and effluent standards, as well as monitoring water quality, prosecuting offenders and issuing licenses for construction and operation of certain facilities.

2.2.10 Other Relevant Acts

The other relevant acts that will be involved with the project are given below.

Cultural Environment Related Act, 1958

As a result of growing interest in cultural heritage in the nation, both government agencies and NGOs concerned with the preservation and conservation of this heritage have been established. The Archaeological Survey of India (ASI) is the organization working on the protection and conservation of monuments and archeological sites. It is supported in its endeavors by the state Directorate of Archeology. The ASI administers the Ancient Monuments and Archaeological Sites and Remains Act, 1958. According to this act, areas within radii of 100 m and 300 m from the "protected property" are designated as "protected" and "controlled" respectively. No development activity is permitted in the protected area, without prior permission of the GOI. Similarly, certain development (likely to damage the protected property) activities require prior permission from GOI. Conservation for the designated are several railway side cultural properties that are not "protected", but are of significant cultural or religious value to the community. No procedure exists at present for conservation of these "smaller" cultural properties.

Motor Vehicle Act, 1988

In 1988, the Indian Motor Vehicle Act empowered the State Transport Authority to enforce standards for vehicular pollution and prevention control. The authority also checks emission standards of registered vehicles, collects road taxes, and issues licenses. In August 1997, the "Pollution Under Control Certificate" (PUC) programme was launched in an attempt to crackdown on the amount of vehicular emissions in the state. To date it has not been highly effective.

Regulation/Act governing Vibration

There is no prevailing regulation/standard in India governing train induced ground vibrations. Regulations/standards prevailing in other countries such as USA, Japan, and Sweden etc. have been reviewed and compared with the findings of vibration monitoring in its respective chapter. Vibration Regulation Law in Japan issued by Ministry of the Environment, Government of Japan stipulates to preserve living environment and contribute to protection of the people's health by regulating vibration. As per this law, standards for vibration emitted from specified construction works and limits for motor vehicle vibration have been provided for different land use pattern. As per USA Federal Transit Administration, the criteria for environment impact from ground-borne vibration are based on the maximum root-mean-square (rms) vibration levels for repeated events from same source. Experience based on international standards provides a good foundation for predicting and controlling annoyance from ground-borne vibrations in residential areas as well as interference with vibration-sensitive activities.

Applicable Cross Sectoral Laws

There are a number of laws that are cutting across all sectors and development process of the country. Some of these are directly relevant especially during the construction stage are listed in the Table 2-6.

Applicable GOI Acts	Year	Objective	
Minimum wages Act 1948		As per this act, the employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government.	
Child labour (prohibition and regulation) Act		This Act prohibits employment of children below 14 years of age in Building and Construction Industry covering Railway.	
Labour Act	1988	The health and safety of workers employed in construction work etc	
The Factories Act	1948	Health and Safety considerations for workers	
Workmen's Compensation Act	1923	This act provides for compensation in case of injury by accidents arising out of and during the course of employment.	
Contract Labour (Regulation and Abolition) Act	1970	This act provides for certain welfare measures to be provided by the contractor to contract labour.	
Payment of Wages Act.	1936	It lays down as to by what date the wages are to be paid, when it will be paid and what deduction can be made from the wages of workers.	
Equal Remuneration Act	1979	This act provides for payment of equal wages for work of equal nature to Male and Female and not for making discrimination against Female employees.	
The Building and other Construction Workers Act		All the establishments who carry on any building or other construction work and employ 10 or more workers are covered under this Act. The employer is required to provide safety measures at construction work site and other welfare measures such as canteens, first-aid facilities, ambulance, housing accommodation for Workers near the Workplace etc.	

Table 2-6 Cross Sectoral Laws that has Applicability
in Infrastructural Development Projects

Source: <u>www.worldbank.org</u>

After several years of negligence, Government of India now decided to strictly apply the Child labour Act to all sectors that are exploiting the children's at their younger age for personal, economic and other benefits. According to this law children's are for primary education till the age of 14 and then up to the age 18 years children if employed should not be engaged in the hazardous working conditions.

2.3 APPLICABLE POLICIES AND STRATEGIES

Applicable guidelines and policies/strategies relevant to this project are described below.

2.3.1 JICA Guidelines on Environmental and Social Considerations

JICA prepared the new guidelines on environmental and social considerations in March 2004. As per this guideline, JICA supports the recipient governments by offering cooperation projects into which JICA incorporates appropriate environmental and social considerations so as to avoid or minimize development projects' adverse impacts on the environment and local communities. JICA thus promotes sustainable development in developing countries. JICA recognizes the following seven principles to be very important under environmental and social considerations of a project.

- Coverage of a wide range of environmental and social impacts to be addressed.
- Implementation of measures for environmental and social considerations at an early stage in project cycle based on analysis of alternatives.
- Incorporation of outcome of environmental and social considerations in the

implementation of projects after cooperation projects is terminated.

- Paying attention to accountability and transparency when implementing cooperation projects.
- Ensuring the meaning participation of stakeholders in order to take consideration of environmental and social factors and to reach consensus accordingly.
- Disclosing information on environmental and social considerations in order to ensure accountability and to promote participation of various stakeholders.
- Capacity building of Organizations to consider environmental and social factors appropriately and effectively at all times.

JICA classifies projects under three categories (A, B and C) according to extent of environmental and social impacts similar to the funding agencies categorization like World Bank, ADB and JBIC. To make this classification, JICA takes into account an outline of the project, the scale, site condition, and environmental impact assessment study scheme in host countries.

As per JICA guidelines, the impacts to be assessed with regard to environmental and social considerations include impacts on human health and safety as well as the natural environment. Impacts on the natural environment include trans-boundary or global-scale impacts through air, water, soil, waste, accidents, water usage, climate change, ecosystems and biodiversity. The impacts to be assessed also include social impacts, which include the migration of populations and involuntary resettlement; local economy such as employment and livelihood; utilization of land and local resources; social infrastructures and services; vulnerable social groups such as the poverty level and indigenous peoples; equality of benefits and losses and equality in development process; gender; children's rights; cultural heritage; local conflict of interests and infectious diseases such as HIV/AIDS.

In addition to the direct and immediate impacts of projects, derivative, secondary and cumulative impacts are also to be assessed in regard to environmental and social considerations within the extent possible. JICA takes into account the importance of good governance surrounding projects so that measures for appropriate environmental and social considerations are implemented. JICA respects the principles of internationally established human rights standards like the International Convention on Human Rights, and gives special attention to the human rights of vulnerable social groups – including women, peoples, persons with disabilities, and minorities – when implementing cooperation projects. JICA obtains country reports and information issued by related institutions about human rights, and JICA understands local human rights situations by disclosing information about cooperation projects.

When JICA's assessment differs from the review by JBIC, JICA conveys its own relevant information to Japan Bank for International Corporation (JBIC), and requires JBIC to undertake adequate measures. JICA discloses the information after making inquiries to the recipient governments and related organizations. When significant impacts become clear and JICA judges it difficult to address them, JICA makes recommendations to the Ministry of Foreign Affairs of JAPAN (MOFA) to stop the studies. JICA discloses recommendations after making inquiries to the recipient governments and related organizations.

The present project is committed to address all requirements of JICA guidelines on environmental and social considerations.

2.3.2 JBIC Guidelines on Environmental and Social Considerations

JBIC established "Japan Bank for International Cooperation Guidelines for Confirmation of Environmental and Social Considerations" on April 1, 2002, as unified guidelines of two environmental guidelines applied to International Financial Operations and Overseas Economic Cooperation Operations respectively. The Guidelines has been implemented from October 1, 2003.

JBIC Guidelines give guiding principles related to environmental consideration by JBIC in its appraisal of a project. They also give the environmental matters to be considered and environmental measures to be prepared by the recipient country in the planning and preparation stages of a project. Projects have been categorized into three basic categories A, B and C depending upon extent of involvement of significant environmental and social issues similar to other funding agencies such as World Bank and ADB.

As per JBIC guideline, projects must, in principle, be undertaken outside protected areas that are specifically designated by laws or ordinances of the government for the conservation of nature or cultural heritage (excluding projects whose primary objectives are to promote the protection or restoration of such designated areas). Projects are also not to impose significant adverse impact on designated conservation areas.

JBIC guidelines focus on participation by stakeholders as local community inhabitants who will be affected by the project. They require the project executor to solicit stakeholders' participation from the project planning stage. The checklist to be confirmed by JBIC now includes social considerations pertaining to resettlement, indigenous people and women. Also more strengthened than in the previous guidelines is a provision on information disclosure. JBIC is required to make public such items as the category classification of the project prior to loan approval.

Projects must be adequately coordinated so that they are accepted in a manner that is socially appropriate to the country and locality in which the project is planned. For projects with a potentially large environmental impact, sufficient consultations with stakeholders, such as local residents, must be conducted via disclosure of information from an early stage where alternative proposals for the project plans may be examined. The outcome of such consultations must be incorporated into the contents of the project plan; \Box Appropriate consideration must be given to vulnerable social groups, such as women, children, the elderly, the poor and ethnic minorities, all of whom are susceptible to environmental and social impact and who may have little access to the decision-making process within society.

Involuntary resettlement and loss of means of livelihood are to be avoided where feasible, exploring all viable alternatives. When, after such examination, it is proved unfeasible, effective measures to minimize impact and to compensate for losses must be agreed upon with the people who will be affected;

People to be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported by the project proponents, etc. in timely manner. The project proponents, etc. must make efforts to enable the people affected by the project, to improve their standard of living, income opportunities and production levels, or at least to restore them to pre-project levels.

Appropriate participation by the people affected and their communities must be promoted in planning, implementation and monitoring of involuntary resettlement plans and against the loss of their means of livelihood.

The present study integrated the basic concerns on environmental and social considerations as per the JBIC guidelines.

2.3.3 Asian Development Bank's (ADB) Environmental Policy

ADB's Environment Policy has been prepared to address five main challenges:

- the need for environmental interventions to reduce poverty
- the need to mainstream environmental considerations into economic growth and development planning
- the need to maintain regional and global life support systems
- the need to work in partnership with others
- the need to further strengthen the processes and procedures for addressing environmental concerns in ADB's own operations

The Policy highlights a number of areas that require attention in ADB's environmental assessment process. It addresses the need for more upstream environmental assessment at the level of country programming, the need for more structured consultation in the conduct of environmental assessments, the need for greater emphasis on monitoring and compliance with environmental requirements during project implementation, and finally the need to view environmental assessment as an ongoing process rather than a one-time event.

Similar to other funding agencies, projects are classified into category A (with potentially significant environmental impacts); category B (with potentially less significant impacts); category C (unlikely to have significant environmental impacts); and a new category, FI, (credit line for subprojects through a financial intermediary, or equity investment in a financial intermediary). A project's environment assessment category is determined by the category of its most environmentally sensitive component, including both direct and indirect impacts. An IEE is required for category B projects, and an EIA, requiring greater depth of analysis, for category A projects. No environmental assessment is required for category C projects although their environmental implications nevertheless need to be reviewed. The classification scheme helps conserve resources for project preparation, by ensuring that the greatest effort is deployed on projects with potentially the most significant adverse environmental impacts.

As per ADB's environmental policy, important considerations in preparing the environmental assessment include assessing indirect and cumulative impacts, examining alternatives, achieving environmental standards, designing least-cost mitigation measures, developing appropriate environmental management plans and monitoring requirements, formulating institutional arrangements, and ensuring meaningful public consultation.

The objectives of ADB's *Policy on Involuntary Resettlement* (November 1995), are to avoid involuntary resettlement whenever feasible, to minimize resettlement where population displacement is unavoidable, and to ensure that displaced persons receive assistance so that they are at least as well-off as they would have been in the absence of the Project. The policy stipulates three important elements in involuntary resettlement: (i) compensation for lost assets and loss of livelihood and income, (ii) assistance in relocation including provision of relocation sites with appropriate facilities and services, and (iii) assistance with rehabilitation so as to achieve at least the same level of well-being with the Project as before. The policy further specifies that the absence of legal title to land cannot be considered an obstacle to compensation and rehabilitation privileges. All persons affected by the Project, especially the poor, landless, vulnerable, and disadvantaged households should be included in the compensation, transition allowance, and rehabilitation package.

2.3.4 World Bank Safeguard Policies

The World Bank has a number of safeguard policies; the details and applicability of the safeguard policies to the Project are provided in the **Table 2-7**.

Environmental requirements of the World Bank are specified in detail in its Operational Policy (OP) 4.01 and other related OPs. In instances in which the procedural and regulatory requirements differ, the more stringent applies. The World Bank environmental requirements are based on a three-part classification system.

- Category A-requires a full Environmental Assessment (EA).
- ✤ Category B-projects require a lesser level of environmental investigation.
- Category C-projects require no environmental analysis.

WB Safe Guard Policy	Subject Category	Reason for its Applicability	Mitigation Measures	Documentation
OP 4.01	Environmental	Umbrella policy	All necessary mitigation	EIA and EMP
	Assessment		measures incorporated.	required
OP 4.04	Natural	Eco-sensitive -Forestry	A separate study is being	EMP.
	Habitats	and wildlife related	carried	
		issues		
OP 4.36	Forestry	Some Forest Land to	Compensatory	EMP
		be acquired	Afforestation	
OP 4.09	Pest	Not Applicable	Not Applicable	Not Applicable
	Management			
OP 4.30	Involuntary	Alignment will lead to	Comprehensive action	Resettlement Action
	Resettlement	loss of livelihood, land	plan	Plan prepared
		and house		
OP 4.20	Indigenous	Not Applicable	Not Applicable	Not Applicable
	people			
OP 4.11	Cultural	A number of temples,		EMP and RAP to be
(Draft)	Property	shrines etc are located	measures to be taken	prepared to minimize
		adjacent to the		the adverse effect on
		alignment.		cultural property

 Table 2-7 Applicability of World Bank Safeguard Policies

Source: <u>www.worldbank.org</u>

As is clear from above table, five of the World Bank safeguard policies concern the current project. The environmental mitigation measure developed for the project needs to be in tune with these safeguard policies.

2.3.5 National Environmental Policies

The National Environmental Policy (NEP) 2006 is a response to national commitment to clean environment mandated in the Indian Constitution and is intended to mainstream environmental concerns in all development activities. NEP recognizes environmental degradation as a major causal factor in enhancing and perpetuating poverty particularly among the rural poor. One of the key objectives of NEP is to integrate environmental concerns into policies, plans, programmes and projects for economic and social development. This policy has evolved from the recognition that only such development is sustainable, which respects environmental and ecological constraints. In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it.

2.3.6 National Forest Policies

Government of India in the erstwhile Ministry of Food and Agriculture enunciated a National Forest Policy to be followed in the management of State Forests in the country long time back in 1952. However, forests in the country have serious depletion over the years. The need to review the situation and to evolve a new strategy of forest conservation for the future has become imperative. In view of this, National Forest Policy was revised in 1988. The principal aim of new Forest Policy is to ensure environmental stability and maintenance of ecological balance including atmospheric equilibrium which is vital for sustenance of all life forms, human, animal and plant. The derivation of direct economic impact must be subordinated to this principal aim. The policy envisions to enhance the forest coverage of the country to 33% of total geographical area of the country.

2.3.7 Resettlement & Rehabilitation Policy

There is no comprehensive legislation, as yet, at the National or State level that governs the resettlement and rehabilitation of PAPs. Ministry of Rural Development (Department of Land Resources) approved a National Policy on Resettlement and Rehabilitation (NPRR) for PAFs, 2003, published in the Gazette of India on 17th February 2004. It recognizes the following essential features:

- That PAFs not only lose their lands, other assets and livelihoods, they also experience adverse psychological and social/cultural consequences;
- The need to minimize large-scale displacement and where displacement is inevitable, resettlement and rehabilitation has to be handled with utmost care. This is especially necessary for tribal, small and marginal farmers and women;
- That cash compensation alone is often inadequate to replace lost agricultural land, homesteads and other resources. Landless laborers, forest dwellers, tenants, artisans are not eligible for cash compensation;
- The need to provide relief especially to the rural poor (with no assets), small and marginal farmers, SCs/ STs and women;
- The importance of dialogue between PAFs and the administration responsible for resettlement for smoother implementation of projects and R &R.
- The policy is in the form of broad guidelines and executive instructions and will be applicable to projects displacing 500 families or more in plain areas and 250 families or more in hilly areas.

The NPRR does not meet some of the International Funding Agencies (World Bank, ADB etc.) resettlement policy's key requirements. Firstly, the NPRR states that in acquisitions for highways, railway lines, transmission lines and pipelines, project affected families will be offered an ex-gratia payment of Rs 10,000 and no other resettlement and rehabilitation benefits. Secondly, the cut-off numbers of affected persons for whom World Bank requires resettlement plans are much lower. Thirdly, replacement value is not clearly defined and more importantly is not taken into account in the various lump-sum compensation payments that have been decreed in the policy. Fourthly, no specific entitlements have been provided for untitled persons such as squatters and encroachers. However, the policy does recognize some significant principles. It requires projects to (a) minimize displacement and to identify non-displacing or least-displacing alternatives; (b) plan the resettlement and rehabilitation of PAPs including special needs of tribal and vulnerable sections; (c) provide a better standard of living to PAFs; and (d) facilitate harmonious relationships between the requiring body and PAFs through mutual cooperation. A National Monitoring Committee will be set up comprising the Secretary Land Resources (Chair), Secretary Planning Commission, Secretary Social Justice

and, Secretary Water Resources, Secretary Tribal Affairs, **Secretary Railways**, Secretary Power and Secretary Coal. In addition a National Monitoring Cell will be established in the Department of Land Resources in the Ministry of Rural Development under a Joint Secretary, assisted by zonal directors, subject matter specialists, deputy directors and other support staff.

In view of many deficiencies identified in NPRR, a new National Rehabilitation Policy has been formulated after reviewing the NPRR many times. The new NPRR has been cleared by the union cabinet very recently on 11th October 2007. The Government of India now plans to give the policy Statutory Status by amending Land Acquisition Act, 1894.

R & R under Current Project

Resettlement & Rehabilitation Framework for this project has been elaborated and subjected to the objectives and the scope of following guidelines and policies.

- National Policy on Resettlement & Rehabilitation 2007
- JICA Guidelines
- JBIC Guidelines
- World bank Safeguard Policies
- ADB Environmental Policies

Entitlement framework for this project has been recommended derived from specific project requirement identified by a baseline socio-economic census and exhaustive community consultation sessions. Considerable references were made to the earlier R&R experiences from the Railway project financed by ADB and other best-demonstrated practices in Gujarat and India.



Published on October 12 2007, Page 10

New policy to share fruits of growth with the land owners

Aloke Tikku and Satyen Mohapatra New Delhi, October II

THE GOVERNMENT on Thursday unveiled a new rehabilitation policy that intends to make the displacement of people for industrial growth a less painful experience.

Land in return for land for displaced families, preference in project jobs to at least a member of each family, vocational training, scholarships for children and housing benefits including houses to affected families in rural and urban areas are some of the benefits under this new policy. The policy and the amendments in land acquisition laws approved by the Cabinet on Thursday also make Social Impact Assessments of projects that affect more than 400 families in the plains (and 200 families in hilly areas) mandatory.

Furthermore, the policy requires the Centre to set up a

National Rehabilitation Commission empowered to independently evaluate the satisfactory rehabilitation and resettlement of affected families. The concept of post-implementation social audits has also been made.

The policy was necessitated by violent protests in West Bengal, Maharashtra and Orissa by farmers who were displaced from their land for the setting up of factories and special economic zones. In light of this resentment, Congress president Sonia Gandhi had asked the government to frame a hu-

mane and equitable policy.

Information and Broadcasting Minister Priya Ranjan Dasmunsi said the new policy is aimed at striking a balance between the need for land for development and protecting the interests of land owners, tenants and others who depend on that property for livelihood. One way the policy strives to achieve this is by giving displaced people the right to share the fruits of industrial growth. "Entitled persons shall have the option of taking up to 20 per cent of their rehabilitation grant and compensation amount in the form of shares if the acquiring entity is a firm authorised to issue shares and debentures," he said.

atikku@hindustantimes.com

Highlights

REHABILITATION AND RESETTLEMENT POLICY, 2007

- National Rehabilitation Commission, ombudsman for grievance redressal and Rehabilitation and Resettlement Committee for each project
- Consultation with gram sabhas compulsory
- Social Impact Assessment for displacement of 400/200 families in plains/hill areas
- Tribal Development Plan for displacement of 200-plus tribal families
- If possible, land for land compensation and housing benefits for those who lose house
- Option for affected families to take 20%-50% compensation with government approval
- Preference in project jobs and one job per nuclear family, support for skill development
- Rs 500 monthly pension for destitute, widows, unmarried girls

LAND ACQUISITION AMENDMENT BILL, 2007

- Land can be acquired for public purpose. It also includes strategic purposes vital to the state and public infrastructure such as electricity, water supply. However, if land remains unutilised for five years, it will revert to government.
- Rate of compensation not to be less than floor price fixed by the state or average of higher prices paid in 50% of land sale cases.
- Persons with tenancy rights recognised entity for proportionate share in compensation.

2.3.8 Other Relevant Policies/Strategies

There are a number of other national policies to address various issues relating to the exploitation of natural resources and other environmental issues. The more relevant of these policies and their applicability to the project are provided below in **Table 2-8**.

Applicable GOI Policy	Year	Objective			
National Water Policy	2002	Conservation and management of water resources			
Policy Statement on Abatement of Pollution	1992	National Policy on the Pollution control and prevention			
	1992	Strategy for development taking environmental concerns in			
Strategy and Policy Statement		to account in our development process			
on Environment And					
Development					
	2003	03 All social issues relating to land acquisition, resettlement			
Resettlement Policy		and rehabilitation			
National River Conservation	2001	001 For the conservation management of issues relating to			
Plan(NRCP)		rivers			
National Lake Conservation	-	For the conservation management of issues relating to			
Plan		Lakes			
Wildlife Conservation	2002	For the conservation management of issues relating to			
Strategy		Wildlife			
National Biodiversity	2006	Developed in fulfillment of India's commitment to the			
Strategy and Action Plan		Biodiversity Convention, it provides strategic directions			
		and action plans for the sustainable management of			
		biodiversity			
National Wildlife Action Plan	1984	6			
		and emphasizes requirements of evolving prescriptions for			
		management of multiple use areas which provide for			
		wildlife habitat needs and forest products			

Table 2-8 Applicable GOI Policies to the DFC Project	Table 2-8
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Source: <u>www.envfor.nic.in</u>

CHAPTER 3 DESCRIPTION OF THE PROJECT

3.1 ALIGNMENT OF THE PROJECT

The western corridor of DFC from Rewari to Vadodara is about 940 km and passes through Haryana, Rajasthan and Gujarat State. In Haryana DFC passes through Rewari and Mahendragarh. The districts covered by DFC in Rajasthan are Alwar, Sikar, Jaipur, Nagaur, Ajmer, Pali and Sirohi. In Gujarat DFC passes through Banaskantha, Patan, Mahesana, Gandhinagar, Ahmedabad, Kheda, Anand and Vadodara.

3.2 ALIGNMENT IN GUJARAT STATE

Gujarat State has both parallel and detour sections of DFC. The length of the parallel section in the district is 103.0 km, while the length of the detour section is 244.3 km. The details of parallel and detour section in the districts of Gujarat are shown below in the **Table 3-1**.

S. No. District		Length of Parallel Section (km)	Length of Detour Section (km)	
1	Banaskantha	36.00	34.00	
2	Patan	10.60	0	
3	Mahesana	23.40	57.80	
4	Gandhinagar	0	13.50	
5	Ahmedabad	0	41.00	
6	Kheda	0	22.50	
7	Anand	0	49.10	
8	Vadodara	33.00	26.39	
	Total	103.00	244.29	

 Table 3-1 Details of Parallel and Detour Section in Gujarat State

The details of alignment in each district are described below:

(1) Banaskantha District

Banaskantha District shares its boundary with Rajasthan in northern side, while Patan District is on the south. The DFC corridor enters in Banaskantha from Patan District near Station Dharewada, parallel to the existing Mumbai-Delhi Broad-gauge track in west side and continues to remain parallel up to 3.5 km north of Umerdashi Station, from where the Palanpur De-tour takes off. The detour crosses the existing track from west to eastern side at 650 m north of Iqbalgarh Station and runs parallel from 1,300 m north of Iqbalgarh Station towards Rajasthan State. Map showing the parallel and detour sections with approximate village boundaries is provided in **Figure 3-1**. The white line in the map refers to the parallel section while the red line refers to the detour section.



The list of stations en-route is provided in Table 3-2.

S. N.	Name of Stations	Northing	Easting
1	Dharewada	23°58'3.99"N	72°22'51.04"E
2	Chappi	24° 2'8.11"N	72°24'2.27"E
3	Umardashi	24° 5'59.78"N	72°25'12.46"E
4	Palanpur	24°10'35.62"N	72°25'51.66"E
5	Karjora	24°13'14.72"N	72°27'24.86"E
6	Chitrasani	24°15'48.22"N	72°29'6.73"E
7	Jethi	24°17'47.75"N	72°30'33.61"E
8	Iqbalgarh	24°20'49.94"N	72°32'4.72"E
9	Satotra Road	24°22'43.10"N	72°35'45.85"E
10	Amirgarh	24°24'16.67"N	72°38'31.42"E

Table 3-2	List of Stations in Banaskantha District	
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Source: JICA Study Team

(2) Patan District

The proposed DFC corridor runs parallel to the existing track on the western side throughout the Patan District. The length of the track within the district is approximately 10.6 km. The district shares its boundary with Mehasana District on the south and Banaskantha District in the north. The DFC corridor enters in Patan District from Mehasana District at about 1.6 km north of Station Kamli, parallel to the existing Mumbai-Delhi Broad-gauge track in west side. It runs parallel to the existing track towards north till the end of the district boundary and enters in Banaskantha District close to Dharewada Station. Map showing proposed DFC track with approximate village boundaries is provided in **Figure 3-2**. The white line in the map refers to the proposed DFC corridor in Parallel Section.



The list of stations en-route is provided in Table 3-3.

Table 3-3 List of Stations in Patan District

S. N.	Name of Stations	Northing	Easting		
1	Siddpur	23°55'12.80"N	72°22'5.24"E		
Source: JICA Study Team					

(3) Mahesana

The DFC corridor enters in Mahesana District from Gandhinagar District as detour alignment at Thol Village (23° 7'10.48"N, 72°23'25.04"E). It passes through the Thol village for about a stretch of 3.5 km and re-enters in Bhimasan Village of Gandhinagar District (23° 9'5.08"N, 72°23'35.74"E). It re-enters in Mahesana District at Vadavi Village (23°10'59.53"N, 72°23'54.27"E) and passes through the villages of Vadavi, Vamaj, Fuletra, Achrasan and Ankol for about a stretch of 9.8 km. Thereafter, it again enters in Chhatral Village of Gandhinagar District (23° 9'5.02"N, 72°23'35.42"E) and passes through a stretch of 3.5 km. The detour alignment enters Mahesana District for the third time at Indrad Village (23°18'3.36"N, 72°25'30.30"E) and goes northwards. It passes through 22 villages before being parallel to the existing Mumbai-Delhi railway track from Palodar Village. It continues to run parallel to the existing Mumbai-Delhi railway track in the western side till 1.8 km north of Kamli Station, where it enters into Patan District.

Map showing the parallel and detour sections with approximate village boundaries is provided in **Figure 3-3**. The blue line in the map refers to the parallel section while the red line refers to the detour section.

The list of existing stations (parallel section) en-route is provided in **Table 3-4**.

S. N.	Name of Stations	Northing	Easting
1	Kamli	23°51'40.44"N	72°22'33.11"E
2	Unjha	23°47'53.45"N	72°22'53.51"E
3	Unava Aithor	23°45'11.22"N	72°23'8.36"E
4	Bhandu Moti Dau	23°41'21.32"N	72°23'26.70"E

Table 3-4	List of	Stations in	Mahesana	District
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Source: JICA Study Team

(4) Gandhinagar

The entire stretch of DFC alignment in Gandhinagar District is a part of Ahmedabad detour. The alignment passes through the western most villages of Gandhinagar District bordering Mahesana District and frequently goes in and out of Gandhinagar District.

The district shares its borders with Mahesana District on west and north, and with Ahmedabad District on the south. The alignment enters Gandhinagar District at Unali Village (23° 3'58.39"N, 72°24'47.30"E) and passes through Unali, Rancharada, Nasmed and Adhana Villages before entering into Mahesana.

After going through a stretch of 3.5 km in Mahesana District, the alignment re-enters in Gandhinagar District at Bhimasan Village (23° 9'5.08"N, 72°23'35.74"E). After passing through the villages of Bhimasan and Hajipur, it again enters into Mahesana District and goes through a stretch of 9.8 km. Thereafter, it enters Gandhinagar District for third time at Chhatral Village (23° 9'5.02"N, 72°23'35.42"E) and passes through Chhatral and Dhanot Villages before entering into Mahesana District finally.

Map showing proposed DFC track with approximate village boundaries is provided in Figure3-4.

(5) Ahmedabad

The entire stretch of DFC alignment in Ahmedabad District is a part of Ahmedabad detour. The district shares its borders with Gandhinagar District on north, and with Kheda District on the south. The alignment enters Ahmedabad District from Kheda District at Sathal Village (22°44'28.44"N, 72°31'54.94"E) and runs for a stretch of 41 km through 18 villages before entering into Gandhinagar District at Garodia Village (23° 3'58.39"N, 72°24'47.30"E).

Map showing proposed DFC track with approximate village boundaries is provided in **Figure 3-5**.

(6) Kheda

The entire stretch of DFC alignment in Kheda District is a part of Ahmedabad detour. The district shares its borders with Ahmedabad District on West and North, and with Anand District on the South. River Sabarmati acts as the north-western boundary of the district. The alignment enters Kheda District at Khandhli Village (22°37'42.33"N, 72°41'21.42"E) and passes though a stretch of 22.5 km before entering into Ahmedabad District at Kaloli Village (22°44'28.44"N, 72°31'54.94"E). Map showing proposed DFC track with approximate village boundaries is provided in **Figure 3-6**.

(7) Anand

The entire stretch of DFC alignment in Anand District is a part of Ahmedabad detour. The district shares its borders with Kheda District on North and with Vadodara District on the

South. River Mahi acts as the south-eastern boundary of the district. The alignment enters Anand District at Amrol Village (22°22'28.59"N, 73° 3'15.96"E) and passes though a stretch of 49.1 km before entering into Kheda District after Badkhad Village (22°37'42.11"N, 72°41'21.30"E). Map showing proposed DFC track with approximate village boundaries is provided in **Figure 3-7**.

(8) Vadodara

Vadodara District shares its boundary with Anand in northern side, while Bharuch District is on the south. River Mahi acts as the boundary between Vadodara and Anand Districts.

The DFC corridor enters in Vadodara from Bharuch District at about 2.5 km north of station Varediya. It passes through two villages of Vadodara District for about a stretch of 2.7 km and re-enters into Bharuch District. It passes through a short stretch of 1.90 km and re-enters in Vadodara District at Mankan Village at about 705 m north of Palej Station.

The DFC alignment in Vadodara District run parallel to the existing Mumbai-Delhi broad gauge railway track from its entry near Varediya Station up to 3.8 km north of Varnama station, from where the Ahmedabad detour takes off. The detour alignment gradually moves to the west of the existing Mumbai-Delhi railway track. The aerial distance between the farthest point of the detour route with the existing track is about 11.5 km.

Map showing the parallel and detour sections with approximate village boundaries is provided in **Figure 3-8**. The blue line in the map refers to the parallel section while the red line refers to the detour section.

The list of existing stations (parallel sections) en-route is provided in Table 3-5.

S. N.	Name of Stations	Northing	Easting
1	Lakodra	21°59'0.60"N	73° 5'43.76"E
2	Miyagam Karjan Jn	22° 3'6.52"N	73° 7'14.45"E
3	Itola	22° 9'2.89"N	73° 9'26.12"E
4	Varnama	22°10'59.75"N	73°10'9.36"E

 Table 3-5
 List of Stations in Vadodara District

Source: JICA Study Team

3.3 CONSTRUCTION WIDTH

The construction width of DFC in sections running parallel to the existing Mumbai-Delhi broad-gauge railway tracks is 25 m. In detour sections, the proposed construction width is 45m. However, the width of the land may vary depending on the height of embankments in low lying areas.

3.4 VILLAGES EN-ROUTE

(1) Banaskantha

In Banaskantha District, the alignment is passing through 31 villages. About 15 villages will be affected by the parallel section while 14 villages will be affected by the detour section. 2 villages are affected by both parallel and detour section. The list of affected villages by parallel and detour section are provided in **Table 3-6.** Out of the 31 affected villages, 11 villages belong to Amirgarh Taluka, 14 villages belong to Palanpur Taluka and 6 villages belong to Vadgam Taluka.

SN	Taluka	Village		By Section
5IN	Ташка	v mage	Parallel	Detour
1		Amirgadh		
2 3		Dungarpura		
		Kirotar		
4		Jorapura	8 villages	
5		Dhanpura	- o villages	
6	Amirgadh	Dholia		
7		Juni Roh Sarothi		
8		Zanzarvav		
9		Iqbalgarh		
10		Jethi		
11		Bantawada		
12		Pirojpura		
13		Antroli		
14		Malana		
15		Rajpur		16 villages
16		Pakhanava		10 villages
17		Moriya		
18	Palanpur	Parpada		
19		Palanpur		
20		Chadotar		
21		Akesan		
22		Gathaman		
23		Jagana		
24		Sedrasana		
25]	Jasleni		
26		Malosana		
27]	Majadar	9 villages	
28	Vadgam	Kotadi		
29	v augain	Teniwada		
30	1	Manpura		
31	1	Dharewada		
	Code	Affected Villages		

Table 3-6 List of Affected Villages in Banaskantha District

Source: Census of India Map and field study

The DFC alignment passes mostly through the agricultural land, except the villages of Iqbalgarh, Kirotar, Majadar, Antroli and Jagana where a few residential and commercial structures will be affected. Details of villages with affected number of structures are provided in **Table 3-7**.

S. N.	Village	DFC Section	No of Structures
1	Majadar	Parallel	14
2	Gathaman	De-tour	1
3	Pakhanwa	De-tour	1
4	Antroli	De-tour	10
5	Iqbalgarh	De-tour	3
6	Kirotar	Parallel	1
		Total: 6 Villages	30

Table 3-7 List of Villages with Affected Structures

Source: Field Survey

(2) Patan

The alignment is passing through 5 villages in this district. The list of affected villages is provided in **Table 3-8**. All of the affected villages belong to Sidhpur Taluka.

SN	Taluka	Village	Affected By Section	
			Parallel	Detour
1		Maloj		
2	Sidhpur	Ganeshpura	5 villages	
3		Ankvi		
4		Sidhpur		
5		Lalpur		

Table 3-8 List of Affected Villages in Patan District

Source: Census of India Map & Field study

The land use along the proposed DFC alignment is mainly agricultural land, except in Sidhpur where 151 structures will be affected.

(3) Mahesana

The alignment is passing through 35 villages in this district. 7 villages will be affected by the parallel section while 27 villages will be affected by the detour section. 1 village is affected by both parallel and detour section. The list of affected villages by parallel and detour section are provided in **Table 3-9**. Out of the 35 affected villages 4 villages belong to Unjha Taluka, 2 villages belong to Visnagar Taluka, 14 villages belong to Mahesana Taluka and rest of the 15 villages belong to Kadi Taluka.

SN	Taluka Vil	Village	Affected By Section	
311	Ганка	Village	Parallel	Detour
1		Kamli		
2	Unjha	Maktupur		
3	Onjna	Unjha		
4		Aithor		
5	Visnagar	Jethalvasana	l	
6	Visitagai	Bhandu		
7		Motidau		
8		Palodar		
9		Panchot		
10		Dediyason		
11		Nugar		
12		Sametra		
13	Mahesana	Heduva- Rajgadh		
14	Manesana	Vadosan		
15		Boriavi		
16		Linch		
17		Ambasan		
18	-	Baliyasan		
19		Bhasariya		
20		Tundali		
21		Ganeshpura		l.
22		Dhanali		l.
23		Mathasur		
24		Nandasan		
25		Lakshmipura		
26		Kherpur		
27		Rajpur		
28	Kadi	Irana		
29		Indrad		
30		Ankhol		
31		Achrason		
32		Vamaj		
33		Fuletra		
34		Vadavi		
35		Thol		

Source: Census of India Map & Field study

The DFC alignment passes mostly through the agricultural land, except the villages of Unjha, Laxmipura, Baliyasan and Rajpur, where a few structures will be affected. Details of villages with affected number of structures are provided in **Table 3-10**.

S. N.	Village	DFC Section	No of Structures
1	Unjha	Parallel	24
2	Laxmipura	De-tour	2
3	Baliyasan	De-tour	91
4	Rajpur	De-tour	4
		Total: 4 Villages	121

Table 3-10	List of Villages with Affected Structures
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Source: Field Survey

(4) Gandhinagar

The alignment is passing through 8 villages in this district. The list of affected villages is provided in **Table 3-11**.

SN	Taluka	Village	Affected by Section	
51	1 aluKa	v mage	Parallel	Detour
1		Dhanot		
2		Chhatral		
3		Hajipur		
4	Kalol	Bhaimasan		
5	Kaloi	Adhana		·
6		Nasmed		
7		Rancharada		
8		Unali		

Table 3-11 List of Affected Villages in Gandhinagar District

Source: Census of India Map & Field study

The DFC alignment in the district passes entirely through the agricultural land. No residential structures will be affected due to DFC in the district. However, about an important MDR connecting Adhana, Bhimasan, Hajipur Villages and other villages with Capital City of Ahmedabad will be affected. The DFC goes over the road for about 450 m. Further, ONGC pipeline may be affected in Unali Village.

(5) Ahmedabad

The alignment is passing through 8 villages in this district. The list of affected villages is provided in **Table3-12**. Out of the total, 9 villages belong to Sanand Taluka, 2 villages belong to Bawla Taluka and rest of the 7 villages belongs to Dholka Taluka.

SN	Tabuka	Taluka Village		by Section
SIN	1 aluka	Village	Parallel	Detour
1		Garodiya		
2	Sanand	Godhavi		
3		Manipur		
4	Sanand	Kanethi		
5	Sanand	Sanand Rural (Gibpura)		
6		Kolat		
7	Sanand	Moti Devti		
8	Sanand	Moraiya		
9		Vasna Chacharavadi		
10	Bawla	Bawala		
11	Dawla	Kavitha		
12		Badarkha		
13		Saroda		
14		Chaloda		
15	Dholka	Vasna Keleya		
16		Chandisar		
17		Ambaliyara	1	
18		Sathal		

 Table 3-12 List of Affected Villages in Ahmedabad District

Source: Census of India Map & Field study

The DFC alignment passes mostly through the agricultural land, except the villages of Vasna Chacharavadi and Kavitha, where good number structures will be affected. Details of villages with affected number of structures are provided in **Table 3-13**.

S. N.	Village	DFC Section	No of Structures
1	Vasna Chacharavadi	De-tour	5
2	Kavitha	De-tour	112
		Total: 2 Villages	117

 Table 3-13 List of Villages with Affected Structures

Source: Field survey

(6) Kheda

The alignment is passing through 13 villages in this district. The list of affected villages is provided in **Table 3-14**.

SN	N Taluka Vi	Village	Affected by Section	
211	Ташка	v mage	Parallel	Detour
1		Kaloli		
2		Naika		
3	Kheda	Radhu		
4	Kileda	Govindpura		
5		Shetra		
6		Vasna Bujarg		
7		Palla		
8		Matar		
9		Traj		
10	Matar	Garmala		
11		Machhiel]	
12		Kathoda]	
13		Khandhli]	

Table 3-14 List of Affected Villages in Kheda District

Source: Census of India Map & Field study

The DFC alignment in the district passes through entirely through the agricultural land, except Shetra Village where 2 structures will be affected. Out of the two, only one structure is residential and the other structure is a godown (Store house).

(7) Anand

The alignment is passing through 28 villages in this district. The list of affected villages is provided in **Table 3-15**.

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SN	Taluka	Village	Affected by Section	
DIN	Танка		Parallel	Detour
1		Bhadkad		
2		Bantwa		
3	Sojitra	Virsadpura		
4		Malataj		
5		Kasor		
6		Mahelav		
7		Sunav		
8		Bandhni		
9	Petlad	Porda		
10		Vishnoli		
11		Ardi		
12		Morad		
13	Arond	Sandesar		
14	Anand	Karamsad		
15	Petlad	Boriya		
16		Gana		
17	Anand	Vanas Khilya		
18		Khandhali		
19		Napa Vanto		
20	Borsad	Dahemi		
21	DOISAU	Kasumbad		
22		Harkhapura		
23		Haldari]	
24		Asodar		
25	Anklav	Bhedi (Talpad)		
26		Anklav		
27		Ambali		
28		Amrol]	

Table 3-15	List of Affected	Villages in	Anand District
	LISE OF AITECLEU	villayes ill	Ananu District

Source: Census of India Map & Field study

The DFC alignment passes mostly through the agricultural land, except the villages of Sunao, Airdi and Sandesar where a few structures will be affected. All the affected structures are residential expect one go-down (store house) at Sandesar Village. Details of villages with affected number of structures are provided in **Table 3-16**.

S. N.	Village	DFC Section	No of Structures
1	Sunav	De-tour	1
2	Airdi	De-tour	10
3	Sandesar	De-tour	1
		Total 3 villages	12

Source: Field Survey

(8) Vadodara

The alignment is passing through 29 villages in this district. 17 villages will be affected by the parallel section while 11 villages will be affected by the detour section. 1 village is affected by both parallel and detour section. The list of affected villages by parallel and detour section are

provided in **Table 3-17**. Out of the 29 affected villages 18 villages belong to Vadodara Taluka while rest of the 11 villages belongs to Karjan Taluka.

SN	Taluka	Village	Affected	Affected By Section	
211			Parallel	Detour	
1	Vadodara	Kotna			
2		Anagarh			
3		Sindhrat			
4		Hinglot			
5		Ampad			
6		Raypura			
7		Bhayli			
8		Bill			
9		Vadodara			
10		Talsat			
11		Chapad			
12		Maretha			
13		Alamgir			
14		Varnama			
15		Vadsala			
16		Itola			
17		Kashipura			
18		Sarar			
19	Karjan	Kherda			
20		Kandari			
21		Karjan			
22		Miyagam			
23		Vavava			
24		Lakodara			
25		Dethan			
26		Valan			
27		Mankhan			
28		Sansrod			
29		Haldarva			

Table 3-17	List of Affected	Villages in	Vadodara District
		Thages in	

Source: Census of India Map & Field study

The DFC alignment passes mostly through the agricultural land, except the villages of Bhayali, Itola and Karjan where a few structures will be affected. Details of villages with affected number of structures are provided in **Table 3-18**.

S. N.	Village	DFC Section	No of Structures
1	Karjan	Parallel	93
2	Itola	Parallel	2
3	Bhayali	Detour	1
	Total: 3 Villa	96	

Source: Field Survey

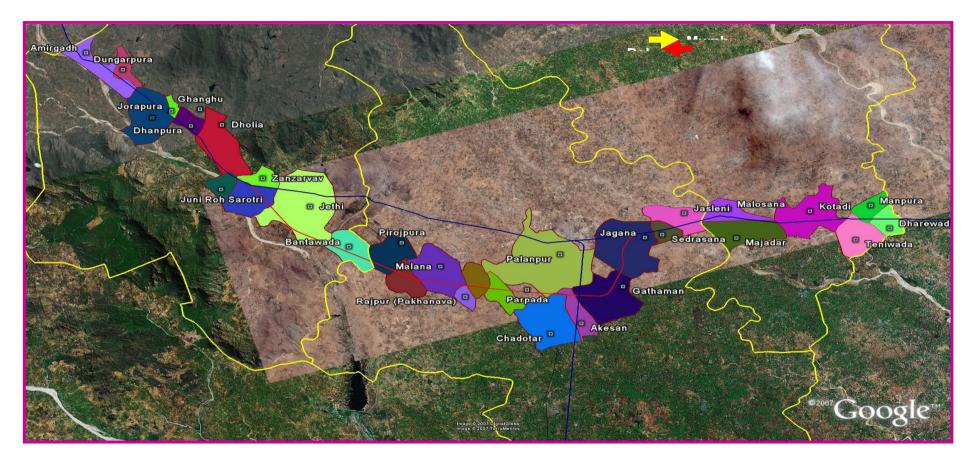




Figure 3-1 Map Showing Villages along DFC Alignment in Banaskantha District

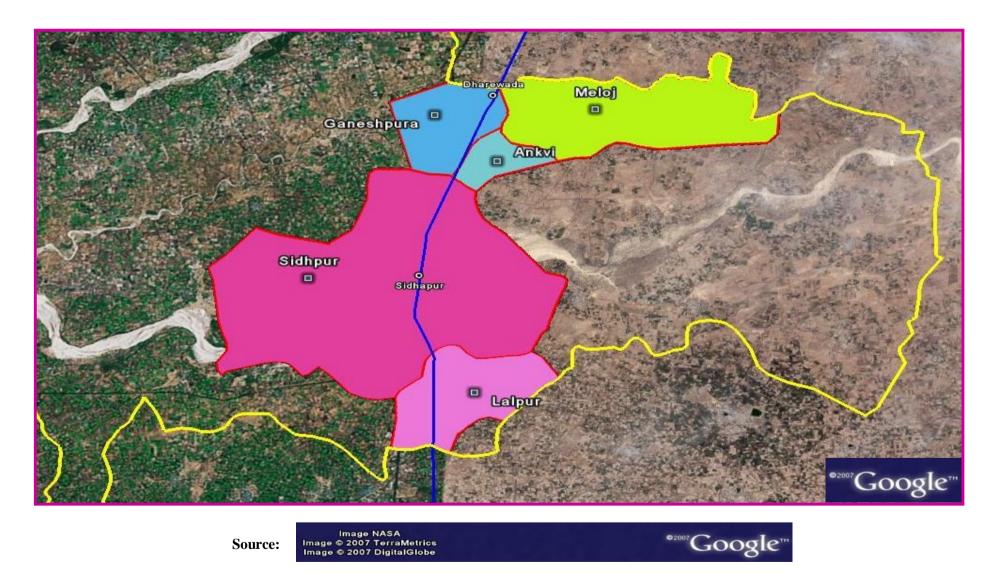
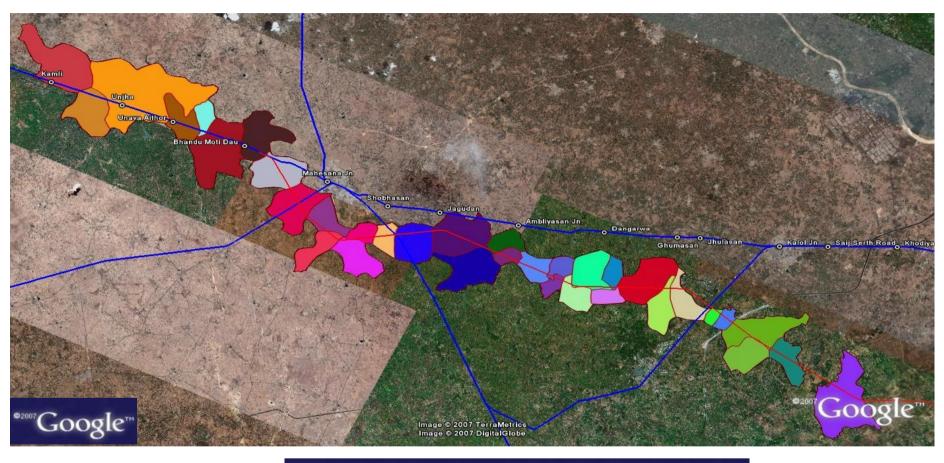


Figure 3-2 Map Showing Villages along DFC Alignment in Patan District

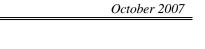


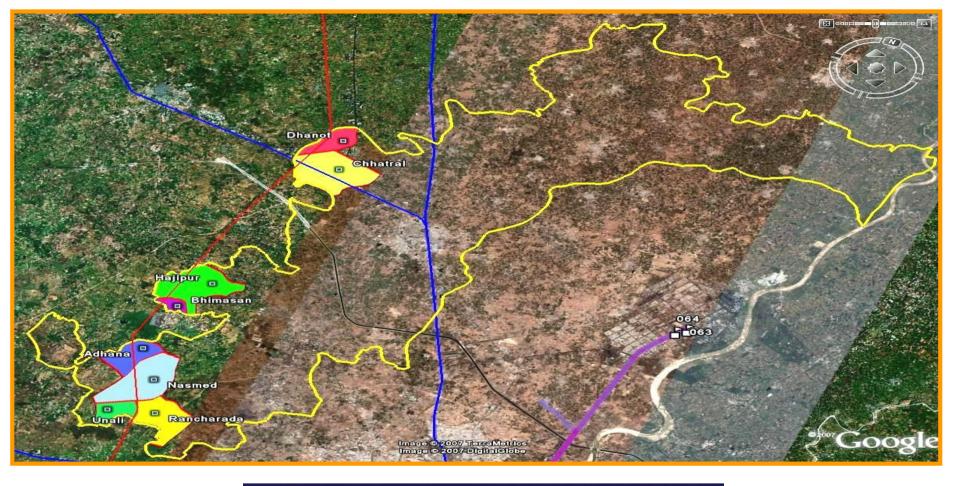
Source:



^{∞2007}Google™

Figure 3-3 Map Showing Villages along DFC Alignment in Mahesana District





Sauree

Image NASA Image © 2007 TerraMetrics Image © 2007 DigitalGlobe



Figure 3-4 Map Showing Villages along DFC Alignment in Gandhinagar District

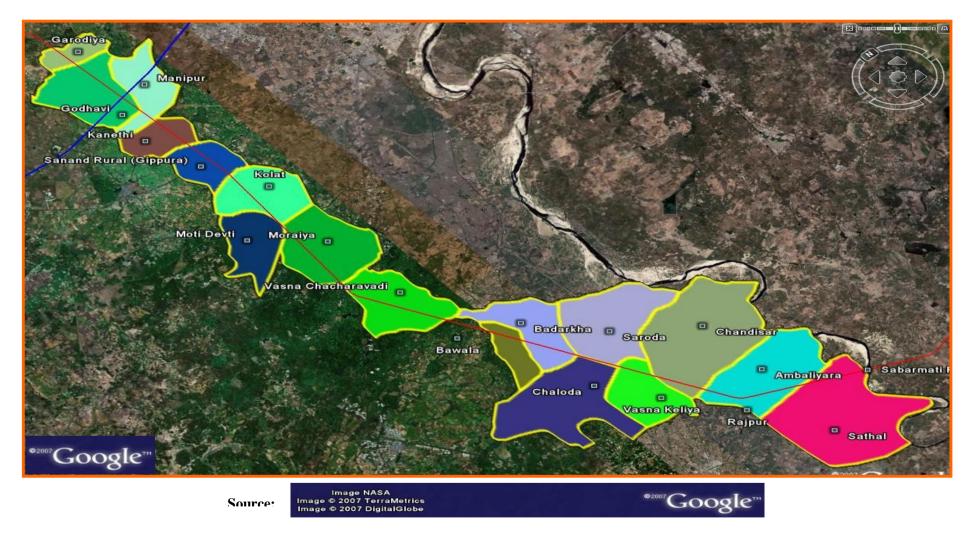


Figure 3-5 Map Showing Villages along DFC Alignment in Ahmedabad District

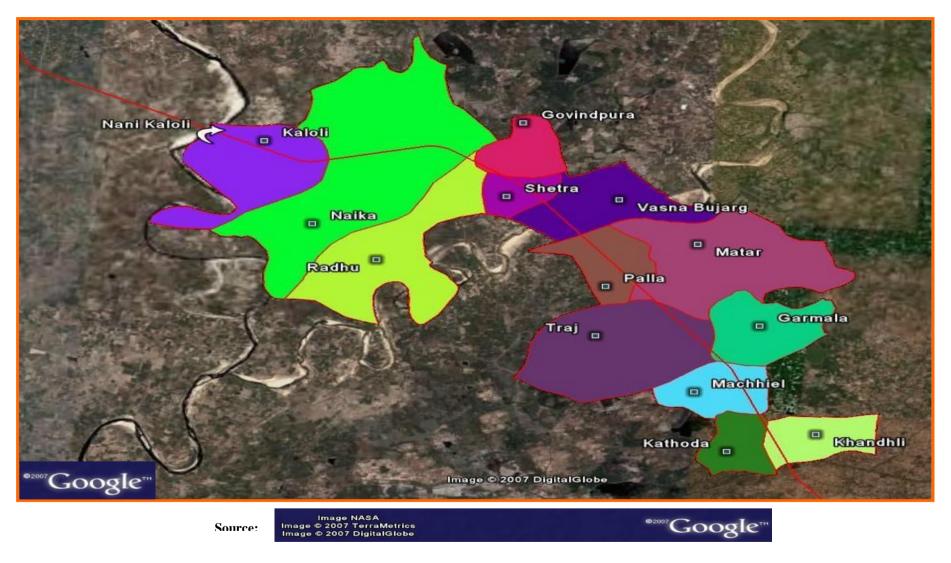


Figure 3-6 Map Showing Villages along DFC Alignment in Kheda District

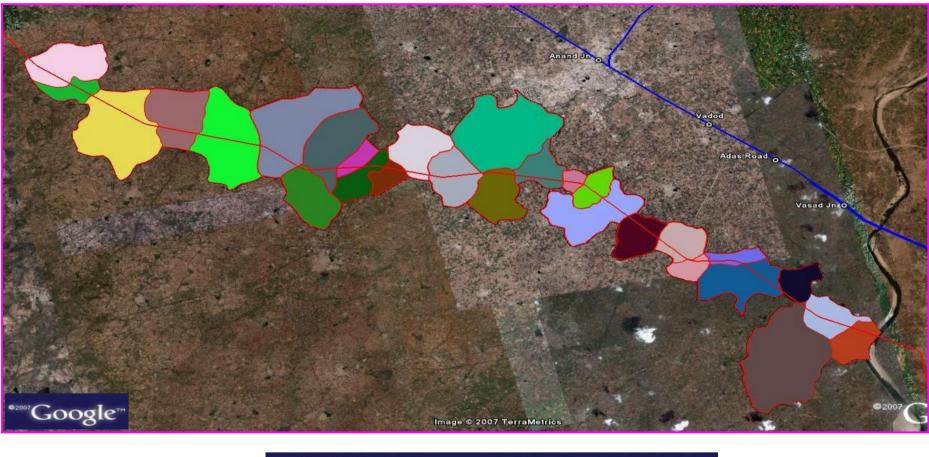


Image NASA Image © 2007 TerraMetrics Image © 2007 DigitalGlobe



Figure 3-7 Map Showing Villages along DFC Alignment in Anand District

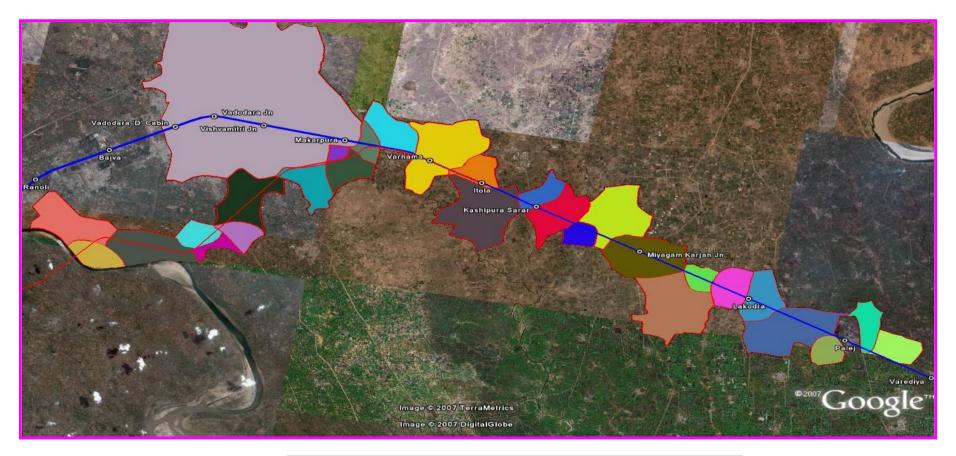




Figure 3-8 Map Showing Villages along DFC Alignment in Vadodara District

3.5 FORESTS EN-ROUTE

The DFC alignment does not pass through any forest area in Patan, Gandhinagar, Ahmedabad, Kheda, Anand and Vadodara Districts. In Banaskantha District, Palanpur Detour passes through 3 Reserve Forests in North Palanpur area, details of which are provided in **Table 3-19**.

S. N.	Village	DFC section	Length (km)
1	Jethi RF	Parallel	1.58
2	Bantawada RF	Parallel	1.09
3	Malana RF	Parallel	0.39
		Total: 3 RF	3.06

Table 3-19 List of Reserve Forests En-r

Source: Field Survey

The DFC alignment does not pass through the Balaram Ambaji Wildlife Sanctuary. The present alignment of Palanpur detour is such selected that it avoids the wildlife sanctuary. However, the previous Palanpur detour alignment joined the existing Mumbai-Delhi broad-gauge railway track at 300m south of Karjora station and run parallel in the west side through the wildlife sanctuary. The length of the track inside the Balaram Ambaji WLS was about 2.4 km.

In Mahesana District, the DFC alignment does not pass through any forest areas. However, the alignment passes closely to the Thol Bird Sanctuary in Thol village. The distance between the proposed alignment and Thol Bird Sanctuary at the closest point is about 80 m. Details of the Thol Bird Sanctuary is discussed in detail in Chapter 4 of this report.

3.6 FACILITY CONSTRUCTION PLAN

The DFC will entail construction of the Railway alignment with associated facilities such as junction stations, crossing stations, service lanes and bridges. The dimension of the junction station is approximately $60 \ge 2,130$ (m), while the dimension of the crossing stations will be $60 \ge 1,600$ (m). ROB/RUB is proposed to be provided in all major road crossings. 4 m wide service road will be provided in either side of the DFC in detour sections to ensure accessibility to bisected lands and settlements. Further, underpasses will be provided at about 1 km interval in detour sections. All utilities (handpumps, borewells, telephone and electric poles etc) in the bisected land will be either shifted or replaced. Longitudinal drains along the tracks on either side will also be provided in detour sections. The details of Junction stations, crossing stations and major bridges in the districts of Gujarat are shown below in **Table 3-20**.

 Table 3-20 Details of Junction Stations, Crossing Stations and Major Bridges in Gujarat State

S. No.	District	No. of Junction Stations	No. of crossing stations	No. of major bridges
1	Banaskantha	1	1	1
2	Patan	-	1	1
3	Mahesana	-	1	2
4	Gandhinagar	-	-	-
5	Ahmedabad	1	1	1
6	Kheda	-	-	1
7	Anand	-	1	-
8	Vadodara	1	-	3
9	Bahruch	-	2	1
10	Surat	1	1	3
11	Navsari	-	1	3
12	Valsad	-	2	10

CHAPTER 4 EXISTING ENVIRONMENT

4.1 INTRODUCTION

Gujarat has three distinct geographical regions, namely, the eastern hilly region, the plains and the peninsular region of Saurashtra and Kachchh. The hilly region is composed of the terminal parts of four mountain ranges: Sahyadri and Satpura in the South, Vindhyan range to the centre and the Aravalli range in the North. The plains extend from north-east to the south, constituting about half of the area of the state. The peninsular region of Saurashtra and Kachchh in the west is joined to the mainland by a connecting low lying land. The major soil type found is the black cotton soil that covers about 38% of the state's area, while the sandy type of soil covers about 33% of the area.

The state has about 185 rivers of various sizes, the major ones being Sabarmati, Mahi, Tapti and Narmada. The average annual precipitation is reported to be 828, though there is significant variation in the geographic distribution of rainfall.

Although the forest cover in Gujarat is only 9.5%, the state has a rich and varied biodiversity. The ecosystem diversity includes inland wetlands, grasslands, the forests, saline desert ecosystem, desert, mangroves and the marine ecosystem. The state's flora comprises of 4,320 species. The vertebrate fauna recorded stands at 1,318 species, representing 27% of the vertebrate fauna of the country. The key fauna include the Asiatic lion, Leopard, Sloth bear, Blackbuck. Gujarat's wetlands attract millions of migratory birds in the winter months.

This chapter presents the results of the study conducted on the state of natural environment of each of the 8 districts.

4.2 APPROACH AND METHODOLOGY

The approach of the study involved review of secondary data and primary survey of the project area. Secondary data is used to compile the regional features whereas primary data is used to describe project Influence area. The Natural Environment Assessment consist review of Topography, Geology, Soil, Groundwater, Hydrology, Flora and Fauna of the project Area. Primary survey is followed by consultation with local people to get the relevant information about the area.

The methodology for carrying out the study for the proposed project is based on the guidelines issued by Ministry of Environment & forest (MoEF) and JICA guidelines. The component wise methodology adopted for this study is given below.

- Air Quality: To establish the air quality of the study corridor, secondary data have been collected from the Annual Report (2006-2007) of Gujarat Pollution Control Board. Based on the Annual Report, the ambient air quality of major towns/cities along the DFC corridor has been established.
- Surface & Ground Water Quality: To establish the water quality of major rivers coming within the study area, secondary data have been collected from the Annual Report (2006-2007) of Gujarat Pollution Control Board. Based on the Annual Report, the ground water quality of major towns/cities along the DFC corridor and water quality of major rivers has been established.
- Geology & Soil Quality: Information about topography, geology and soil quality of the study area has been collected from Geological Survey of India.
- **Biological Environment (Flora, Fauna & Forest):** To characterize the vegetation of Forest Area, standard quadrat method and random sampling approach has been adopted. The detailed methodology if given below:

The density measurements reflect as to how many individuals were present, the dominance measurements denote which species is largest in terms of its presence and the frequency measurements indicate how widely species is distributed among the same plots. Importance value is a reasonable measure to assess the overall significance of a species since it takes into account several properties of the species in the vegetation. Importance value index will be calculated as per Curtes & Mc Intosh (1950). The following parameters will be assessed from the field data measurements.

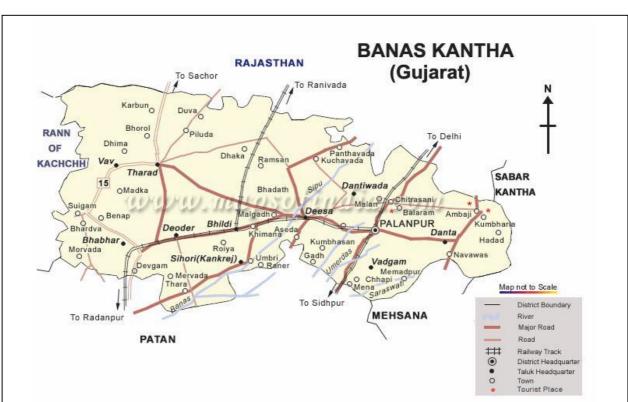
Scale = Per m^2 . **Quadrate Size =** $10 \text{ m x} 10 \text{ m} = 100\text{m}^2$ Frequency (F) = $\frac{\text{Total no. Of quadrates in which the species occur x 100}}{\text{Total No of quadrate studied}}$ **Relative Frequency of a species (RF)** = $\frac{\text{Frequency of the species in stand x X 100}}{\text{Sum of the frequencies for all species in stand x}}$ **Density of a species** Total No Of individuals of species in all the sample plot per unit area (D) = Total No of sample plots studied Relative density of a species (RD) = $\frac{\text{Total no of individuals of a species X 100}}{\text{Total No of individual of all species}}$ Abundance of a species $(AB) = \frac{\text{Total number of individual of the species in all quadrates}}{\text{Total number of quadrate in which the species occurred}}$ **Relative Dominance** Total Basal area of a species in all the quadrates X 100 of the species (RDO) = Total Basal area of all the species in all the quadrates 2 X No. of common species X 100 **Index of Similarity** Total number of species in both associations

Importance Value Index = (Relative Density + Relative Dominance + Relative Frequency)

4.3 EXISTING NATURAL ENVIRONMENT

4.3.1 Banaskantha

The Banaskantha District lies between 23°35' to 24°43' north latitudes and 71°0' to 73°0' east longitudes on the banks of the Banas River, in the north-western part of Gujarat. The district occupies an area of 12,702 km², with a population of 2,162578. To the north of this district lies Rajasthan State. In the south it is bounded by Mahesana District. Sabarkantha District lies to the east while the Kachchh District occupies the area west of it. At present, the district is divided into 12 talukas for administrative purpose. All C.D. block boundaries of this district are co-terminus with taluka boundaries. The terrain of this district can be divided into two broad physiographic sub-divisions viz., eastern hilly region and western plain region. The eastern part of the district is rugged and hilly. The region is highly elevated in the district and the altitude ranges between 100 m and 300 m above M.S.L. The region is well forested. The western region of the district is a vast level plain with an elevation of below 100 m from mean sea level. This tract is devoid of any significant vegetation and the area touching on the Rann of Kachchh is an extensive salt marsh. The general slope of the district is from north-east to south-west in which direction all the rivers flow. Banas is the principal river of the district.



Other minor rivers are Umardasi, Saraswati, and Sukal. These are non-perennial. Most of the rivers of the district originate in the Aravalli Hills and are monsoon dependent.

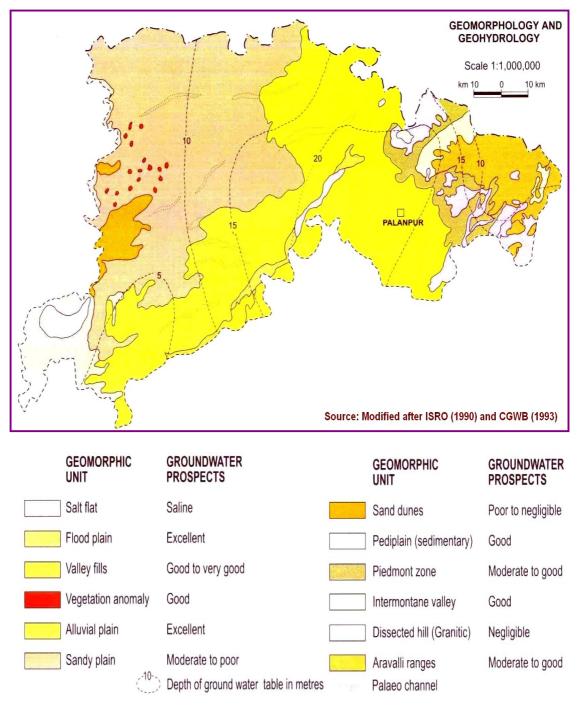
Figure 4-1 Banaskantha District

(1) Geology

The oldest litho units belonging to the Delhi Supergroup of rocks occupy the eastern part of the district. These rocks are represented by the metasediments of the Todgarh/Basantgarh Formations of the Kumbhalgarh Group and Jiyapura and Reodar Formations of the Sirohi Group. The metasediments of the Kumbhalgarh Group are predominantly calcareous and are intruded by the basic intrusives of Phulad Ophiolite Suite and Sendra-Ambaji Granite and gnesises. The younger Sirohi Group is dominantly argillaceous with some calcareous bands. The Delhi Supergroup of rocks are subjected to still younger igneous activity represented in the form of Jalor Granite and rhyolite porphyry, belonging to the Malani Igneous Suite. The Mesozoic sediments are represented by the Katrol and Bhuj Formations and comprise arenaceous and argillaceous sediments in the north-western part of the district.

(2) Topography

The landscape is characterized by a subdued topography comprising a variety of depositional landforms. The transitional area between the plain and the highland is marked by a pediment zone of undulating topography, characterized by low altitude mounds and hillocks of stabalised Aeolian sands dunes. There are also small alluvial fans and cones of fluvial material brought by the rivers coming from the neighbouring highland. The central part of the plain shows mix topography of fluvial plains marked by subdued fossil dunes. The western part is almost a level ground of saline waste land with a thin veneer of sand and silt.

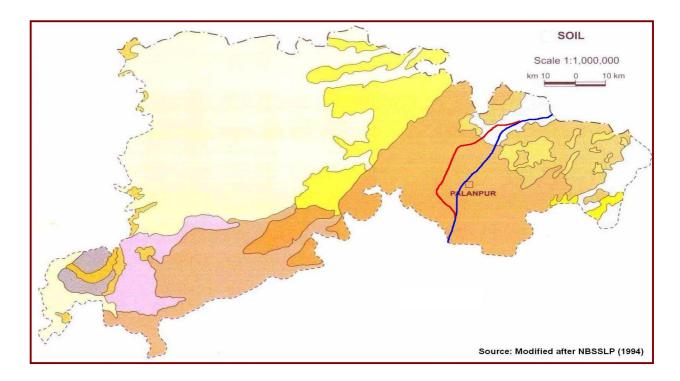


(3) Geomorphology and Geohydrology

Figure 4-2 Geomorphology and Geohydrology of Banaskantha District

(4) Soil

The soils of Banaskantha Districts are poorest from agriculture point of view as the soil is deficient in organic matter and nitrogen. The sub-soil well waters are highly saline and are not normally useful for irrigation. In western part of the district, saline soil is found with salt content varying from 0.5 to 2.5%. The western part of Banaskantha District has coarse shallow soils derived from granites, known as alluvial soil. The soil type of the study corridor is mixed, calcareous, coarse, loamy soil with slight to moderate salinity. The different soil types of the district are shown in **Figure-4.3**.



Mixed, calcareous, coarse, loamy soil
Rock outcrops with loamy, skeletal, mixed soil
Coarse to fine loamy, mixed calcareous soil with slight to moderate salinity
Mixed, calcareous, coarse loamy soil
Loamy-skeletal, coarse-loamy, mixed soil
Fine to coarse-loamy, mixed, calcareous soil with strong salinity
Fine loamy, mixed, calcareous soil with strong salinity
Coarse to fine loamy, mixed soil
Fine loamy, mixed, calcareous soil
Existing Railway Track Detour Alignment

Figure 4-3 Soil Types of Banaskantha District

(5) Agriculture

The major crops grown in Banaskantha District are given in the following table:

Name of the Crop	Scientific Name	Remarks
Bajri	Pennisetum typhoidem	Kharif crop
Wheat	Triticum vulgare	Rabi crop
Maize	Zea mays	Kharif crop
Pulses		Kharif crop
Tur	Cajanus indicus	
Gram	Cicer arietinum	
Mag	Phaseolus radiatus	
Math	Phaseolus acontifolius	
Udid	Phaseolus mungo	
Val	Lablab niger	
Isabgul	Plantago ovata	Kharif crop
		It is a sort of husk, which has a high medicinal
		value and therefore exported abroad

Table 4-1 Major Crops Grown in Banaskantha Distri

(6) Land Use

The Land use profile of the Banaskantha District is given in **Table 4-2**.

Area (ha)
12,703
690
369
696
0
246
0
440
6,408
2,985
11,393

Source: District Gazetteer

(7) Climate and Meteorology

The climate of the area is moderate and tropical characterized by a hot summer from March to Mid June, a humid monsoon or rainy season stretching from Mid June to September, a short pleasant post-monsoon during October and November, and a cool winter spanning between December and February. Therefore, climatologically, four seasons viz. summer (pre-monsoon), monsoon, post-monsoon and winter could be deciphered comprising the following months:

Summer	:	March, April, May
Monsoon	:	June, July, August, September
Post-monsoon	:	October, November
Winter	:	December, January, February.

Past meteorological data described in this section have been collected from the nearest IMD observatory located at Deesa, which deemed representative of the study corridor. Available past meteorological data has been collected and presented in **Table 4-3**.

Month	Daily Temperature (⁰ C)		Relative Humidity (%)		Total Rainfall	No of Rainy	Total Cloud Cover(octas)		Wind Speed
	Max	Min	0830	1730	(mm)	Days	0830	1730	(km/h)
January	27.3	9.8	59	29	2.7	0.3	1.2	1.1	7.5
February	30.2	12.0	53	24	0.9	0.1	1.3	1.1	7.4
March	35.1	17.1	48	21	4.3	0.1	1.4	1.5	7.9
April	39.0	21.9	49	20	0.1	0.0	1.2	1.4	7.8
May	41.0	25.3	63	23	1.4	0.2	1.7	1.2	10.7
Jun	38.5	26.7	73	40	59.2	2.6	4.5	3.4	14.3
July	33.6	25.4	84	62	215.7	9.1	6.2	6.0	11.7
August	32.2	24.5	87	67	163.2	8.0	6.1	5.8	9.4
September	33.7	23.5	81	55	102.2	4.1	3.7	3.8	7.1
October	36.1	19.7	62	32	12.6	0.6	1.1	1.5	5.8
November	33.0	15.2	54	30	10.2	0.6	1.1	1.2	6.0
December	29.3	11.2	58	31	6.3	1.2	1.2	1.3	6.7
Mean/Total	34.1	19.4	64	36	578.8	26.9	2.6	2.4	8.5

Table 4-3 Mean Monthly Climatological Records (Based on Records of IMD, 1951- 1980)

Source: India Meteorological Department (IMD)

In Banaskantha District January is the coldest month with the mean daily minimum temperature of 9.8°C and maximum of 27.3°C. March onwards the temperature begins to rise rapidly and May is the hottest months with the mean daily maximum temperature of 41°C and minimum of 25.3°C. Thereafter, the advent of monsoon brings down the temperature. Monsoon withdraws in October but the temperature continues to fall gradually up to January, the middle of winter. The annual average of maximum and minimum mean daily temperatures are 34.1°C and 19.4°C respectively.

The air is fairly humid through the major part of the year and the mean relative humidity rises during the monsoon months, particularly July to September ranging between 81-87% in the morning (0830 IST) and 55-67% in the evening (1730 IST). As usual, it is dry in the summer months, particularly April to May, the mean relative humidity ranging between 49-63% in the morning and 20-23% in the evening. The above trend in humidity in various seasons clearly shows a discernible influence of rain on humidity. The highest mean relative humidity is recorded in August (87% in the morning and 67% in the evening), a wet monsoon month and the lowest mean relative humidity is recorded in March (48% in the morning and 21% in the evening). The annual mean relative humidity is about 64% in the morning and 36% in the evening, which correlates well with the tropical humid climate of the area. As usual, the humidity in the morning (0830 IST) is more than that in the evening (1730 IST) during all the months.

The total annual rainfall received along the study corridor is about 578.8 mm. The four monsoon months (June to September) contribute about 80% of the total annual rainfall. Lowest rainfall is observed in April (0.1 mm) and highest rainfall is observed in July (215.7 mm). Total number of rainy days is about 26.9 days per annum. Winds are generally moderate to high through out the year. The annual mean wind speed is 8.5 km/h with the mean monthly wind speed 5.8-6.7 km/h (during October-December) and 10.7-14.3 km/h (May to July).

(8) **River System**

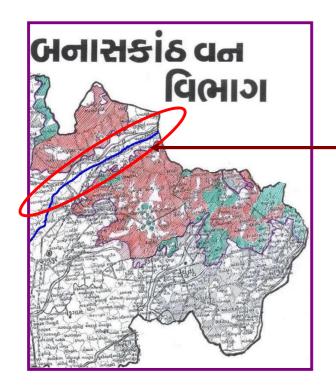
The Banas is the most important river of the district. It rises in the Dhebar lake among the Udepur hills in the Rajasthan State and flows westwards in the Banaskantha District. The chief tributary of the Banas is the Balaram, which joins the Banas near Karaj in Palanpur taluka.

The new alignment of Palanpur detour crosses the Balaral River between the Jethi and Bantwada Villages.



(9) Forest, Flora & Fauna

Forest along the Detour Section: The Palanpur detour alignment crosses three Reserved Forest namely Jethi Reserved Forest, Bantawada Reserved Forest and Malana Reserved Forest. The detour alignment passes through the agricultural land in between Balaram Ambaji Wildlife Sanctuary (located on eastern side) and Jassor Wildlife Sanctuary (located on western side). The Forest Department has the future plan to develop a corridor to join these two Wildlife Sanctuaries. The key tree species found in the reserve forest areas are listed in **Tables 4-4** and **4-5** and the Balaram Ambaji sanctuary is described below.



Detour Alignment between Balaram Ambaji Wildlife Sanctuary and Jassor Wildlife Sanctuary

Table 4-4 Major Tree Species of Jethi and Bantawada Reserved Forest

Local Name	Scientific Name
Amala	Emblica officinalis
Bor	Zizyphus jujube
Dudhi	Wrightia tinctoria.
Garmala	Cassia fistula
Hinger	Balanites roxbughii
Timru	Diospyors melanoxylon
Ankol	Alangium salvifolium
Ghatbor	Zizyphus xylopyrus
Gurab	Helectaris isora
Tal Baval	Acacia farnesiana

Source: State Forest Department, Palanpur Division

Table 4-5 Major tree species of Jethi and Bantawada Reserved Forest

Local Name	Scientific Name
Aniyar	Acacialeucophloea
Bili	Aegle marmelos
Kakad	Garuga pinnata
Kala-Siris	Albizia odoratissima
Rayan	Soymida febrifuga
Ankol	Alangium salvifolium
Kantharo	Capparis sepiria
Kardo	Capparis aphylla

Source: State Forest Department, Palanpur Division

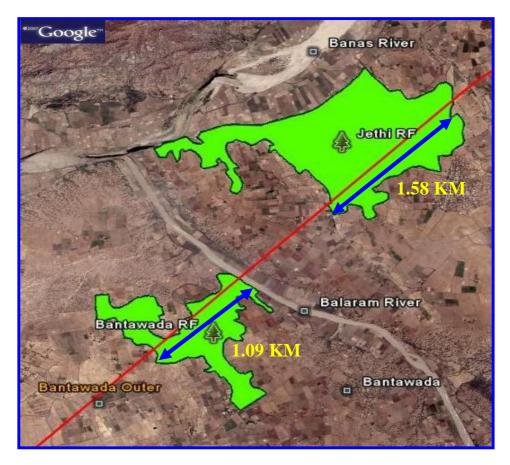
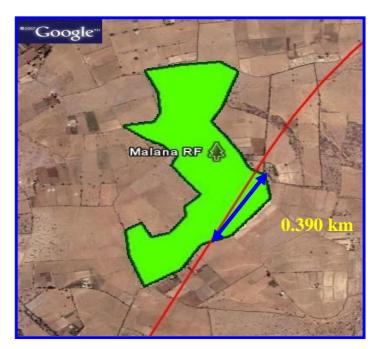


Figure 4-4 Location and Length of Reserved Forest along Palanpur Detour



Plantation along the Parallel Section Figure 4-5 Location and Length of Reserved Forest along Palanpur Detour

Station/ Place	Length	No. of Trees		es	Name of the Trees	Demoster
Name	ne (m) West East Total		Ivalle of the Trees	Remarks		
Amirgarh	1,200	320	280	600	Ardua, Khakra, Babul	Natural
Sarotra	500	120	110	230	Babul, Neem, Khakra, Bordi	Natural
Kalimati	600	340	250	590	Babul, Neem, Khakra, Bordi	Natural
Laxmipura-West	500	360	290	650	Babul, Neem, Khakra, Bordi	Natural
Juni Sarotri Gate No-151	1000	400	400	800	Babul, Neem, Khakra, Bordi	Natural & Private
Iqbalgarh	1000	280	245	525	Babul, Neem, Palas	Natural & Private
Chekhata Gate	1200	170	230	400	Small Babul, Neem, Palas	Natural
No-154						
Gangasar	500	70	80	150	Babul, Neem, Palas	Natural
Chitrasani	500	90	110	200	Small Babul, Neem, Palas	Natural
Jaspuriya	700	100	50	150	Neem, Mango, Babul	Natural
Hebatpur	900	210	265	475	Neem, Babul, Palas, Bordi	Natural
Palanpur	500	15	65	80	Neem, Babul	Natural
(checkpost)						
Kanodar	600	0	15	15	Israili Babul	Natural
Chhapi	750	14	86	100	Babul, Neem, Israili Babul	Natural
	Total	2489	2476	4965		

Table 4-6	Details of Railwa	y side Plantation
	Botano or rtanno	y oldo i lantation

Source: State Forest Department, Palanpur Division

(10) Wild Life Sanctuary

BALARAM AMBAJI WILDLIFE SANCTUARY

Undulating hills of Aravalli, supporting the dry deciduous forests of North Gujarat, provide an unimaginably beautiful ambience to Balaram-Ambaji Wildlife Sanctuary. The sanctuary derives its name from two historical temples- Balaram and Ambaji, situated at the opposite corners of the sanctuary. This picturesque area was constituted as Wildlife Sanctuary a bv Government of Gujarat on 7th August' 1989 for the purpose of protection, propagation and development of wildlife and its environment. The total area of the



Sanctuary is 542.1 km². The area is characteristically rich in floral diversity- particularly medicinal plants. It has numerous floral and faunal species of global conservation significance. The predominant trees are- Khair, Salai, Modad, Dhavada, Khakhara, and Timru. During late winters (February-March) Khakhara- the flame of the forests- known by many different names such as Palash, Tesu, Kesudo, Dhak etc. is generally in bloom with its striking red colour resembling flames in the forests.

Flora: The excessive biotic pressure in the sanctuary area has resulted in reduced regenerative capacity of various floral species leading to loss of biodiversity. Several species of global importance, as indicated by the IUCN List of Threatened Plants, are found in the sanctuary

and protection measures are to be reinforced for the conservation of these species. A list of such species and their IUCN category is given in **Table 4-7**.

The DFC alignment does not pass through the Balaram Ambaji Wildlife Sanctuary. The present alignment of Palanpur detour is such selected that it avoids the Wildlife Sanctuary. However, the previous Palanpur detour alignment joined the existing Mumbai-Delhi broad-gauge railway track at 300 m south of Karjora station and run parallel in the west side through the Wildlife Sanctuary. The length of the track inside the Balaram Ambaji WLS was about 2.4 km. Transect survey was carried out inside the WLS area along the existing track.

S.N	Scientific Name	IUCN Category	Distribution Area (Villages)
1.	Sterculia urens	Threatened	Hathidra, Zanzarva, Ghoda and
			Koteshwar to Hadad.
2.	Dendrocalamus strictus	Rare	Hathidra, Dharmata, Kansa,
			Karmadi, Kengora.
3.	Tecomella undulata	Rare	Rupvas
4.	Commiphora wightii	Intermediate	Dharmata, Gavra.
5.	Phoenix sylvestris	Threatened	Sembalpani, Karmadi, Bedapani,
			Guda, Virampur.
6.	Anogeissus sericea	Intermediate	Dharmata.
7.	Ceropegia odorata	Endangered	Rupvas, Danta.
8.	Chlorophytum	Rare	Rupvas, Danta.
	borivilianum		
9.	Pavonia arabica	Rare	Rupvas.
10.	Solanum indicum	Rare	Godh.
11	Gloriosa superba	Intermediate	Hathidra, Rupvas.

 Table 4-7
 List of Tree Species and IUCN Category

Source: Gujarat Forest Department, Palanpur Division

These species may not survive if timely action is not taken against threats of extinction. Due to their small population size and restricted distribution, they require intensive care and habitat management. Apart from these species, there are certain other key areas which are of special conservation significance.

> - Fauna: Sloth Bear, *Melursus ursinus* is the flagship species of the Balaram-Ambaji wildlife sanctuary. The top carnivore inhabiting the area is Leopard, *Panthera pardus*.



Other major vertebrate species of the area include the striped hyaena, jungle cat, jackal, Indian fox, common langur, neelgai, palm striped squirrel, hedgehog, Indian pangolin, bats, porcupine, etc.

Popuations of key mammal species of BAWLS		
Leopard	42	
Sloth Be	ar 35	
Striped 1	Hyaena 50	
Wild Bo	ar 69	
• Fox	66	
• Bluebull	57	

Avifauna: The sanctuary is rich in both landbirds and waterbirds. The multi storeyed forests in several parts of the sanctuary and the scrubs in other parts provide a suitable habitat for various avifaunal species. Khapa, Gangasagar and Guda waterbodies and some almost perennial streams provide habitats to a variety of water birds. At least 11 bird species found in the sanctuary are listed in the IUCN Red Data Book and at least 4 bird species are included in the ZSI Red Data Book, are

given in the Table4-8 & 4-9.

Sl. No.	English Name	Scientific Names	Category
1	Lesser Adjutant stork	Leptoptilos javanicus	Threatened
2	Spoonbill	Platelia leucorodia	Threatened
3	Osprey	Pandion haliaeatus	Threatened
4	Common peafowl	Pavo cristatus	Threatened

Source: State Forest Department, Palanpur Division

Sl. No.	English Name	Scientific Names	Category						
1	Red spurfowl	Galloperdix spadicea	Endangered						
2	Grey junglefowl	Gallus sonneratii	Near threatened						
3	Whitebellied minivet	Pericrocotus rythropygus	Near threatened						
4	Indian black ibis	Pseudibis papillosa	Near threatened						
5	Painted stork	Mycturia leucocephala	Vulnerable						
6	Whitewinged black tit	Parus nuchalis	Vulnerable						
7	Openbill stork	Anastomus oscitans	Vulnerable						
8		Gyps bengalensis	Vulnerable						
	vulture								
9	Long-billed griffon	Gyps indicus	Vulnerable						
10	Indian black vulture	Sarcogyps calvus	Vulnerable						
11	Rednecked falcon	Falco chicquera	Vulnerable						

Table 4- 9 Birds of Balaram - Ambaji Sanctuary included in IUCN Red Data Book

Source: State Forest Department, Palanpur Division

Transect Analysis

In Balaram Wildlife Sanctuary, transect analysis was carried out in July 2007 at 10 m x 10 m plots in twenty sampling locations. Average girth size of the species in all sample plots were 56.5 cm and average height were 7.4 m. Average tree density was $0.03/m^2$. Average girth size and height of all species is summarized in **Table 4-10**. Six types of species were observed during the survey, out of which babul was the predominant species. Species wise total number of trees in different sample plots is presented in **Table 4-11**. Species wise frequency, relative frequency, density, relative density, abundance, relative abundance and Important Value Index are presented in **Table 4-12**.





Local	Data	Girth Class								
Name	Data	Α	B	C	D	Е	F			
Akar	Average of Height (m)					25.00				
	Average of Girth (cm)					137.50				
Babul	Average of Height (m)	1.44	7.59	9.28	12.43		3.00			
	Average of Girth (cm)	13.22	42.27	69.56	98.57		200.00			
Israili babul	Average of Height (m)	2.50	6.00	8.50	6.67					
	Average of Girth (cm)	14.11	40.70	68.33	93.33					
Karanj	Average of Height (m)	2.67	8.00			30.00				
	Average of Girth (cm)	13.33	43.33			160.00				
Neem	Average of Height (m)				3.50	20.00	40.00			
	Average of Girth (cm)				95.00	140.00	250.00			
Palas	Average of Height (m)	0.50	5.07	7.50	11.29	13.75				
	Average of Girth (cm)	10.00	40.71	70.00	95.00	136.25				

Note: Girth Class: A: <30 cm, B: 30-60 cm; C: 60-90 cm; D: 90-120 cm E: 120-180 cm F: >180 cm

Table 4-11	Species wise	Total Number of	Trees in Different	t Sample Plots
------------	--------------	-----------------	---------------------------	----------------

Sample Plot		Species							
No.	Akar	Babul	Israili babul	Karanj	Neem	Palas	Total		
1		3	2				5		
2		8					8		
3		10	1			2	13		
4		5	4				9		
5		4				3	7		
6			9				9		
7				1		6	7		
8		5				2	7		
9		2		4			6		
10		8				2	10		
11		1	4	1		3	9		
12			6			2	8		
13		3	1		1	2	7		
14		4			1		5		
15	2		4				6		
16			5			3	8		
17		5		1		2	8		
18		2	5			2	9		
19			4			4	8		
20		4	2		2	2	10		
Total	2	64	47	7	4	35	159		

Species (SP)	Frequency (%) (F)	Relative frequency (RF)	Density (D)	Relative Density (RD)	Abundance (AB)	Relative Dominance (RDO)	Importance Value Index
Akar	5	2.13	0.10	1.26	2.00	5.10	8.49
Babul	70	29.79	3.20	40.25	4.57	37.10	107.14
Israili Babul	60	25.53	2.35	29.56	3.92	12.60	67.69
Karanj	20	8.51	0.35	4.40	1.75	4.30	17.21
Neem	15	6.38	0.20	2.52	1.33	13.60	22.50
Palas	65	27.66	1.75	22.01	2.69	27.30	76.97

Table 4-12 Results of Transect Analysis

ANOVA and T test Results:

Difference in height & girth size at 95% confidence level is not significant. The observed value of T (7.73) (corresponding to an area of 0.05 in both tails of the distribution combined) is greater than the value of T from T table. Therefore, the difference in number of trees in various sample plots is not significant. Detailed results of 'T' Test and ANOVA are given in **Annex-4-1**.

4.3.2 Patan District

Patan District extends over the north-western portion of Gujarat and lies between $23^{\circ} 35'$ and $24^{\circ} 5'$ north latitudes and $71^{\circ} 40'$ and $72^{\circ} 30'$ east longitudes. It is surrounded by the district of Banaskantha from north, by Mahesana District from east and south-east, by Surendranagar District from south and Kachchh District from west. At present the district is divided into 8 talukas for administrative purpose. All C.D. block boundaries of this district are co-terminus with taluka boundaries. This is a newly created district which was carved out from Banaskantha and Mahesana Districts during the decade 1991-2001.

The district covers 5 towns and 517 villages. These are all inhabited villages. According to the Surveyor General of India, the total area of the district is $5,740 \text{ km}^2$. In this district, $5,616.8 \text{ km}^2$ area pertains to rural and 123.25 km² area belongs to urban. The district has increased population from 1,036,019 persons in 1991 to 1,182.709 persons in 2001 and thus registering a much lower growth rate of 14.2% as against the state average of 22.7%. Out of the total population, it has recorded 612.100 persons as males and 570,609 persons as females and indicated a sex ratio of 932 females per 1000 males against the state average of 920. The sex ratio in age group 0-6 population comes to 865 girls per 1000 boys which is below the state average of 883. Out of the total population, as many as 944,281 persons are living in rural areas and remaining 238,428 persons are residing in urban areas. The overall density of population of the district is 206 persons/km² which is below the state average of 258 persons/km².

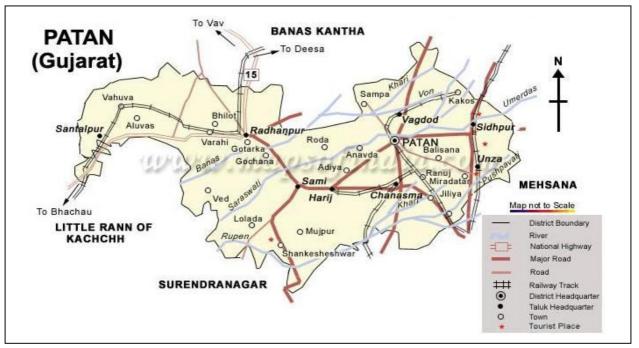


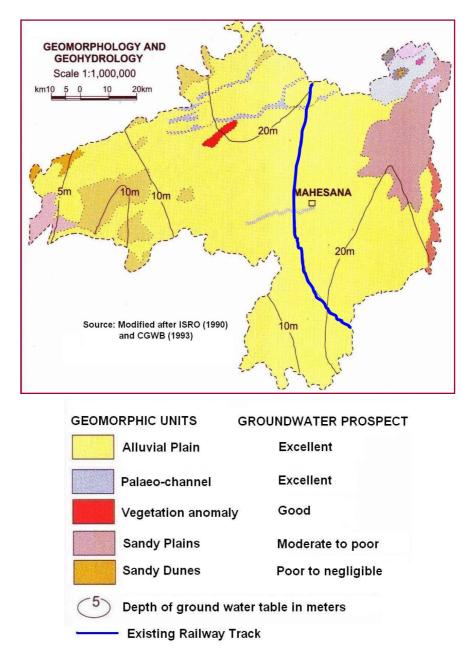
Figure 4-6 Patan District

(1) Geology

The sediments of the plain belong to the youngest geological formation, mostly upper Quaternary, and consist of a thick succession of sandy and clayey layers of fluvial, fluviomarine and Aeolian origin. The depositional environments provide a good example of the control of fluctuating of sea level and climatic changes, which was subjected to neotectonic disturbances from time to time. The deposition has taken place in the N-S trending structural depression of the Cambay basin. The maximum thickness of the deposits is more than 500 m in the central and western part. The sediments in the east are dominantly of fluvial origin. Traced west, they progressively grade into fluviomarine to marine. The western part of the region along the Rann border represents a palaeomudflat.

(2) Topography

The landscape is characterized by a subdued topography comprising a variety of depositional landforms. The transitional area between the plain and the highland is marked by a pediment zone of undulating topography, characterized by low altitude mounds and hillocks of stabilized Aeolian sands dunes. There are also small alluvial fans and cones of fluvial material brought by the rivers coming from the neighbouring highland. The central part of the plain shows mix topography of fluvial plains marked by subdued fossil dunes. The western part is almost a level ground of saline waste land with a thin veneer of sand and silt.



(3) Geomorphology and Geohydrology

Figure 4-7 Geomorphology and Geohydrology of Patan District

(4) Soil

The soils of the region in general are very deep (>150 cm) somewhat excessively to well drained and sandy to fine loamy in texture. They are slight to moderately alkaline and moderate to strongly calcareous; slightly eroded and saline. Salinity and sodicity increases in the areas adjoining the Rann. The soil type of the area through which the DFC alignment is passing in Patan District is shown in **Figure4-7**.

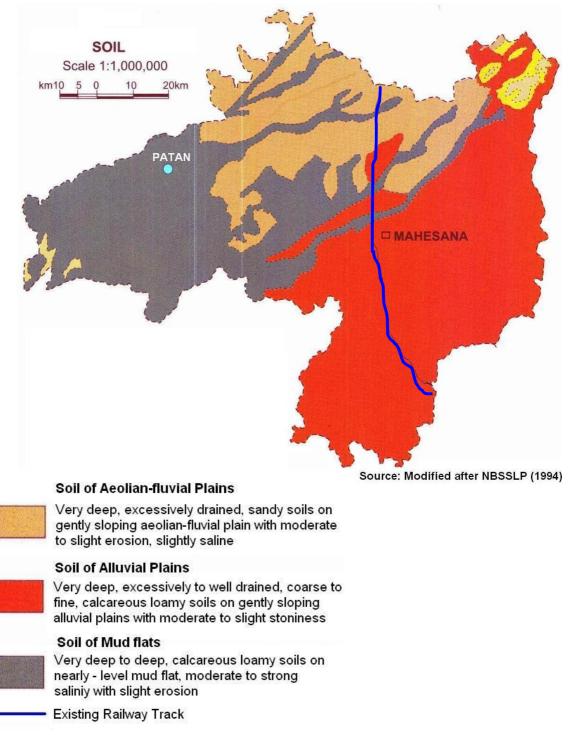


Figure 4-8 Soil Types of Patan District

(5) Agriculture

The major crops grown in Patan District are given in the following table:

Name of the Crop	Scientific Name	Remarks
Bajri	Pennisetum typhoidem	Kharif crop
Wheat	Triticum vulgare	Rabi crop
Maize	Zea mays	Kharif crop
Pulses		Kharif crop
Tur	Cajanus indicus	
Gram	Cicer arietinum	
Mag	Phaseolus radiatus	
Math	Phaseolus acontifolius	
Udid	Phaseolus mungo	
Val	Lablab niger	
Tobacco	Nicotiana tobacum	Kharif crop
Isabgul	Plantago ovata	Kharif crop
		It is a sort of husk, which has a high medicinal value and therefore exported
		abroad

Table 4-13	Maior	Crops	Grown	in	Patan	District
	major	0.000	0.000		i uturi	District

(6) Climate & Meteorology

The climate of the area is moderate and tropical characterized by a hot summer from March to Mid June, a humid monsoon or rainy season stretching from Mid June to September, a short pleasant post-monsoon during October and November, and a cool winter spanning between December and February. Therefore, climatologically, four seasons viz. summer (pre-monsoon), monsoon, post-monsoon and winter could be deciphered comprising the following months:

Summer	:	March, April, May				
Monsoon	:	June, July, August, September				
Post-monsoon	:	October, November				
Winter	:	December, January, February.				

Past meteorological data described in this section have been collected from the nearest IMD observatory located at Radhanpur, which deemed representative of the study corridor. Available past meteorological data has been collected and summarized in **Table4-14** below.

Month	Daily		Relative		Total	No of	Total Cloud		Wind
	Tempera	ture (⁰ C)	Humidity (%)		Rainfall	Rainy	Cover(octas)		Speed
	Max	Min	0830	1730	(mm)	Days	0830	1730	(km/h)
January	27.2	10.0	60	37	2.3	0.2	0.4	0.3	6.5
February	30.4	12.5	60	34	0.7	0.1	0.2	0.3	6.3
March	35.2	17.0	58	28	5.3	0.1	0.3	0.4	6.6
April	39.3	21.9	62	30	0.1	0.0	0.3	0.4	7.4
May	41.6	24.8	70	29	1.7	0.2	0.6	0.4	11.7
Jun	38.6	26.6	78	46	32.3	1.5	2.4	1.4	15.3
July	34.4	25.3	85	63	152.0	6.9	4.6	3.7	13.5
August	33.1	24.2	86	65	97.2	4.8	4.1	3.7	10.8
September	34.3	23.6	82	58	105.1	3.1	2.3	2.5	7.5
October	36.3	20.7	67	39	4.7	0.3	0.3	0.6	5.0
November	32.9	15.9	56	38	1.2	0.1	0.3	0.4	5.3
December	29.1	11.7	62	40	0.1	0.0	0.5	0.4	6.1
Mean/Total	34.4	19.5	69	42	418.9	17.3	1.4	1.2	8.5

Table 4-14	Mean Monthly Climatological Records	
(Bas	sed on Records of IMD, 1951- 1980)	

Source: India Meteorological Department (IMD)

In Patan District January is the coldest month with the mean daily minimum temperature of 10.0°C and maximum of 27.2°C. March onwards the temperature begins to rise rapidly and May is the hottest months with the mean daily maximum temperature of 41.6°C and minimum of 24.8°C. Thereafter, the advent of monsoon brings down the temperature. Monsoon withdraws in October but the temperature continues to fall gradually up to January, the middle of winter. The annual average of maximum and minimum mean daily temperatures are 34.4°C and 19.5°C respectively.

The air is fairly humid through the major part of the year and the mean relative humidity rises during the monsoon months, particularly July to September ranging between 82-86% in the morning (0830 IST) and 63-65% in the evening (1730 IST). As usual, it is dry in the summer months, particularly March to April, the mean relative humidity ranging between 58-62% in the morning and 28-30% in the evening. The above trend in humidity in various seasons clearly shows a discernible influence of rain on humidity. The highest mean relative humidity is recorded in August (86% in the morning and 65% in the evening), a wet monsoon month and the lowest mean relative humidity is recorded in November (56% in the morning and 36% in the evening). The annual mean relative humidity is about 69% in the morning and 42% in the evening, which correlates well with the tropical humid climate of the area. As usual, the humidity in the morning (0830 IST) is more than that in the evening (1730 IST) during all the months.

The total annual rainfall received along the study corridor is about 418.9 mm. The four monsoon months (June to September) contribute about 80% of the total annual rainfall. Lowest rainfall is observed in April (0.1 mm) and highest rainfall is observed in July (152.0 mm). Total number of rainy days is about 17.3 days per annum. Winds are generally moderate to high through out the year. The annual mean wind speed is 8.5 km/h with the mean monthly wind speed 5.0-6.1 km/h (during October-December) and 11.7-15.3 km/h (May to July).

(7) **River System**

The Saraswati is the most important river of the district. The Saraswati River originates from the mountain near Koteshwar in Banaskantha District and disappears in the Rann of

Kachhchha. The river does not meet the sea. The river is considered extremely sacred. The DFC alignment crosses Saraswati River in Sidhapur Town.

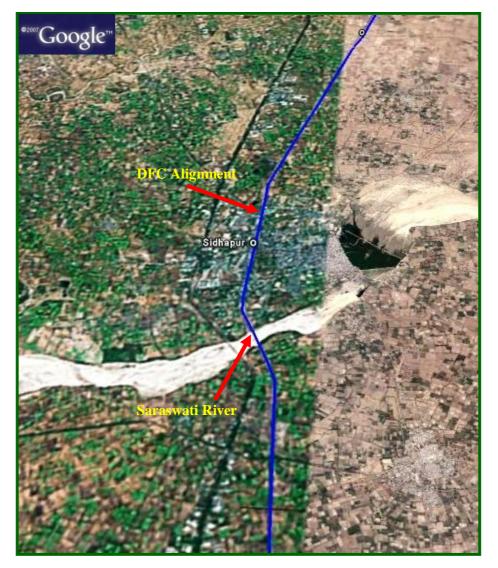


Figure 4-9 River Crossing

(8) Forest, Flora & Fauna

Forest: In Patan District, DFC alignment does not pass through any Reserved Forest or Protected Forest.

Plantation along the Existing Railway Track There is no detour in Patan District. Along the existing track, plantation has been raised by the Forest Department on the railway land. Total number of trees along the track is 2740 and major species are Babul, Neem, Israili babul etc. A detail of Railway side plantation is presented in **Table 4-15**.

Station/ Place	tation/ Place Length No. of 7). of Tree	es	Name of the Trees	Remarks	
Name	(m)	West	East	Total	Name of the Trees	Kemai KS	
Dharevada	500	110	180	290	Babul, Neem, Israili Babul	Natural	
Siddhapur	300	80	60	140	Babul, Neem, Israili Babul	Natural	
Kamli	1000	310	190	500	Babul, Neem, Israili Babul	Govt. Plantation	
Bhandu	600	190	285	475	Babul, Neem, Israili Babul	Govt. Plantation	
Aaithor	1200	380	245	625	Babul, Neem, Israili Babul	Govt. Plantation	
Jetalvasana	800	230	480	710	Babul, Neem, Israili Babul	Govt. Plantation	
	Total	1300	1440	2740			

Table 4-15	Details of	Railway	side	Plantation
		nunuy	0100	i luniulion

Source: Forest Department, Government of Gujarat

4.3.3 Mahesana District

The district is situated in the northern part of the state and lies between 23^0 5' and 24° 10' north latitudes and 72° 0' and 73° 0' east longitudes. It makes its boundaries with Banaskantha District in the north, Sabar Kantha District in the east, Gandhinagar District in the south east, Ahmedabad District in the south and Patan District in the west. Surendranagar District also touches this district. At present, the district is divided into 9 talukas for administrative purpose. All C.D. block boundaries of this district are co-terminus with taluka boundaries.

The terrain of the district is almost flat plain except a small hilly portion in the eastern part of Kheralu taluka with an elevation ranging from 57 metres to 370 metres above M.S.L. The general slope of this district is from north-east to south-west. The maximum height is recorded at Tranga Hill where the Rupen River originates. The eastern portion of the district is rich in vegetation.

Sabarmati, Rupen and Pushpawati are the major rivers of the district and flow towards southerly and westerly directions respectively.

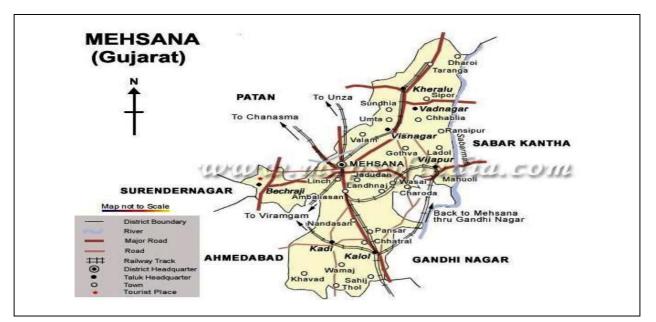


Figure 4-10 Mahesana District

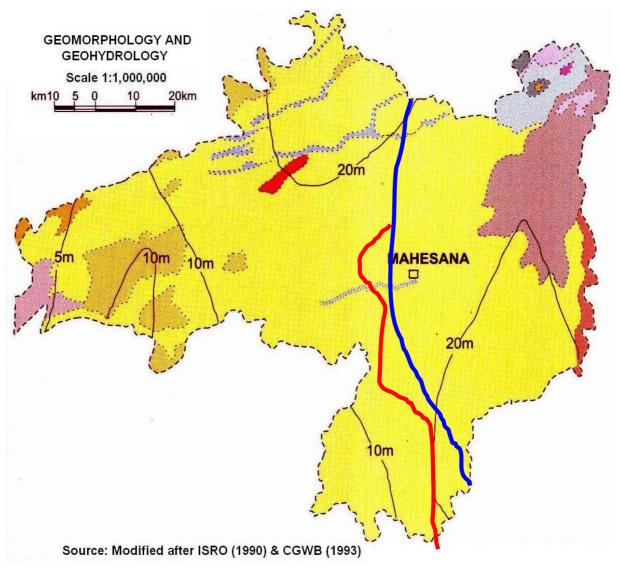
(1) Geology

Calc-gneiss and para-gneiss belonging to the Kumbhalgarh Group of the Delhi Supergroup are the oldest rocks exposed in the northeastern parts of the district. These are intruded by the Sendra- Amabaji and Idar (Malani) granites. The Tertiary sediments are represented by the Gaj and Miliolite and the Vend Formation of the Porbandar Group. The Gaj Formation comprises a repetitive sequence of fossiliferous sandstone, limestone, calcareous siltstone and gypseous clays. The calcareous and oolitic deposits in the area containing calcareous grit, calcareous sandstone, grapestone, calcareous siltstone and polymictic conglomerate, (associated with Mililoid foraminifer) are included in the Miliolite Formation. The Vend Formation occurs as small inliers within the Holocene sediments and is represented by very finely laminated, variegated calcareous clay, siltstone and sandy gravel- pebbly marl. The Holocene sediments comprise marine, fluvial, aeoline and fluvio marine facies. The marine sediments grouped under the Rann Clay Formation include dark grey to greenish clay. The fluvial counterpart of the Rann clay Formation is the Katpur Formation representing flood plain and levee deposits. These unimodal to bimodal deposits of fine to medium grained sand, sand -silt granules occur as widespread sheets. The Akhaj Formation forms Aeolian sand sheets and sand dunes comprising medium to fine grained, sub-angular and subrounded silty sand. The present- day fluvial deposits confined to either side of the present day river channels of the Sabarmati, Rupen and Saraswati Rivers are grouped under the Varahi Formation, and consist of immature, unconsolidated sand and silt. The Jantral Formation represents comparatively unstablised sand sheet and sand dunes made up of unimodal fine sand.

(2) Topography

The landscape is characterized by a subdued topography comprising a variety of depositional landforms. The transitional area between the plain and the highland is marked by a pediment zone of undulating topography, characterized by low altitude mounds and hillocks of stabilized Aeolian sands dunes. There are also small alluvial fans and cones of fluvial material brought by the rivers coming from the neighbouring highland. The central part of the plain shows a mix topography of fluvial plains marked by subdued fossil dunes. The western part is almost a level ground of saline waste land with a thin veneer of sand and silt.

(3) Geomorphology and Geohydrology



Geomorphic Unit	Groundwater Prospects
Alluvial Plain	Excellent

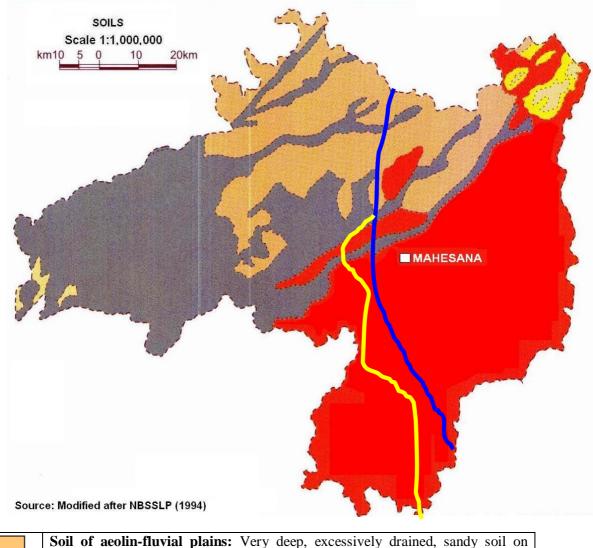
Parallel Section

Detour Section



(4) Soil

The diverse soil types of the district include well-drained, calcareous loams, calcareous sandy soils and well drained skeletals soils.



Soil of acolin-fluvial plains: Very deep, excessively drained, sandy soil on gently sloping acolian-fluvial plain with moderate to slight erosion, slightly saline
Soil of mud flats: Very deep to deep, calcareous loamy soils on nearly-level mud flat, moderate to strong salinity with slight erosion
Soil of alluvial plain: Very deep, excessively well drained, coarse to fine, calcareous loamy soils on gently sloping alluvial plains with moderate to slight stoniness

Parallel Section

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Detour Section

Figure 4-12 Soil Types of Mahesana District

(5) Agriculture

The Soils of Mahesana District is poorest from agriculture point of view as the soil is deficient in organic matter and nitrogen. The sub soil well waters are however, highly saline and are not normally useful for irrigation. In western part of the district, saline soil is found with salt content varying from 0.5 to 2.5%. However, 90% of the soils of this area is of sandy nature, a soil which is black in colour is met with in patches, chiefly in south-west parts of Mahesana District. The western part of Mahesana District has coarse shallow soils derived from granites, known as alluvial soil. The major crops grown in Mahesana District are given in the following table:

Name of the Crop	Scientific Name	Remarks
Bajri	Pennisetum typhoidem	Kharif crop
Wheat	Triticum vulgare	Rabi crop
Isabgul	Plantago ovata	Kharif crop
Tobacco	Nicotiana tobacum	Kharif crop
Cotton	Gossypium herbaccum	

(6) Climate & Meteorology

The climate of the area is moderate and tropical, characterized by a hot summer from March to Mid June, a humid monsoon or rainy season stretching from Mid June to September, a short pleasant post-monsoon during October and November, and a cool winter spanning between December and February. Therefore, climatologically, four seasons viz. summer (pre-monsoon), monsoon, post-monsoon and winter could be deciphered comprising the following months:

Summer	:	March, April, May
Monsoon	:	June, July, August, September
Post-monsoon	:	October, November
Winter	:	December, January, February.

Past meteorological data described in this section have been collected from the nearest IMD observatory located at Idar, which deemed representative of the study corridor. Available past meteorological data has been collected and summarized in **Table 4-17**.

Month	Daily		Relative		Total	No of	No of Total		Wind
	Tempera	ture (⁰ C)	Humidity (%)		Rainfall	Rainy	Cover	(octas)	Speed
	Max	Min	0830	1730	(mm)	Days	0830	1730	(km/h)
January	27.5	14.5	39	27	1.4	0.1	1.0	1.0	7.1
February	30.1	15.8	36	21	0.9	0.0	0.8	0.8	7.2
March	34.6	19.7	34	17	3.3	0.2	1.3	1.3	7.5
April	38.8	23.4	38	15	1.1	0.0	1.2	1.4	7.8
May	40.5	25.1	56	19	5.9	0.4	1.3	0.7	9.0
Jun	37.7	25.5	73	41	106.5	4.4	4.9	3.5	10.3
July	32.3	24.2	87	66	308.7	12.7	6.9	6.4	7.6
August	30.5	23.6	90	72	248.9	12.5	7.1	6.6	5.9
September	32.3	22.9	81	58	147.2	5.4	4.5	4.4	5.2
October	35.0	21.6	50	33	17.8	0.8	1.3	1.2	4.9
November	32.4	19.0	37	29	2.3	0.1	1.1	1.2	5.5
December	29.1	16.2	40	30	3.7	0.2	1.4	1.5	6.4
Mean/Total	33.4	21.0	55	36	847.7	36.8	2.7	2.5	7.0

Table 4-17 Mean Monthly Climatological Records (Based on Records of IMD, 1951- 1980)

Source: India Meteorological Department (IMD)

In Mahesana District January is the coldest month with the mean daily minimum temperature of 14.5°C and maximum of 27.5°C. March onwards the temperature begins to rise rapidly and May is the hottest months with the mean daily maximum temperature of 40.5°C and minimum of 25.1°C. Thereafter, the advent of monsoon brings down the temperature. Monsoon withdraws in October but the temperature continues to fall gradually up to January, the middle of winter. The annual average of maximum and minimum mean daily temperatures are 33.4°C and 21.0°C respectively.

The air is fairly humid through the major part of the year and the mean relative humidity rises during the monsoon months, particularly July to September ranging between 81-90% in the morning (0830 IST) and 58-72% in the evening (1730 IST). The trend in humidity in various seasons clearly shows a discernible influence of rain on humidity. The highest mean relative humidity is recorded in August (90% in the morning and 72% in the evening), a wet monsoon month and the lowest mean relative humidity is recorded in March (34% in the morning and 17% in the evening). The annual mean relative humidity is about 55% in the morning and 36% in the evening, which correlates well with the tropical humid climate of the area. As usual, the humidity in the morning (0830 IST) is more than that in the evening (1730 IST) during all the months.

The total annual rainfall received along the study corridor is about 847.7 mm. The four monsoon months (June to September) contribute about 80% of the total annual rainfall. Lowest rainfall is observed in February (0.9 mm) and highest rainfall is observed in July (308.7 mm). Total number of rainy days is about 36.8 days per annum. Winds are generally moderate to high through out the year. The annual mean wind speed is 7.0 km/h with the mean monthly wind speed 4.9-6.4 km/h (during October-December) and 7.6-10.3 km/h (May to July).

(7) **River System**

The district is drained by three south westerly flowing rivers namely the Saraswati, Khari, Rupen, and their tributaries. *DFC alignment crosses Khari River twice in Mahesana District*. In Vamaj Village, DFC alignment crosses Narmada Canal (23°14'58.88"N, 72° 24'44.16"E). The details of river crossing are given in **Table 4-18**.

S. N.	Name of the River	Village	Northing	Easting
1.	Khari River	Aithor	23° 44' 10.73"N	72° 23' 14.09"E
3.	Khari River	Palodar	23° 40' 4.60"N	72° 23' 23.10"E

Table 4-18	Location	of River	Crossing
		•••••	••••••••••••••••••••••••••••••••••••••

Source: Field Survey



(8) Forest, Flora & Fauna

Forest: There is a negligible area under forests in Mahesana District. The district does not have any Reserved Forest, but has a wetland Bird Sanctuary (Thol). However, the whole district is green with vegetation containing number of trees such as *Tectona grandis* (Teak), *Accacia catechu* (Khair), *Zizyphus mauritania* (Bordi), *Ficus infectoria* (Pipal) etc. The DFC alignment does not cross any forest in Mahesana District.

THOL BIRD SANCTUARY

Thol Bird Sanctuary is located 40 km northwest of Ahmedabad, in Kadi Taluka of Mahesana District. Thol Lake, created in 1912, covers 7 km² of mostly open water. There are small marshes at the edges and some scrub forest on the sides of the high embankments. This man made wetland, declared as a Sanctuary in November 1988, has high conservation value. The tallest flying bird of the world Sarus crane inhabits this area and is found in good number. A shallow water reservoir and predominantly open water area without island, reeds beds



give it a distinct ambience. Thol Sanctuary is located in the east of DFC alignment (detour section). The distance between DFC alignment and Thol Sanctuary is varying between 80 m to 245 m.



Avifauna of Thol Sanctuary: Large number of waterfowls are attracted to this site. The lake is also surrounded by good tree covers. Thol is well known for wintering Flamingos, a variety of waterfowls including Mallards and good numbers of Greylag Goose, Sarus Cranes, Kingsifher, Heron, Spoonbill etc. There are more than 80 species of waterfowls reported at Thol. Some of the important bird species are:





Local Name	Botanical Name
Lesser Flamingo	Phoenicopterus minor
Greylag Goose	Anser anser
Sarus Crane	Grus antigone
Pied Kingfisher	Ceryle rudis
Common Kingfisher	Alcedo atthis
Little Heron	Butorides striatus
Eurasian Spoonbill	Platalea leucorodia
Green Bee-Eater	Merops orientalis
Common Pochard	Aythya ferina
Rose Ringed Parakeet	Psittacula krameri
Yellow Footed Green Pigeon	Treron phoenicoptera
Purple Swamphen	Porphyrio porphyrio
Common Snipe	Gallinago gallinago
Black Winged Stilt	Himantopus himantopus
River Tern	Sterna aurantia
Osprey	Pandion haliaetus
Indian Pondheron	Ardeola grayii
Little Egrets	Egretta garzetta
Source: Forest Department, Go	vt. of Gujarat



Flora: Emergent and floating aquatic plants are there at Thol Bird Sanctuary along with some terrestrial trees and herbs such as Babul, Bor, Neem, Vad, Pilu, Gando Baval, Kerdo etc.



Plantation along the Existing Railway Track: Length of the parallel section of DFC in Mahesana District is **23.4 km**. Along the existing track; plantation has been raised by the Forest Department on the railway land. Total number of trees planted along the track is presented in **Table 4-19**. Last plantation was carried out during the year 1994-1995. Information about railway side plantation has been collected from the record of Forest Department. But the number of trees actually exist on either side of the track is much lesser.

Name of Taluka	Location	No	Species		
Unjha	Kamli to Unjha	4950	Gulmahor, Babul, Bangal Baval,		
Visnagar	Unjha to Bhandu-Motidau	3500	Sharu, Arujunsadad, Karanj, Pangaro,		
			Vans, Boganvel, Karan		

Table 4-19 Details of Railway Side Plantation

Source: Forest Department, Government of Gujarat

Plantation along the Detour: The detour portion of DFC in Mahesana District (**57.8 km**) is a part of Ahmedabad detour and the detour alignment is mainly passing through agricultural land. There is no plantation raised by the Forest Department along the detour alignment except few private trees. The major tree species along the detour alignment are Neem, Pipal, Babul, Teak etc.

4.3.4 Gandhinagar District

Gandhinagar District is part and parcel of the fertile plain of north Gujarat and State Capital. The district is situated in the central part of the state and lies between 23^0 15' and 23^0 38' north, latitudes and 72^0 42' and 73^0 15' east longitudes. It makes its boundaries with Mahesana District in the north and west, Ahmedabad and Kheda Districts in the south and Sabar Kantha District in the east. The district carved out of the villages which formerly belonged to the Ahmedabad and Mahesana Districts. These villages were of the city, Dehgam and Daskroi talukas of Ahmedabad District and the Kalol District of Mahesana District. At present, the district is divided into 4 talukas for administrative purpose. All C.D. block boundaries of this district are co-terminus with taluka boundaries.

The entire district is a part of north Gujarat plain with neither hill features nor any significant natural bodies of water except the Sabarmati River. Sabarmati is the principal river of the district which flows from north to south direction and divides it almost into two parts. Other rivers are Khari, Meshwa and Vatrak which also traverse the district in north-southerly direction. The north-eastern portion of the district is relatively higher than south-western part.

The elevation varies between 68 metres and 100 metres above M.S.L. The district has no forests of any significance.

(1) Geology

The geological structure of this region is formed of Alluvium, blown sand, etc., formations. The sediments of the plain belong to the youngest geological formation, mostly upper Quaternary, and consist of a thick succession of sandy and clayey layers of fluvial, fluviomarine and aeolian origin. The depositional environment provides a good example of the control of fluctuating of sea level and climatic changes, which was subjected to neotectonic disturbances from time to time. The deposition has taken place in the N-S trending structural depression of the Cambay basin. The maximum thickness of the deposits is more than 500 m in the central and western part. The sediments in the east are dominantly of fluvial origin. Ttraced west, they progressively grade into fluviomarine to marine. The western part of the region along the Rann border represents a palaeomudflat.

(2) Topography

The landscape is characterized by a subdued topography comprising a variety of depositional transitional area between the plain and the highland is marked by a pediment zone of undulating topography, characterized by low altitude mounds and hillocks of stabalised aeolian sands dunes. There are also small alluvial fans and cones of fluvial material brought by the rivers coming from the neighbouring highland. The central part of the plain shows mix topography of fluvial plains marked by subdued fossil dunes. The western part is almost a level ground of saline waste land with a thin veneer of sand and silt.

(3) Geomorphology and Geohydrology

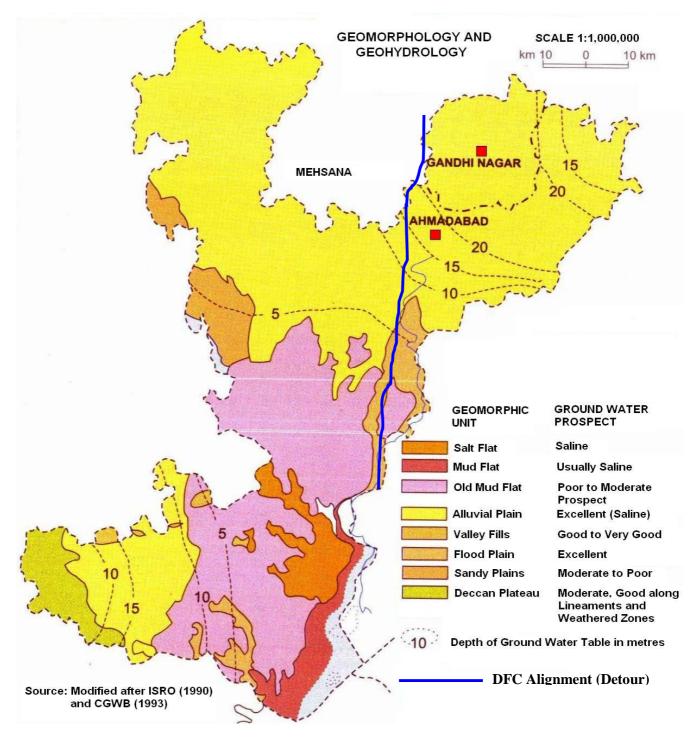
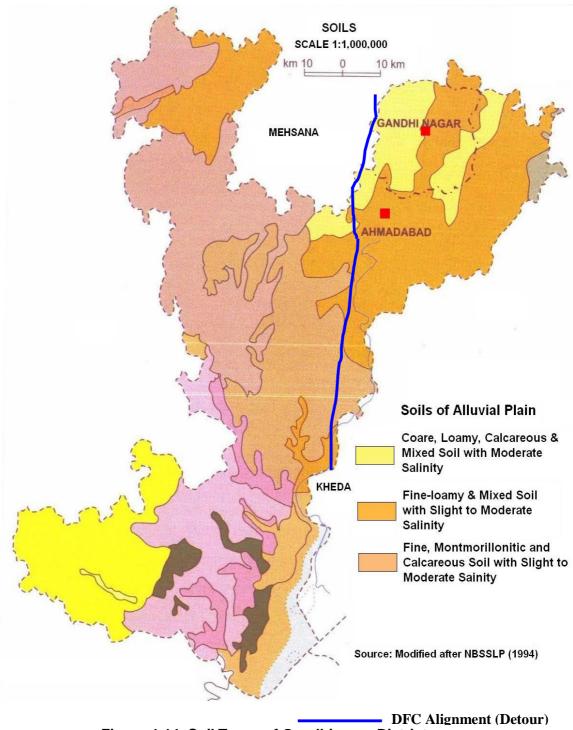
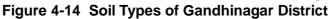


Figure 4-13 Geomorphology and Geohydrology of Gandhinagar District

(4) Soil

The DFC alignment in Gandhinagar District is passing through alluvial plain. Gandhinagar District has sandy loam soils locally known as *goradu* which owe their origin to the Indo-Gangetic alluvium. This is one of the most fertile parts of the state and agriculturally much advanced. The soil type of the area through which the DFC alignment is passing in Gandhinagar District is shown in **Figure 4-14**.





(5) Agriculture

DFC alignment is mainly passing through the agricultural land in Gandhinagar District. Agriculture plays a prominent part in the economy of the district. The district has a total area of 67,600 ha, of which 48,800 ha are under cultivation. The agricultural land of Gandhinagar is irrigated by wells and tube-wells. The Sabarmati and Khari Rivers flows through this district but they are not utilized for irrigation purpose. The major crops grown in Gandhinagar District are given in the following table:

Name of the Crop	Scientific Name	Remarks
Bajri	Pennisetum typhoidem	Kharif crop
Paddy	Oryza sativa	Kharif crop
Jowar	Andropogau sorghum	Rabi crop
		Mainly for fodder purpose
Cotton	Gossypium herbaccum	
Pulses		
Tur	Cajanus indicus	Kharif crop
Gram	Cicer arietinum	
Mag	Phaseolus radiatus	
Math	Phaseolus acontifolius	
Udid	Phaseolus mungo	
Val	Lablab niger	

Table 4-20 Crops grown in Gandhinagar District	Table 4-20	Crops grown	in Gandhinagar	District
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(6) Climate and Meteorology

The climate of the area is moderate and tropical characterized by a hot summer from March to Mid June, a humid monsoon or rainy season stretching from Mid June to September, a short pleasant post-monsoon during October and November, and a cool winter spanning between December and February. Therefore, climatologically, four seasons viz. summer (pre-monsoon), monsoon, post-monsoon and winter could be deciphered comprising the following months:

Summer	:	March, April, May
Monsoon	:	June, July, August, September
Post-monsoon	:	October, November
Winter	:	December, January, February.

Past meteorological data described in this section have been collected from the nearest IMD observatory located at Ahmedabad, which deemed representative of the study corridor. Available past meteorological data has been collected and summarized in **Table 4-21**.

In Gandhinagar Districts January is the coldest month with the mean daily minimum temperature of 11.7° C and maximum of 28.4° C. March onwards the temperature begins to rise rapidly and May is the hottest months with the mean daily maximum temperature of 41.8° C and minimum of 26.2° C. Thereafter, the advent of monsoon brings down the temperature. Monsoon withdraws in October but the temperature continues to fall gradually up to January, the middle of winter. The annual average of maximum and minimum mean daily temperatures are 34.4° C and 20.5° C respectively.

Month		nily (°C)		ative	Total Desirefall	No of		Cloud	Wind
	1 empera Max	Min	0830	ity (%) 1730	Rainfall (mm)	Rainy Days	Cover 0830	(0ctas)	Speed km/h
January	28.4	11.7	57	29	2.6	0.3	1.3	1.4	5.8
February	31.3	13.8	50	22	1.1	0.2	1.2	1.2	5.9
March	36.0	18.8	46	18	1.0	0.1	1.4	1.6	6.3
April	39.9	23.4	51	18	0.9	0.1	1.5	1.7	7.0
May	41.8	26.2	63	22	6.0	0.4	1.8	1.2	9.2
Jun	38.4	27.0	74	45	108.7	5.0	4.9	4.0	10.1
July	33.3	25.7	85	67	265.3	11.3	6.6	6.4	8.7
August	31.9	24.8	88	70	219.8	10.7	6.8	6.4	7.2
September	33.4	24.1	83	59	171.9	6.2	4.5	4.2	6.0
October	35.8	20.9	64	37	10.8	0.7	1.7	1.7	4.3
November	33.2	16.5	53	33	8.9	0.6	1.5	1.5	4.6
December	29.8	13.0	57	33	2.6	0.2	1.6	1.6	5.3
Mean/Total	34.4	20.5	64	38	803.4	35.8	2.9	2.7	6.7

Table 4-21 Mean Monthly Climatological Records (Based on Records of IMD, 1951- 1980)

Source: India Meteorological Department (IMD)

The air is fairly humid through the major part of the year and the mean relative humidity rises during the monsoon months, particularly July to September ranging between 83-88% in the morning (0830 IST) and 59-70% in the evening (1730 IST). The trend in humidity in various seasons clearly shows a discernible influence of rain on humidity. The highest mean relative humidity is recorded in August (88% in the morning and 70% in the evening), a wet monsoon month and the lowest mean relative humidity is recorded in March (46% in the morning and 18% in the evening). The annual mean relative humidity is about 64% in the morning and 38% in the evening, which correlates well with the tropical humid climate of the area. As usual, the humidity in the morning (0830 IST) is more than that in the evening (1730 IST) during all the months.

The total annual rainfall received along the study corridor is about 803.4 mm. The four monsoon months (June to September) contribute about 80% of the total annual rainfall. Lowest rainfall is observed in April (0.9 mm) and highest rainfall is observed in July (265.3 mm). Total number of rainy days is about 35.8 days per annum. Winds are generally moderate to low through out the year. The annual mean wind speed is 6.7 km/h with the mean monthly wind speed 4.3-5.3 km/h (during October-December) and 8.7-10.1 km/h (May to July).

(7) **River System**

There are only two rivers flowing through the district, viz., the Sabarmati and the Khari. The Sabarmati River enters this district near the Rajpur Village and out of its total length of 416 km, the Sabarmati flows for only 34 km in the Gandhinagar District. The Khari River is a tributary of the Sabarmati River. The rivers in the district do not flow throughout the year. The DFC alignment in Gandhinagar District does not cross any rivers.

(8) Forest, Flora & Fauna

Forest: There is a negligible area under forests in Gandhinagar District. No part of this district has been declared as forest area. However, the whole district is green with vegetation containing number of trees such as *Zizyphus mauratiana* (Bordi), *Magnifera indica* (Mango), *Ficus infectoria* (Pipal) etc.

Plantation along the Detour: The entire stretch of DFC in Gandhinagar District is a part of Ahmedabad detour and the detour alignment is mainly passing through agricultural land.

There is no plantation raised by the Forest Department along the detour alignment except few private trees. The major tree species along the detour alignment are Neem, Mango, Pipal, Babul etc.

4.3.5 Ahmedabad District

Ahmedabad District is situated in the central part of Gujarat and lies between 22° 0' and 23° 35' north latitudes and 71° 42' and 72° 50' east longitudes. It is bounded by Mahesana District in the north, by Gandhinagar District in the north-east, by Kheda and Anand Districts in the east, by the Gulf of Khambhat in the south, by Bhavnagar District in the south-west and by Surendranagar District in the west. At present, the district is divided into 11 talukas for administrative purpose. All C.D. block boundaries of this district are co-terminus with taluka boundaries. Ahmedabad ranks 1st in order of population and 8th in order of area among the districts of the state.

As regards the relief, the district as a whole forms a level plain gradually rising towards the north and east where the elevation varies between 17 metres and 100 metres above M.S.L. The southern portion of the district is low lying area with an altitude ranging between 12 metres and 22 metres above M.S.L. Sabarmati is the principal river of the district.

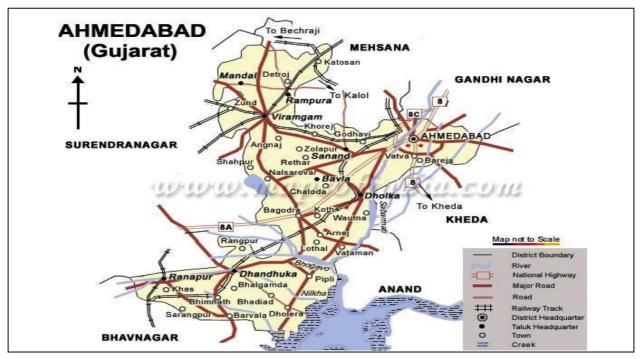


Figure 4-15 Ahmedabad District

It enters the district in the extreme north-eastern side and flows in southerly direction which ultimately merges along with its tributary i.e. Bhogava in the Gulf of Khambhat. Other river is Bhadar which also flows eastward and merges in the same Gulf. The climate of the district is, on the whole, one of extremes with considerable variation in temperatures. The southern tract towards the coast, however, enjoys salubrious climate for the better part of the year.

(1) Geology

The area is almost entirely occupied by the sediments of Quaternary era. Only In the southwestern part of the Ahmedabad district basalt flows of the Deccan volcanics of Upper Cretaceous to Eocene age are exposed The Quaternary sediments indude oontlc to sandy limestone with intercalated grit and sandstone (Miliolite Formatlon) and minor isolated outcrops of variegated clay, siltstone and marl (Vend formation) of Pleistocene age. Sediments of Holocene age comprise Rann Clay Formation (tidal flat deposits] and Mahuva Formation (Shoal spit/bar, tidal flat and tidal marsh deposits) deposited by marine agencies, Katpur Formation (Flood plain and deltaic deposits) and larahi Formationb (channel/fill and flood plane deposits) by fluvial agencies, Akhaj Formation (sand sheet and sand dune, stabilized) and Jantral formation (sand sheet and sand dunes unstabilized) by Aeolian agencies and Nalsarobar Formation deposited by lacustrine agencies.

(2) Topography

The landscape is characterized by a subdued topography comprising a variety of depositional transitional area between the plain and the highland is marked by a pediment zone of undulating topography, characterized by low altitude mounds and hillocks of stabalised aeolian sands dunes. There are also small alluvial fans and cones of fluvial material brought by the rivers coming from the neighbouring highland. The central part of the plain shows mix topography of fluvial plains marked by subdued fossil dunes. The western part is almost a level ground of saline waste land with a thin veneer of sand and silt.

(3) Geomorphology and Geohydrology

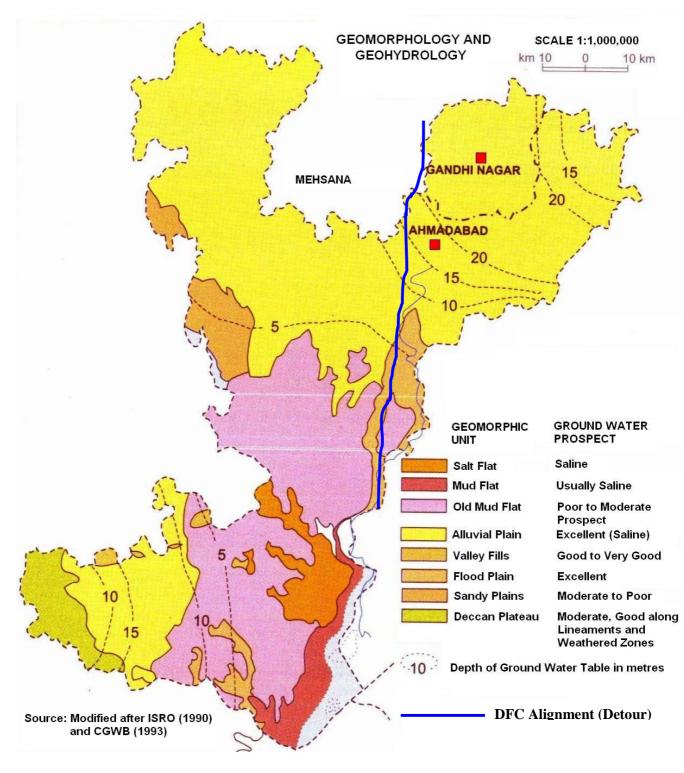


Figure 4-16 Geomorphology and Geohydrology of Ahmedabad District

(4) Soil

The DFC alignment in Ahmedabad District is passing through alluvial plain. The soils in the district are fine to coarse, loamy, mixed, montmorillonitic, calcareous and mostly saline. The soil type of the area through which the DFC alignment is passing in Ahmedabad District is shown in **Figure 4-17**.

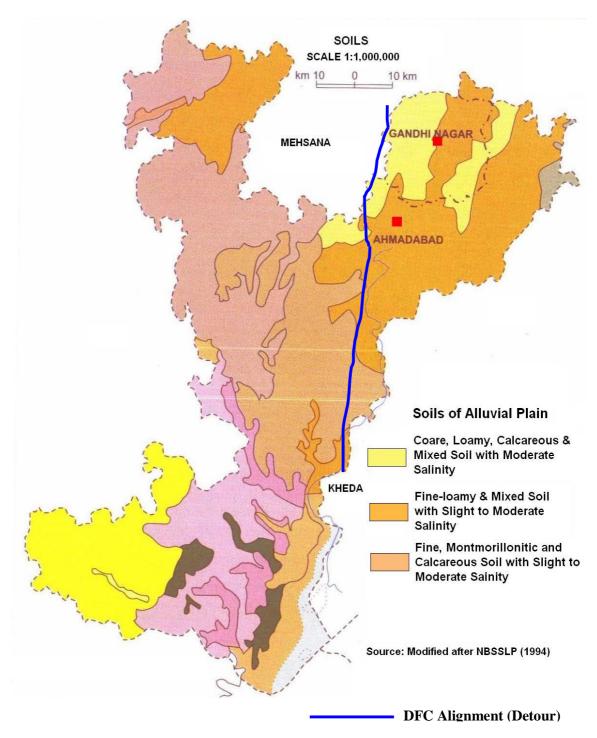


Figure 4-17 Soil Types of Ahmedabad District

(5) Agriculture

DFC alignment is mainly passing through the agricultural land in Ahmedabad District. The soil of Ahmedabad has sandy loam soils locally known as *goradu* which owe their origin to the Indo-Gangetic alluvium. The Sabarmati River have contributed considerable quantities of silt in various degrees of fineness forming flood plains. The soils along the banks of the Sabarmati are light yellow, loose grained and typically *goradu*. The major crops grown in Ahmedabad District are given in the **Table 4-22**.

Name of the Crop	Scientific Name	Remarks
Wheat	Triticum vulgare	Rabi crop
Paddy	Oryza sativa	Kharif crop
Jowar	Andropogau sorghum	Rabi crop
		Mainly for fodder purpose
Cotton	Gossypium herbaccum	
Tobacco	Nicotiana tobacum	Kharif crop
Pulses		
Tur	Cajanus indicus	Kharif crop
Gram	Cicer arietinum	
Mag	Phaseolus radiatus	

Table 4-22	Crops	grown	in	Ahmedabad	District
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(6) Climate & Meteorology

The climate of the area is moderate and tropical characterized by a hot summer from March to Mid June, a humid monsoon or rainy season stretching from Mid June to September, a short pleasant post-monsoon during October and November, and a cool winter spanning between December and February. Therefore, climatologically, four seasons viz. summer (pre-monsoon), monsoon, post-monsoon and winter could be deciphered comprising the following months:

Summer	:	March, April, May
Monsoon	:	June, July, August, September
Post-monsoon	:	October, November
Winter	:	December, January, February.

Past meteorological data described in this section have been collected from the nearest IMD observatory located at Ahmedabad, which deemed representative of the study corridor. Available past meteorological data has been collected and summarized in **Table 4-23**.

In Gandhinagar District January is the coldest month with the mean daily minimum temperature of 11.7°C and maximum of 28.4°C. March onwards the temperature begins to rise rapidly and May is the hottest months with the mean daily maximum temperature of 41.8°C and minimum of 26.2°C. Thereafter, the advent of monsoon brings down the temperature. Monsoon withdraws in October but the temperature continues to fall gradually up to January, the middle of winter. The annual average of maximum and minimum mean daily temperatures are 34.4°C and 20.5°C respectively.

Month	Da	ily	Rela	ative	Total	No of	Total	Cloud	Wind
	Tempera	ture (⁰ C)	Humid	Humidity (%)		Rainfall Rainy		Cover (octas)	
	Max	Min	0830	1730	(mm)	Days	0830	1730	km/h
January	28.4	11.7	57	29	2.6	0.3	1.3	1.4	5.8
February	31.3	13.8	50	22	1.1	0.2	1.2	1.2	5.9
March	36.0	18.8	46	18	1.0	0.1	1.4	1.6	6.3
April	39.9	23.4	51	18	0.9	0.1	1.5	1.7	7.0
May	41.8	26.2	63	22	6.0	0.4	1.8	1.2	9.2
Jun	38.4	27.0	74	45	108.7	5.0	4.9	4.0	10.1
July	33.3	25.7	85	67	265.3	11.3	6.6	6.4	8.7
August	31.9	24.8	88	70	219.8	10.7	6.8	6.4	7.2
September	33.4	24.1	83	59	171.9	6.2	4.5	4.2	6.0
October	35.8	20.9	64	37	10.8	0.7	1.7	1.7	4.3
November	33.2	16.5	53	33	8.9	0.6	1.5	1.5	4.6
December	29.8	13.0	57	33	2.6	0.2	1.6	1.6	5.3
Mean/	34.4	20.5	64	38	803.4	35.8	2.9	2.7	6.7
Total									

Table 4-23	Mean Monthly Climatological Records
(Bas	sed on Records of IMD, 1951- 1980)

Source: India Meteorological Department (IMD)

The air is fairly humid through the major part of the year and the mean relative humidity rises during the monsoon months, particularly July to September ranging between 83-88% in the morning (0830 IST) and 59-70% in the evening (1730 IST). The trend in humidity in various seasons clearly shows a discernible influence of rain on humidity. The highest mean relative humidity is recorded in August (88% in the morning and 70% in the evening), a wet monsoon month and the lowest mean relative humidity is recorded in March (46% in the morning and 18% in the evening). The annual mean relative humidity is about 64% in the morning and 38% in the evening, which correlates well with the tropical humid climate of the area. As usual, the humidity in the morning (0830 IST) is more than that in the evening (1730 IST) during all the months.

The total annual rainfall received along the study corridor is about 803.4 mm. The four monsoon months (June to September) contribute about 80% of the total annual rainfall. Lowest rainfall is observed in April (0.9 mm) and highest rainfall is observed in July (265.3 mm). Total number of rainy days is about 35.8 days per annum. Winds are generally moderate to low through out the year. The annual mean wind speed is 6.7 km/h with the mean monthly wind speed 4.3-5.3 km/h (during October-December) and 8.7-10.1 km/h (May to July).

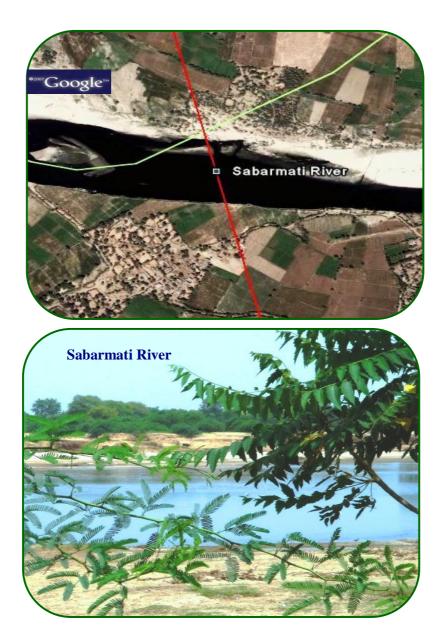
(7) River System

Sabarmati is the principal river of the district. It enters the district in the extreme north-eastern side and flows in southerly direction which ultimately merges along with its tributary i.e. Bhogava in the Gulf of Khambhat. Other river is Bhadar which also flows eastward and merges in the same Gulf. *DFC alignment crosses the Sabarmati River in Ahmedabad District*. The details of river crossing are given in **Table 4-24**.

S. N.	Name of the River	Village	Northing	Easting
1.	Sabarmati River	Sathal	22°44'27.27"N	72°31'58.65"E

Table 4-24	Location o	f River	Crossing
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Source: Field survey



(8) Forest, Flora and Fauna

Forest: The total forest area in Ahmedabad District is 114.7 km² (0.054 % of total geographical area). The major type of forest found in Ahmedabad District is Babul Forest, which comes under the category of 5/E3 in Gujarat state. However, the whole district is green with vegetation containing number of trees such as Zizyphus mauratiana (Bordi), Magnifera indica (Mango), Ficus infectoria (Pipal), Tectona Grandis (Sagtank), Dalbergia latifolia (Sisham), Acacia catechu (Khair), Terminalia bellirica (Baheda), Albizzia lebbek (Siras) etc. **The DFC alignment does not cross any forest in Ahmedabad District.**

Plantation along the Detour: The detour portion of DFC in Ahmedabad District (**41 km**) and the detour alignment is mainly passing through agricultural land. There is no plantation raised by the Forest Department along the detour alignment except few private trees. The major tree species along the detour alignment are Babul, Neem, Pipal, Khanji, Khigra, Gulmohor, Amli etc.

4.3.6 Kheda District

Kheda District extends over the central portion of the state and lies between 22^0 30' and 23^0 18' north latitudes and 72^0 30' and 73^0 37' east longitudes. It makes its limits with Gandhinagar District in the northwest, Sabar Kantha District in the north, Panch Mahals and Vadodara Districts in the east, Anand District in the south and Ahmedabad District in the west. At present, the district is divided into 10 talukas for administrative purpose. In this district, all C.D. block boundaries are co-terminus with taluka boundaries- It is one of the leading agricultural districts in the slate.

The terrain of the district is flat level plain except for a small hilly tract in the northern part of Balasinor and Kapadvanj talukas. The slope gradient of the district is generally from north-west to south-west in which .direction all rivers flow. The elevation generally varies between 22 metres to 212 metres above M.S.L. The northern portion of the district is relatively higher than southern part. Mahi, Vatrak and Sabarmati are the principal rivers of the district. The entire water of the district is drained by three rivers with their tributaries. These rivers are perennial. Mahi River is most useful for irrigation.

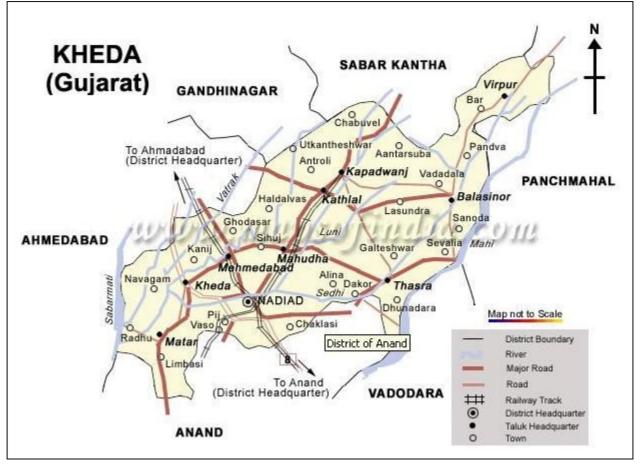


Figure 4-18 Kheda District

(1) Geology

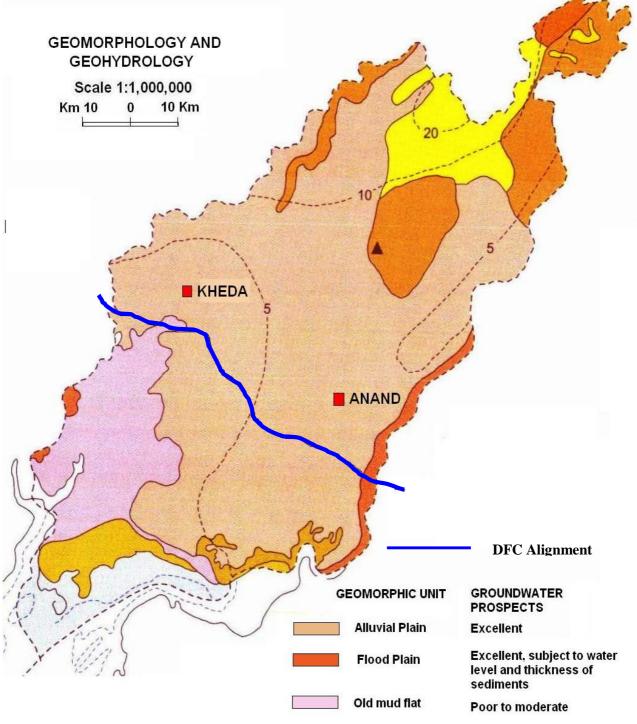
The metasedimentary rocks such as mica-schist, meta- subgraywacke and quartzites, belonging to the Kadana Formation of the Lunavada Group (Aravalli Supergroup) are exposed in the north eastern part of the district. These are of Lower Proterozoic age. These rocks are intruded by the Godhra Granite. At places, these are overlain by the Lameta beds. Basalts, belonging to the Deccan Traps are found in the northeastern part of the district containing

intertrappean sediments. Laterite and bauxite cappings (Salod Formation) are found over the Deccan Traps at many places. Limestone, sandstone and marl belonging to the Vagadkhol Formation of the Eocene age are found in the area between Dakor and Kapadvanj. Calcareous sand belonging to the Miliolite Formation of the Porbandar Group is found WNW of Khambhat. The district is mostly occupied by Holocene sediments. These sediments are of marine, fluvial and aeolian origin. The marine sediments include the older tidal flats and tidal marsh of Rann Clay Formation and shoal, tidal flat and marsh of younger Mahuva Formation. The fluvial sediments include flood plain and delta of Katpur Formation and channel-fill and flood plain of younger Varahi Formation. The Aeolian sediments include stabilized sand sheet and sand dune of Akhaj Formation and sand sheet of younger Jantral Formation.

(2) Topography

The region shows more or less a flat topography with a series of sections cut by deeply incised channels of rivers flowing across the region. The sections are 10 to 30 m deep, and the river banks are generally marked by levee deposits, creating a ridge type banks with higher elevations than the general ground level. The flat topography is dotted by low height sandy mounds of stabilized dunes. Formation of ravine landscape is quite common on most of the river banks due to deep gully erosion.

(3) Geomorphology and Geohydrology

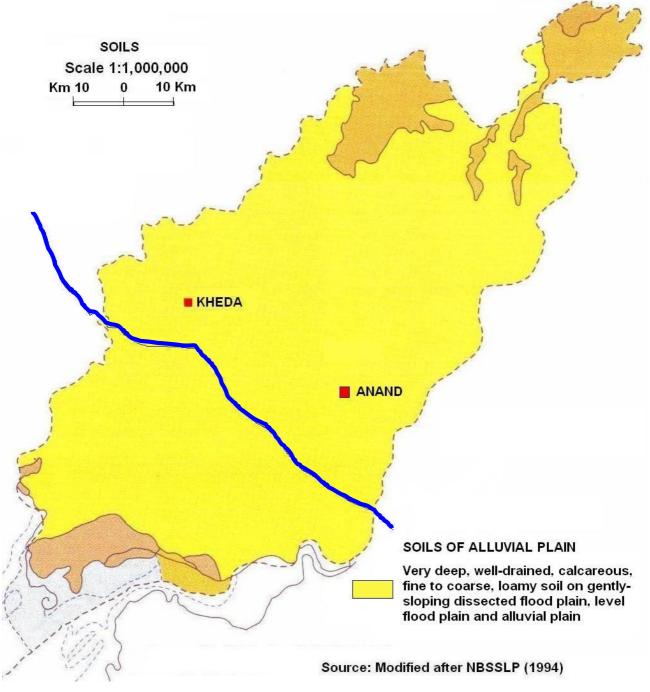


Source: Modified after ISRO (1990) & CGWB (1993)



(4) Soil

The soils in the **Kheda** District is popularly known as "pieces of gold" they respond vary well to manuring and irrigation. There are mainly three types of soils in the district. The soils of alluvial plains consists of very deep, well- drained, calcareous, fine to coarse loam, occupying the major part of the district. The DFC alignment in Kheda District is passing through alluvial plain (**Figure 4-20**).





(5) Agriculture

Agriculture is the main occupation of the people in the district. The soils of the districts are very deep, well drained, calcareous, fine to coarse, loamy soil on gently sloping dissedted flood plain and are very rich and fertile. The major crops grown in Kheda district are given in the following table.

Name of the Crop	Scientific Name	Remarks
Bajri	Pennisetum typhoidem	Kharif crop
Wheat	Triticum vulgare	Rabi crop
Paddy	Oryza sativa	Kharif crop
Tobacco	Nicotiana tobacum	Kharif crop
Isabgul	Plantago ovata	Kharif crop
		It is a sort of husk, which has a high
		medicinal value and therefore exported
		abroad
Pulses		
Tur	Cajanus indicus	Kharif crop
Gram	Cicer arietinum	
Mag	Phaseolus radiatus	
Math	Phaseolus acontifolius	
Udid	Phaseolus mungo	
Val	Lablab niger	

 Table 4-25 Crops Grown in Kheda District

(6) Climate and Meteorology

The climate of the area is moderate and tropical characterized by a hot summer from March to Mid June, a humid monsoon or rainy season stretching from Mid June to September, a short pleasant post-monsoon during October and November, and a cool winter spanning between December and February. Therefore, climatologically, four seasons viz. summer (pre-monsoon), monsoon, post-monsoon and winter could be deciphered comprising the following months:

Summer	:	March, April, May
Monsoon	:	June, July, August, September
Post-monsoon	:	October, November
Winter	:	December, January, February.

Past meteorological data described in this section have been collected from the nearest IMD observatory located at Ahmedabad, which deemed representative of the study corridor. Available past meteorological data has been collected and summarized in **Table 4-26**.

In Kheda District January is the coldest month with the mean daily minimum temperature of 11.7°C and maximum of 28.4°C. March onwards the temperature begins to rise rapidly and May is the hottest months with the mean daily maximum temperature of 41.8°C and minimum of 26.2°C. Thereafter, the advent of monsoon brings down the temperature. Monsoon withdraws in October but the temperature continues to fall gradually up to January, the middle of winter. The annual average of maximum and minimum mean daily temperatures are 34.4°C and 20.5°C respectively.

Month	Tempe	ily crature C)		ative ity (%)	Total Rainfall	No of Rainy		Cloud (octas)	Wind Speed
	Max	Min	0830	1730	(mm)	Days	0830	1730	(km/h)
January	28.4	11.7	57	29	2.6	0.3	1.3	1.4	5.8
February	31.3	13.8	50	22	1.1	0.2	1.2	1.2	5.9
March	36.0	18.8	46	18	1.0	0.1	1.4	1.6	6.3
April	39.9	23.4	51	18	0.9	0.1	1.5	1.7	7.0
May	41.8	26.2	63	22	6.0	0.4	1.8	1.2	9.2
Jun	38.4	27.0	74	45	108.7	5.0	4.9	4.0	10.1
July	33.3	25.7	85	67	265.3	11.3	6.6	6.4	8.7
August	31.9	24.8	88	70	219.8	10.7	6.8	6.4	7.2
September	33.4	24.1	83	59	171.9	6.2	4.5	4.2	6.0
October	35.8	20.9	64	37	10.8	0.7	1.7	1.7	4.3
November	33.2	16.5	53	33	8.9	0.6	1.5	1.5	4.6
December	29.8	13.0	57	33	2.6	0.2	1.6	1.6	5.3
Mean/Total	34.4	20.5	64	38	803.4	35.8	2.9	2.7	6.7

Table 4-26	Mean Monthly Climatological Records
(Bas	ed on Records of IMD, 1951- 1980)

Source: India Meteorological Department (IMD)

The air is fairly humid through the major part of the year and the mean relative humidity rises during the monsoon months, particularly July to September ranging between 83-88% in the morning (0830 IST) and 59-70% in the evening (1730 IST). The trend in humidity in various seasons clearly shows a discernible influence of rain on humidity. The highest mean relative humidity is recorded in August (88% in the morning and 70% in the evening), a wet monsoon month and the lowest mean relative humidity is recorded in March (46% in the morning and 18% in the evening). The annual mean relative humidity is about 64% in the morning and 38% in the evening, which correlates well with the tropical humid climate of the area. As usual, the humidity in the morning (0830 IST) is more than that in the evening (1730 IST) during all the months.

The total annual rainfall received along the study corridor is about 803.4 mm. The four monsoon months (June to September) contribute about 80% of the total annual rainfall. Lowest rainfall is observed in April (0.9 mm) and highest rainfall is observed in July (265.3 mm). Total number of rainy days is about 35.8 days per annum. Winds are generally moderate to low through out the year. The annual mean wind speed is 6.7 km/h with the mean monthly wind speed 4.3-5.3 km/h (during October-December) and 8.7-10.1 km/h (May to July).

(7) **River System**

The Sabarmati, Mahi, Vatrak & Khari are the main rivers of the district. The DFC alignment crosses Vatrak & Sabarmati Rivers in Kheda. The details of river crossing are given in **Table 4-27**.

S. N.	Name of the River	Village/Town	Northing	Easting
1.	Vatrak River	Vasna Bujarg	22°42'52.94"N	72°37'29.15"E
2.	Sabarmati River	Kaloli	22°44'27.27"N	72°31'58.65"E

Table 4-27 Location of River Crossing

Source: Field Survey



(8) Forest, Flora & Fauna

Forest: There is a negligible area under forests in Kheda District. The whole district is green with vegetation containing number of trees such as *Tectona grandis* (Teak), *Accacia catechu* (Khair), *Zizyphus mauratiana* (Bordi), *Ficus infectoria* (Pipal) etc. The DFC alignment does not cross any Forest in Kheda District.

Plantation along the Detour: The entire stretch of DFC in Kheda District is a part of Ahmedabad detour and the detour alignment is mainly passing through agricultural land. There is no plantation raised by the Forest Department along the detour alignment except few private trees. The major tree species along the detour alignment are Neem, Mango, Nilgiri, Pipal, Babul, Teak, Khair etc.

4.3.7 Anand District

Anand District spreads over the central part of the state and lies between $22^{0}10'$ and $23^{0}45'$ north latitudes and $72^{0}15'$ and $73^{0}10'$ east longitudes. It is surrounded by Kheda District from north, by Vadodara District from east, by the Gulf of Khambhat and Bharuch District from south and Ahmedabad District from west. Anand, a newly created district, was carved out from Kheda District during the decade 1991-2001 and is divided into 8 talukas for administrative purpose. All C.D. block boundaries of the district are co-terminus with taluka

boundaries. It is famous for its Amul Dairy at Anand which is considered among the best of its kind in South-East Asia.

The terrain of the district is flat level plain with an altitude ranging between 10 metres and 66 metres above M.S.L. The southern part of the district is a low lying silting area and usually flooded in monsoon season. It attains the minimum height of the district. The elevation gradually moves towards north and east. The main rivers which form the drainage pattern of this district are Mahi and Sabarmati. The former makes its eastern boundary while latter runs along the western boundary and both the rivers flow in southerly direction and ultimately empty into the Gulf of Khambhat. Mahi River is most useful for irrigation. The climatic condition of the district is mild to hot in summer and cool in winter.

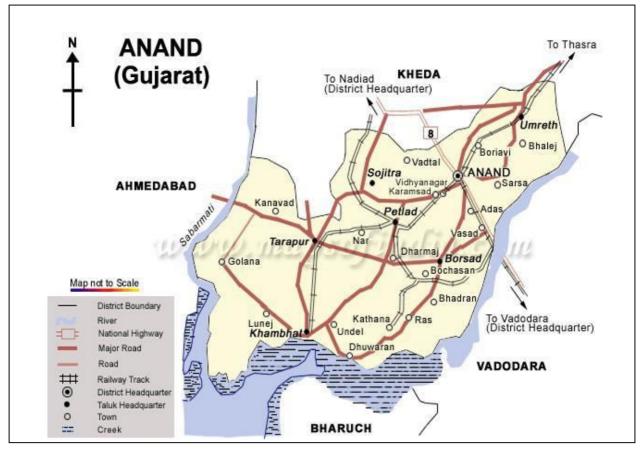


Figure 4-21 Anand District

(1) Geology

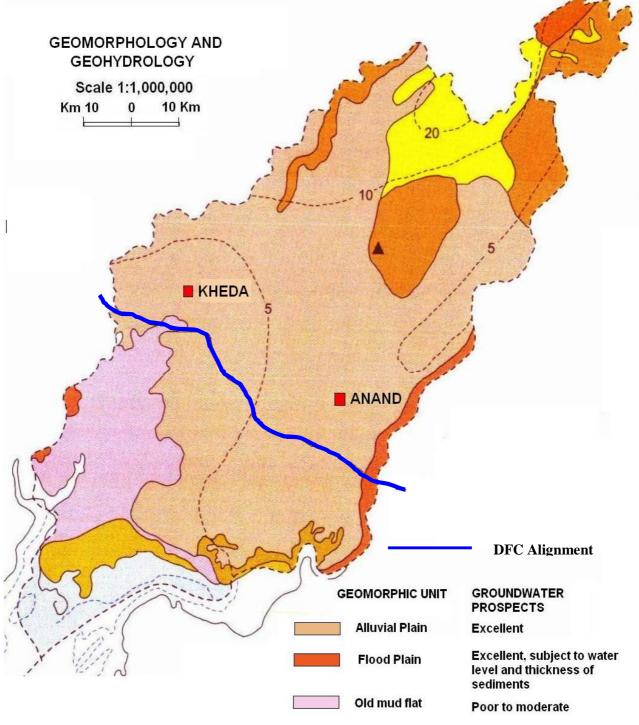
The metasedimentary rocks such as mica-schist, meta- subgraywacke and quartzites, belonging to the Kadana Formation of the Lunavada Group (Aravalli Supergroup) are exposed in the north eastern part of the district. These are of Lower Proterozoic age. These rocks are intruded by the Godhra Granite. At places, these are overlain by the Lameta beds. Basalts, belonging to the Deccan Traps are found in the north-eastern part of the district containing intertrappean sediments. Laterite and bauxite cappings (Salod Formation) are found over the Deccan Traps at many places. Limestone, sandstone and marl belonging to the Vagadkhol Formation of the Eocene age are found in the area between Dakor and Kapadvanj. Calcareous sand belonging to the Miliolite Formation of the Porbandar Group is found WNW of Khambhat. The district is mostly occupied by Holocene sediments. These sediments are of marine, fluvial and aeolian origin. The marine sediments include the older tidal flats and tidal

marsh of Rann Clay Formation and shoal, tidal flat and marsh of younger Mahuva Formation.The fluvial sediments include flood plain and delta of Katpur Formation and channel-fill and flood plain of younger Varahi Formation. The Aeolian sediments include stabilized sand sheet and sand dune of Akhaj Formation and sand sheet of younger Jantral Formation.

(2) Topography

The region shows more or less a flat topography with a series of sections cut by deeply incised channels of rivers flowing across the region. The sections are 10 to 30 m deep, and the river banks are generally marked by levee deposits, creating a ridge type banks with higher elevations than the general ground level.

(3) Geomorphology and Geohydrology



Source: Modified after ISRO (1990) & CGWB (1993)



(4) Soil

There are mainly three types of soils in the district. The soils of alluvial plains consists of very deep, well- drained, calcareous, fine to coarse loam, occupying the major part of the district. The DFC alignment in Anand District is passing through alluvial plain (**Figure 4-23**).

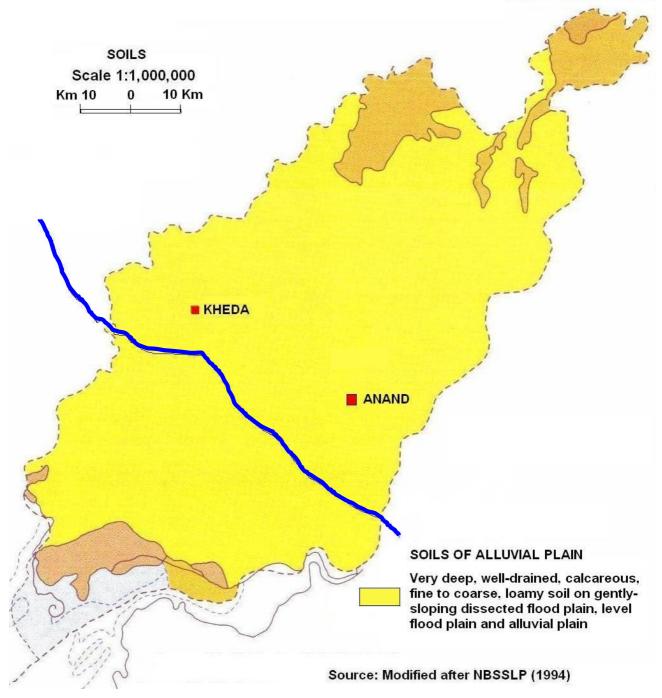


Figure 4-23 Soil Types of Anand District

(5) Agriculture

The soils of the districts are very deep, well drained, calcareous, fine to coarse, loamy soil on gently sloping dissedted flood plain and are very rich and fertile. The major crops grown in Anand district are given in the following table.

Name of the Crop	Scientific Name	Remarks
Bajri	Pennisetum typhoidem	Kharif crop
Wheat	Triticum vulgare	Rabi crop
Paddy	Oryza sativa	Kharif crop
Pulses		
Tur	Cajanus indicus	Kharif crop
Gram	Cicer arietinum	
Mag	Phaseolus radiatus	
Math	Phaseolus acontifolius	
Udid	Phaseolus mungo	
Val	Lablab niger	

Table 4-28 Crops Grown in Anand District

(6) Climate and Meteorology

The climate of the area is moderate and tropical characterized by a hot summer from March to Mid June, a humid monsoon or rainy season stretching from Mid June to September, a short pleasant post-monsoon during October and November, and a cool winter spanning between December and February. Therefore, climatologically, four seasons viz. summer (pre-monsoon), monsoon, post-monsoon and winter could be deciphered comprising the following months:

Summer	:	March, April, May
Monsoon	:	June, July, August, September
Post-monsoon	:	October, November
Winter	:	December, January, February.

Past meteorological data described in this section have been collected from the nearest IMD observatory located at Vadodara, which deemed representative of the study corridor. Available past meteorological data has been collected and summarized in **Table 4-29**.

Month	Daily Temperature (⁰ C)		Relative Humidity (%)		Total Rainfall	No of Rainy	Total Cloud Cover(octas)		Wind Speed
	Max	Min	0830	1730	(mm)	Days	0830	1730	(km/h)
January	30.3	12.0	67	33	1.2	0.1	1.1	1.1	4.0
February	33.0	13.8	61	25	0.6	0.1	0.9	0.9	4.1
March	37.1	18.4	53	20	2.2	0.2	1.1	1.2	4.2
April	40.2	22.9	53	20	0.9	0.1	1.1	1.2	4.8
May	40.9	26.5	64	27	4.4	0.3	1.7	0.7	8.7
Jun	37.1	27.0	76	51	146.8	5.6	4.5	3.4	10.3
July	32.7	25.7	88	72	297.6	13.8	6.5	6.4	8.4
August	31.5	25.0	90	74	284.7	12.0	6.7	6.5	7.1
September	33.2	24.3	86	63	141.7	7.1	4.3	4.0	5.1
October	36.0	21.3	72	44	22.0	1.3	1.5	1.4	3.0
November	34.3	16.7	64	41	16.2	0.7	1.3	1.3	3.0
December	31.4	13.4	70	40	4.4	0.2	1.3	1.3	3.6
Mean/Total	34.8	20.6	70	43	922.7	41.5	2.7	2.5	5.5
Source: India M	leteorologic	al Departme	ent (IMD)					

Table 4-29 Mean Monthly Climatological Records(Based on Records of IMD, 1951- 1980)

In Anand District January is the coldest month with the mean daily minimum temperature of 12.0°C and maximum of 30.3°C. March onwards the temperature begins to rise rapidly and May is the hottest months with the mean daily maximum temperature of 40.9°C and minimum of 26.5°C. Thereafter, the advent of monsoon brings down the temperature. Monsoon withdraws in October but the temperature continues to fall gradually up to January, the middle of winter. The annual average of maximum and minimum mean daily temperatures are 34.8°C and 20.6°C respectively.

The air is fairly humid through the major part of the year and the mean relative humidity rises during the monsoon months, particularly July to September ranging between 86-90% in the morning (0830 IST) and 63-74% in the evening (1730 IST). The trend in humidity in various seasons clearly shows a discernible influence of rain on humidity. The highest mean relative humidity is recorded in August (90% in the morning and 74% in the evening), a wet monsoon month and the lowest mean relative humidity is recorded in March (53% in the morning and 20% in the evening). The annual mean relative humidity is about 70% in the morning and 43% in the evening, which correlates well with the tropical humid climate of the area. As usual, the humidity in the morning (0830 IST) is more than that in the evening (1730 IST) during all the months.

The total annual rainfall received along the study corridor is about 922.7 mm. The four monsoon months (June to September) contribute about 80% of the total annual rainfall. Lowest rainfall is observed in April (0.9 mm) and highest rainfall is observed in July (297.6 mm). Total number of rainy days is about 41.5 days per annum. Winds are generally moderate to low through out the year. The annual mean wind speed is 5.5 km/h with the mean monthly wind speed 3.0-3.6 km/h (during October-December) and 8.4-10.3 km/h (May to July).

(7) **River System**

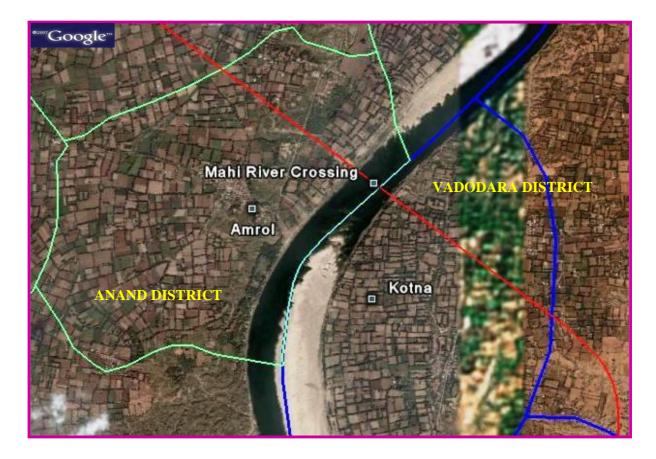
River Mahi is the main river of the district. The interstate Mahi River is 583 km long, originating in Madhya Pradesh, passing through Rajasthan and Gujarat and draining into the Gulf of Khambhat. The Mahi flows northwards initially entering into Banswara District and then turning southward flowing through Udaipur and Dungarpur Districts before entering into Gujarat. In Gujarat, it flows through Panchmahal, Kheda, Anand, Vadodara and Bharuch Districts before draining into the Gulf. The principal tributaries of the river are the Som from the right and the Anas and the Panam from the left. *DFC alignment crosses the Mahi River in the border of Anand & Vadodara Districts*. The details of river crossing are given in **Table 4-30**.



Table 4-30	Location of F	River Crossing
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S. N.	Name of the River	Village	Northing	Easting			
1.	Mahi River	Amrol	22°22'27.18"N	73° 3'18.56"E			
Source: Field Survey							

Source: Field Survey



(8) Forest, Flora & Fauna

Forest: There is a negligible area under forests in Anand District. The district does not have any Reserved Forest, National park, Wild Life Sanctuary etc. However, the whole district is green with vegetation containing number of trees such as *Tectona grandis* (Teak), *Accacia catechu* (Khair), *Zizyphus mauratiana* (Bordi), *Ficus infectoria* (Pipal) etc. The DFC alignment does not cross any Forest in Anand District.

Plantation along the Detour: The entire stretch of DFC in Anand District is a part of Ahmedabad detour and the detour alignment is mainly passing through agricultural land. There is no plantation raised by the Forest Department along the detour alignment except few private trees. The major tree species along the detour alignment are Neem, Mango, Nilgiri, Pipal, Babul, Teak, Khair etc.

4.3.8 Vadodara District

Vadodara District extends over the eastern part of the state and lies between 21^{0} 50' and 22^{0} 50' north latitudes and 72^{0} 50' and 74^{0} 10' east longitudes. It is the ninth largest district of the state in terms of area. The district makes its boundaries with the districts of Kheda and Anand in the north-west, Bharuch District in the south-west, Narmada District in the south, the slates of Maharashtra and Madhya Pradesh in the east while the district is divided and Panch Mahals bound it from north and north-east. At present, the district is divided into 12 talukas for administrative purpose and all C.D. block boundaries of the district are co-terminus with taluka boundaries.

The terrain of the district is flat level plain except for a hilly tract in the eastern part comprising of the Chhota Udaipur, Kavant, Nasvadi and Jetpur Pavi talukas where elevation varies between 300 metres and 520 metres above M.S.L. In this hilly area, south-eastern

portion is relatively higher in altitude and forms the part of the Vidhyan hills. The hilly tract is also covered by thick forests at some places. It is mainly inhabited by the tribal people. The elevation in rest of the area ranges between 10 metres to 100 metres above M.S.L. The slope is generally westward. Narmada and Mahi are the principal rivers which form the southern and north-western boundaries of the district respectively and ultimately merge in the Gulf of Khambhat outside the district. Other important rivers are Orsang, Heran and Dhadhar and flow through the district in south-western direction. These are the tributaries of major rivers.

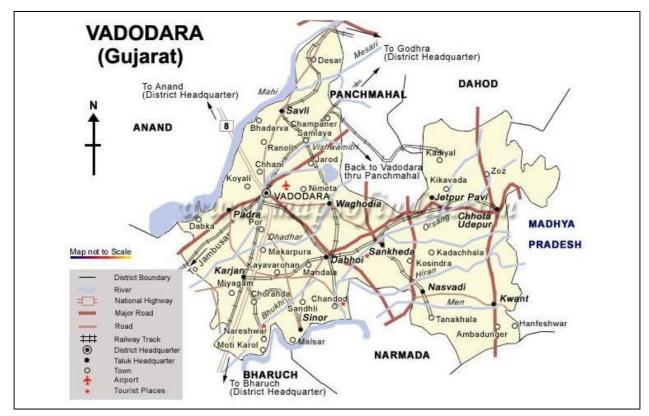


Figure 4-24 Vadodara District

(1) Geology

The Chhota Udepur granite gneisses, referred to as Archaean Crystallines are exposed (in the eastern part of the district) north of Heran River south of Orsang River and around Singlaja area. These gneisses appear to represent granitised psammatic metasediments. The Aravalli Supergroup of rocks is represented by the deformed metasediments of the Lambia, the Khandia, the Narukot, the Jaban, the Shivrajpur and the Rajgarh Formations-all grouped under the Champaner Group. These medasediments comprise conglomerate quartzite, schist, metasubgraywacke, phyllite, slate and limestone. The Lambia Formation also has magmatite. The undeformed Godhra Granite has been emplaced in the Archaean gneisses and the Aravalli metasediments. It is restricted to the eastern part of the Lameta Formations. The Bagh Formation comprises conglomerate calcareous sandstone and imputes limestone in the eastern and central parts of the district whereas the Lameta Formation comprises basal conglomerate, calcareous and fossiliferous quartzitic sandstone, friable sandstone cherty limestone, shale and clay in the north.

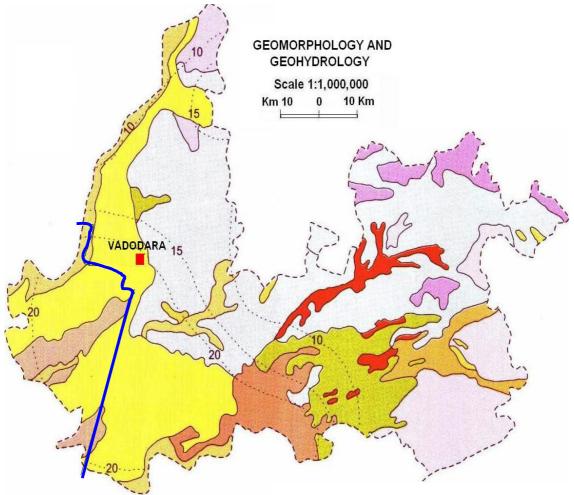
Dinosaurian fossils (bones and eggs) have been found in the Lameta Formation SE of Sandhasal. These infratrappean sediments are overlain by the Deccan volcanics with faulted contact. The Deccan volcanics comprise basaltic flows intruded by granophyre, gabbro, and alkali dyke, carbonatite and associated rocks; and dykes of basalt and dolerite. Mottled clay

and represent the Pliocene sediments. The Holocene sediments are restricted to the western part and are represented by the sands of the Akhaj Formation tidal flat and marsh deposits of the Rann Clay Formation. Flood plain and delta deposits of Katpur Formation and channel-fill and flood plain deposits of the Varahi Formation.

(2) Topography

The overall topography is highly rugged and is characterised by linear E-W trending hill ranges with deeply dissected intervening valleys. The ranges are generally flat topped and valleys are deep and narrow. The hills when traced from N to S show a progressive increase in elevation. They are made up of lava flows and plutonic intrusives of Deccan Trap. The Trappean highlands shows a strong structural control and the entire landscape is characterized by E-W trending step faults, horsts and graben related to Narmada rift system. The region is drained by numerous rivers flowing from E to W.

(3) Geomorphology and Geohydrology



Source: Modified after ISRO (1990) & CGWB (1993)

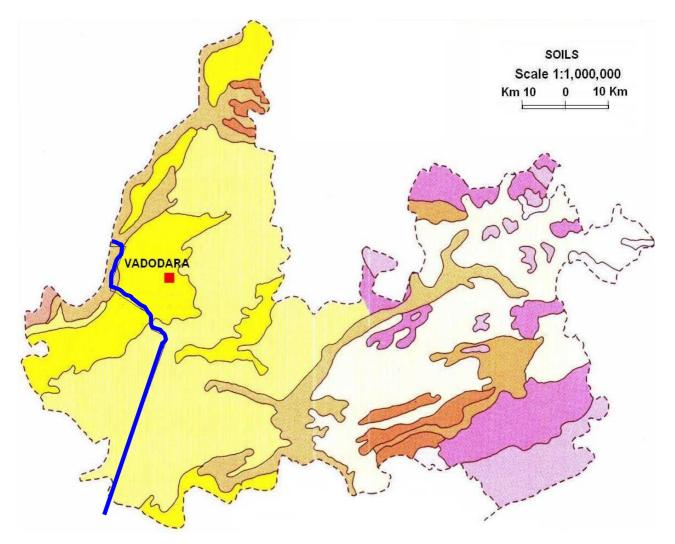
Geomorphic Unit	Groundwater Prospects
Flood Plain	Excellent
Alluvial Plain	Excellent
Plains	Poor to Moderate

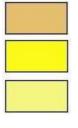
DFC Alignment

Figure 4-25 Geomorphology and Geohydrology of Vadodara District

(4) Soil

The soils of the district are loamy, clayey, mixed calcareous and montmorillonitic. The soil type of the DFC corridor in Vadodara District is shown in **Figure 4-26**.





Fine to coarse, loamy, mixed, calcareous soil with moderate salinity

Fine, loamy, mixed calcareous soil

Fine, montmorillonitic calcareous soil

DFC Alignment

Figure 4-26 Soil Types of Vadodara District

(5) Agriculture

The soils of Vadodara District are deep black and are very rich and fertile and suitable for cotton, jawar, rice, wheat and other garden crops. The black soil is clayey containing 45% clay and 20% sand. The soils are extremely fertile and do not require manuring for long periods. The rich alluvial deposits along the banks of the Narmada are known as *bhatha* soils. The major crops grown in Vadodara District are given in the following table:

Name of the Crop	Scientific Name	Remarks
Paddy	Oryza sativa	Kharif crop
Wheat	Triticum vulgare	Rabi crop
Jowar	Andropogau sorghum	Rabi crop
Cotton	Gossypium herbaccum	
Tobacco	Nicotiana tobacum	Kharif crop
Pulses		
Tur	Cajanus indicus	Kharif crop
Gram	Cicer arietinum	
Mag	Phaseolus radiatus	
Math	Phaseolus acontifolius	
Udid	Phaseolus mungo	
Val	Lablab niger	

 Table 4-31 Crops Grown in Vadodara District

(6) Climate and Meteorology

The climate of the area is moderate and tropical characterized by a hot summer from March to Mid June, a humid monsoon or rainy season stretching from Mid June to September, a short pleasant post-monsoon during October and November, and a cool winter spanning between December and February. Therefore, climatologically, four seasons viz. summer (pre-monsoon), monsoon, post-monsoon and winter could be deciphered comprising the following months:

Summer	:	March, April, May
Monsoon	:	June, July, August, September
Post-monsoon	:	October, November
Winter	:	December, January, February.

Past meteorological data described in this section have been collected from the nearest IMD observatory located at Vadodara, which deemed representative of the study corridor. Available past meteorological data has been collected and summarized in **Table 4-32**.

Month	Daily Temperature (⁰ C)		Relative Humidity (%)		Total Rainfall	No of Rainy	Total Cloud Cover(octas)		Wind Speed
WIOHUI	Max	Min	0830	1730	(mm)	Days	0830	1730	(km/h)
January	30.3	12.0	67	33	1.2	0.1	1.1	1.1	4.0
February	33.0	13.8	61	25	0.6	0.1	0.9	0.9	4.1
March	37.1	18.4	53	20	2.2	0.2	1.1	1.2	4.2
April	40.2	22.9	53	20	0.9	0.1	1.1	1.2	4.8
May	40.9	26.5	64	27	4.4	0.3	1.7	0.7	8.7
Jun	37.1	27.0	76	51	146.8	5.6	4.5	3.4	10.3
July	32.7	25.7	88	72	297.6	13.8	6.5	6.4	8.4
August	31.5	25.0	90	74	284.7	12.0	6.7	6.5	7.1
September	33.2	24.3	86	63	141.7	7.1	4.3	4.0	5.1
October	36.0	21.3	72	44	22.0	1.3	1.5	1.4	3.0
November	34.3	16.7	64	41	16.2	0.7	1.3	1.3	3.0
December	31.4	13.4	70	40	4.4	0.2	1.3	1.3	3.6
Mean/Total	34.8	20.6	70	43	922.7	41.5	2.7	2.5	5.5

Table 4-32 Mean Monthly Climatological Records(Based on Records of IMD, 1951- 1980)

Source: India Meteorological Department (IMD)

In Vadodara District January is the coldest month with the mean daily minimum temperature of 12.0°C and maximum of 30.3°C. March onwards the temperature begins to rise rapidly and May is the hottest months with the mean daily maximum temperature of 40.9°C and minimum of 26.5°C. Thereafter, the advent of monsoon brings down the temperature. Monsoon withdraws in October but the temperature continues to fall gradually up to January, the middle of winter. The annual average of maximum and minimum mean daily temperatures are 34.8°C and 20.6°C respectively.

The air is fairly humid through the major part of the year and the mean relative humidity rises during the monsoon months, particularly July to September ranging between 86-90% in the morning (0830 IST) and 63-74% in the evening (1730 IST). The trend in humidity in various seasons clearly shows a discernible influence of rain on humidity. The highest mean relative humidity is recorded in August (90% in the morning and 74% in the evening), a wet monsoon month and the lowest mean relative humidity is recorded in March (53% in the morning and 20% in the evening). The annual mean relative humidity is about 70% in the morning and 43% in the evening, which correlates well with the tropical humid climate of the area. As usual, the humidity in the morning (0830 IST) is more than that in the evening (1730 IST) during all the months.

The total annual rainfall received along the study corridor is about 922.7 mm. The four monsoon months (June to September) contribute about 80% of the total annual rainfall. Lowest rainfall is observed in April (0.9 mm) and highest rainfall is observed in July (297.6 mm). Total number of rainy days is about 41.5 days per annum. Winds are generally moderate to low through out the year. The annual mean wind speed is 5.5 km/h with the mean monthly wind speed 3.0-3.6 km/h (during October-December) and 8.4-10.3 km/h (May to July).

(7) **River System**

Mahi and Vishwamitri are the principal rivers which are west flowing and confluences in the Gulf of Khambhat Other important rivers are Orsang, Heran and Dhadhar and flow through the district in south-western direction. These are the tributaries of major rivers. *DFC alignment crosses the Mahi River in the border of Anand and Vadodara Districts*. The details of river crossing are given in **Table 4-33**.

S. N.	Name of the River	Village	Northing	Easting
1.	Mahi River	Kotna	22°22'27.18"N	73° 3'18.56"E
2.	Mini Mahi River	Sindhrot	22°18'27.18"N	73° 4'20.76"E
3.	Vishwamitri River	Alamgir	22°12'25.73"N	73°10'26.44"E

Source: Field Survey



(8) Forest, Flora and Fauna

Forest: There is a negligible area under forests in Vadodara District. The district does not have any Reserved Forest, National park, Wild Life Sanctuary etc. However, the whole district is green with vegetation containing number of trees such as *Tectona grandis* (Teak), *Accacia*

catechu (Khair), Zizyphus mauratiana (Bordi), Ficus infectoria (Pipal) etc. The DFC alignment does not cross any Forest in Vadodara District.

Plantation along the Detour: The detour portion of DFC in Vadodara District (**26.4 km**) is a part of Ahmedabad detour and the detour alignment is mainly passing through agricultural land. There is no plantation raised by the Forest Department along the detour alignment except few private trees. The major tree species along the detour alignment are Neem, Pipal, Babul, Teak etc.

Plantation along the Existing Railway Track: Length of the parallel section of DFC in Vadodara District is 33 km. Along the existing track; plantation has been raised by the Forest Department on the railway land. Total number of trees planted along the track is presented in **Table 4-34** Last plantation was carried out during the year 1984-1985. Information about railway side plantation has been collected from the record of Forest Department. But the number of trees actually exist on either side of the track is much lesser.

Year of Plantation	Name of Taluka	Location	No	Species
1984-85	Vadodara	Vadodara to	8000	Kaijeliya, Gulmahor, Kashid, Bangal
		Bharuch		Baval, Sharu, Arujunsadad, Karanj,
1984-85	Karjan	Karjan to	5000	Pangaro, Vans, Boganvel, Karan
	_	Palej		

 Table 4-34 Details of Railway side Plantation

Source: Forest Department, Government of Gujarat

Fauna:

Indian soft shelled terrapin has been observed along the bank of Mahi River and river side agricultural field in Kotna Village of Vadodara District. This area is an active tidal zone. However, the species is reported (Source: Department of Zoology, MS University, Vadodara) to be distributed along the bank of Mahi River and river side agricultural fields of Anand and also in neighbouring Kheda and Bharuch Districts. As per the IUCN Red List 2006, the Indian soft shelled terrapin is a threatened species. Some details about the species are given below:

Scientific Name: (*Aspederetes gangeticus*)

- ***** Phylum Chordata,
- ***** Class Reptile
- ***** Order Cheloria

Average Age – 250 to 300 years

Body length: * Female (6-9 inches) * Male (4-5.5 inches)

Mating Season: Spring

Morphological Featues

- * Round to oval shaped carapace, greyish black in color
- * Males are longer than females
- * Individual female breed every four years
- * Omnivorus scavenger species eats mussels, crabs, dead animals, etc

Vulnerability Status

- * Species listed in IUCN Red List of Threatened Species, 2006
- * Species listed in Schedule-I (Part-II) of Wild Life Protection Act, 1972
- * Solitary in nature except breeding period





4.4 EXISTING SOCIAL ENVIRONMENT

4.4.1 Demography

(1) Banaskantha District

The district contains 6 towns and 1,249 villages. Of which 1,244 villages are inhabited. According to the Surveyor General of India, its geographical area is 10,757 km². In this district, 10,635.4 km² areas belong to rural and 121.6 km² areas pertains to urban. It has returned to total population of 2,504,244 persons at the 2001 Census as against 191,513 persons reported at the 1991 Census, thus registering an overall growth rate of 26.4%, which is above the state average of 22.7%. Of the total population, 1,297,404 persons are males and 1,206,840 persons are females thereby reflecting a higher sex ratio of 930 females per 1,000 males as against the state average of 920. It has also the higher sex ratio of 907 girls per 1,000 boys in the age group 0 – 6 populations. In this district, 2,228,743 persons are distributed in 1,244 inhabited villages and 275,501 persons reside in 6 towns. The overall density of population comes to 233 persons per km² which is below the state average of 258 persons/km². As per census of India 2001, the population of the area upto 0-6 years is 4,68,394, Out of which 2,45,654 are male and 2,22,740 are female.

Ethnic Minorities

The Schedule Caste (SC) population of Banaskantha is 271,484; it is 10.8% of total population. Out of total SC population male SC population is 140,999 (10.9% of total population) and female SC population is 130,485 (10.8% of total population). The schedule Tribe (ST) population of the Banaskantha is 205,904 (8.2% of total population). Out of total ST population, male ST population is 105,818 (8.2% of total population) and female ST population is 100,086 (8.3% of the total population).

DFC Specific Demographic Profile

Demographic profile of Banaskantha District, according to Census data is presented in **Table 4-35.** There are 32 villages in 3 Talukas in Banaskantha District. Amirgadh (12), Vadgam (6) and Palanpur (14), Amirgadh, Iqbalgadh and Chadotar are bigger villages with around 1000 households. Some villages have higher SC population and some ST population. Literacy rate is average. Work participation rate is only 25% to 30% average in all the villages.

District/		Total No. of	Tot	al Populat	ion	SC	ST	Literacy	Work
Taluka/ Village	Name	Households	Person	Male	Female	Population (%)	Population (%)	Rate (%)	Participation Rate (%)
District	Banaskant ha	426,781	2,504,244	1,297,404	1,206,840	10.84	8.22	50.97	43.61
Taluka	Amirgad	17,026	101,133	52,148	48,985	3.19	53.21	34.87	39.73
Village	Juni Roh Sarotri	175	986	521	465	0.00	62.78	40.34	46.15
	Kidotar	514	2,875	1,487	1,388	8.31	12.90	36.34	39.44
	Amirgadh	1,145	6,109	3,261	2,848	7.19	8.79	68.32	27.86
	Dungarpura	119	634	325	309	0.00	23.34	54.89	54.57
	Jorapura (Amirgadh)	57	348	182	166	0.00	1.15	59.64	52.87
	Dholia	431	3,041	1,538	1,503	0.20	92.34	19.01	46.37
	Zanzarvav	103	567	295	272	3.53	10.41	60.61	30.34
	Iqbalgadh	983	5,211	2,751	2,460	3.57	4.47	66.21	38.71
	Jethi	714	3,669	1,935	1,734	8.94	33.77	50.31	52.33
	Bantawada	130	562	308	254	6.76	5.52	60.29	45.37

 Table 4-35 Demographic Profile of District Banaskantha

District/		Total No. of	Tot	al Populat	ion	SC	ST	Literacy	Work
Taluka/ Village	Name	Households	Person	Male	Female	Population (%)	Population (%)	Rate (%)	Participation Rate (%)
	Dhanpura	596	3,957	2,001	1,956	0.00	81.20	13.81	42.25
Taluka	Vadgam	40,735	205,992	104,967	101,025	16.62	2.39	68.78	39.63
Village	Malosana	417	2,140	1,093	1,047	21.96	0.00	71.61	43.50
	Majadar	1,396	7,585	3,847	3,738	14.41	0.09	77.58	27.13
	Teniwada	811	4,241	2,137	2,104	10.35	2.90	71.88	35.91
	Kotadi	301	1,443	716	727	21.55	3.47	70.83	43.24
	Manpura	332	1,534	778	756	18.64	0.00	68.22	34.29
	Dharewada	209	1,066	542	524	14.17	0.00	65.83	34.33
Taluka	Palanpur	72,765	380,707	196,956	183,751	11.22	3.81	70.45	37.22
Village	Rajpur (Pakhanva)	184	998	518	480	17.43	28.66	49.07	45.39
	Antroli	495	2,607	1,341	1,266	2.42	0.00	40.92	28.85
	Pirojpura(T ankani)	176	904	488	416	4.87	7.19	57.94	42.37
	Malana	738	3,775	1,931	1844	15.68	8.90	57.38	40.69
	Pakhanwa	90	526	277	249	0.00	37.83	34.62	52.28
	Moriya	289	1,396	695	701	14.61	0.93	63.75	45.99
	Parpada	273	1,357	719	638	1.84	0.00	69.36	43.70
	Akesan	254	1,350	711	639	19.78	0.00	67.91	37.26
	Chadotar	1,212	6,326	3,238	3,088	5.69	0.40	68.35	36.56
	Gathaman	731	4,162	2,127	2,035	6.78	0.00	70.10	26.74
	Sedrasana	243	1,336	695	641	21.93	3.29	71.81	34.13
	Jagana	1,417	6,802	3,517	3,285	14.10	0.37	79.79	36.80
	Jasleni	491	2,507	1,280	1,227	16.67	2.63	75.32	44.12
	Palanpur (OG)	2,358	11,881	6,310	5,571	1.24	0.99	80.31	32.34

Source: Census of India, 2001

(2) Patan District

The district covers 5 towns and 517 villages. These are all inhabited villages. The district has increased population from 1,036,019 persons in 1991 to 1,182.709 persons in 2001 and thus registering a much lower growth rate of 14.2% as against the state average of 22.7%. Of the total population, it has recorded 612.100 persons as males and 570,609 persons as females.

The scheduled castes constitute 9.9% of the total population of the district against the state average of 7.1%. On the other hand, there is a low population of merely 1.1% of the scheduled tribes. In the district, the literacy rate is 60.4% and male literacy of 73.6% and female literacy of 46.3%. Out of the total population of the district, 33.4% are main workers, 11.6% marginal workers and 54.9% are non-workers.

In the 2001 Census, the workers have further been divided into 4 major, categories according to their main economic activity The proportions of cultivators, agricultural labourers, workers in household industries and other workers to total workers of the district work out to 28.5%, 35.4%, 1.7 % and 34.4% respectively

Ethnic Minorities

The Schedule Caste (SC) population of Patan is 116,879; it is 9.9% of total population. Out of total SC population male SC population is 61,023 (10.0% of total population) and female SC population is 55,856 (9.8% of total population). The schedule Tribe (ST) population of the Patan is 12,637 (1.1% of total population). Out of total ST population, male ST population is

6,722 (1.1% of total population) and female ST population is 5,915 (1.0% of the total population).

DFC Specific Demographic Profile

The Table 4-36 below shows the socio-economic demographic profile of the DFC corridor in Patan district. Literacy rate is quite high in all the villages and one town (Sidhapur municipality) and so is work participation rate. There is marginal SC population, but no ST population at all.

District/		Total No. of	Tota	l Populati	ion	SC	ST	Literacy	Work
Taluka/ Village	Name		Person	Male	Female	Population (%)	Population (%)	Rate (%)	Participation Rate (%)
District	Patan	222,630	1,182,709	612100	570609	9.88	1.07	50.65	45.07
Taluka	Sidhpur	35,640	190,937	98,063	92,874	11.71	0.86	61.08	39.56
Village/	Meloj	664	3,416	1,740	1,676	19.09	0.00	47.07	47.63
Town	Ankvi	325	1,646	830	816	6.14	0.06	69.68	53.10
	Ganeshpu	374	1,943	957	986	0.00	0.00	66.44	37.06
	ra								
	Lalpur	446	2,294	1,191	1,103	6.89	7.89	56.23	38.71
	Sidhpur MC	10,309	53,858	27,875	25,983	11.60	1.65	69.77	28.57

Table 4-36	Demographic Profile of Patan District
	Demographic i rome of i atan District

Source: Census of India, 2001

(3) Mahesana District

According to the Surveyor General of India, the district has a total area of 4,371 km². In this district, 4,211.6 km² area pertains to rural and 159.4 km' area belongs to urban. It has a total number of 603 villages of which 593 are inhabited. The district has 8 towns. It has returned a total population of 1,837,892 persons at the 2001 Census as against 1,640,251 persons reported at the 1991 Census, thus registering an overall growth rate of 12.1 % which is second lowest among the districts of the state. Of the total population of the district, 953,842 persons are males and 884,050 persons are females thereby indicating a ratio of 927 females per 1.000 males against the slate average of 920. On the other hand, the district the lowest sex ratio of 801 girls per 1000 boys in age-group 0-6 population. Out of the total population of the district, 1,426.717 persons inhabit in rural areas and only 411,175 persons in urban areas. The overall density of population of the district comes to 420 persons per km².

The scheduled castes constitute 8.1% of the total population of the district which is above the state average of 7.1%. On the other hand, there is lower population of merely 0.5% of the scheduled tribes.

In the 2001 Census, the district has registered a literacy rate of 72.2% as against 69.1% the state. The male and female literacy rates of the district account for 86.2% and 63.6% respectively.

Of the total population of the district, the proportions of main workers, marginal workers and non-workers are 36.2%, 8.9% and 54.9% respectively. In the 2001 Census, the workers have further been divided into 4 major sectors according to their main economic activity. The proportions of cultivators, agricultural labourers, workers in household industries and other workers lo total workers account 23.3%, 24.5%, 1.7% and 50.5% respectively.

Ethnic Minorities

The Schedule Caste (SC) population of Mahesana is 148,597; it is 8.1% of total population. Out of total SC population male SC population is 77,710 (8.1% of total population) and female SC population is 70,887 (8.0% of total population). The schedule Tribe (ST) population of the Mahesana is 8,975 (0.5% of total population). Out of total ST population, male ST population is 4,884 (0.5% of total population) and female St population is 4,091 (0.5% of the total population).

DFC Specific Demographic Profile

Demographic profile of Mahesana District, according to Census data is presented in Table 4-37. There are 34 villages and 1 town that are likely to be affected by DFC spread over 4 Talukas of Unjha, Visnagar, Mahesana and Kadi. While Unjha and Visnagar talukas are in the parallel section, Mahesana and Kadi are in the detour areas. Linch, Nandasan, Panchot, Rajpur and Thol are villages in decreasing order households but all with over 1000 households. SC population is moderate while ST is marginal. Literacy rate is quite high in all the villages (between 60%-80%) and 1 town (Unjha municipality with 85% literacy rate); work participation rate is moderate in all villages, around 50%.

As is evident from the above table, 8 villages are in the parallel section and 27 in detour. 1 village- Palodar (highlighted in pink colour) is where both parallel and detour routes meet. There is one municipal town of Unjha (in parallel section) which would get affected by DFC.

District/		Total No.of	Tota	al Popula	tion	SC	ST	Literacy	Work
Taluka/ Village	Name	Households	Person	Male	Female	Populat ion (%)	Population (%)	Rate (%)	Participation Rate (%)
District	Mahesana	364,447	1,837,892	953,842	884,050	8.09	0.49	75.22	45.08
Taluka	Unjha	35,064	174,303	90,235	84,068	7.63	0.24	80.81	44.57
Village	Kamli	1,365	6,508	3,347	3,161	3.69	0.06	83.46	49.32
	Maktupur	1,037	5,138	2,662	2,476	9.40	0.16	76.90	48.73
	Aithor	1,769	8,509	4,372	4,137	7.25	0.00	77.56	40.52
	Unjha (M)	10,734	53,876	28,396	25,480	7.75	0.68	84.96	36.11
Taluka	Visnagar	49,906	253,179	131809	121,370	7.40	0.38	79.74	43.79
Village	Jetalvasana	723	3,417	1,739	1,678	15.86	0.00	84.84	51.95
	Bhandu	1,432	7,186	3,733	3,453	5.46	0.22	77.83	44.22
Taluka	Mahesana	90,920	461,320	241115	220205	8.15	0.85	78.02	41.58
Village	Motidau	948	4,901	2,492	2,409	10.55	0.00	77.40	52.81
	Palodar	831	4,225	2,217	2,008	7.36	0.00	77.07	56.50
	Panchot	1,554	7,945	4,138	3,807	7.67	0.00	84.60	43.26
	Dediyasan (Part)	733	3,857	2,019	1,838	8.58	0.00	79.93	31.81
	Nugar	597	2,938	1,553	1,385	5.14	0.00	69.69	54.32
	Sametra	554	2,729	1,438	1,291	11.29	0.00	78.27	55.73
	Heduva-ajgar	232	1,260	660	600	2.30	0.48	77.87	46.19
	Vadosan	518	2,813	1,425	1,388	4.83	0.00	62.40	44.47
	Boriavi	987	5,496	2,844	2,652	7.26	0.02	75.60	40.96
	Linch	1,889	9,444	4,900	4,544	4.92	0.21	66.98	41.18
	Ambasan	1,001	4,807	2,452	2,355	11.17	0.00	78.97	46.87
	Baliyasan	897	4,410	2,647	1,763	17.21	7.51	69.02	51.02
	Bhasariya	499	2,586	1,361	1,225	5.34	0.00	77.33	50.81
	Tundali	444	2,375	1,228	1,147	3.96	0.00	70.87	48.34
Taluka	Kadi	59,882	296,921	154947	141974	9.20	0.42	73.72	45.11
Village	Dhanali	493	2,436	1,245	1,191	7.55	0.00	70.61	33.54

 Table 4-37 Demographic Profile of District Mahesana

District/		Total No.of	Tota	al Popula	tion	SC	ST	Literacy	Work
Taluka/ Village	Name	Households	Person	Male	Female	Populat ion (%)	Population (%)	Rate (%)	Participation Rate (%)
	Ganeshpura	297	1,494	753	741	9.97	0.00	71.20	29.32
	Nandasan	1,884	10,222	5,344	4,878	11.42	0.17	80.24	42.23
	Mathasur	493	2,490	1,253	1,237	16.71	0.16	77.62	39.36
	Kherpur	312	1,546	778	768	15.27	0.00	77.62	37.90
	Lakshmipura (Nandasan)	315	1,542	788	754	0.00	0.00	89.61	44.23
	Rajpur	1,707	8,253	4,390	3,863	7.43	0.13	66.28	43.90
	Irana	535	2,970	1,514	1,456	13.30	0.03	53.75	45.22
	Indrad	878	4,289	2,282	2,007	6.39	0.00	67.61	42.99
	Ankhol	331	1,584	855	729	1.26	0.32	57.05	44.63
	Achrasan	342	1,662	842	820	12.76	0.00	60.07	47.59
	Vamaj	846	4,357	2,448	1,909	8.22	0.09	83.33	56.23
	Fuletra	554	2,884	1,496	1,388	5.37	0.00	56.45	37.62
	Vadavi	537	2,745	1,410	1,335	5.54	0.00	63.79	48.60
	Thol	1,188	6,121	3,186	2,935	11.11	0.08	73.10	50.17

(4) Gandhinagar District

The Gandhinagar District covers 291 villages and 10 towns. All the villages of the district are inhabited. According to the Surveyor General of India, its geographical area is 2,166 km². It has returned a total population of 1,334,455 persons at the 2001 Census as against 1,077,406 persons reported at the 1991 Census, thus registering an overall growth rate of 23.9 %, which is above the state average of 22.7 % of the total population. 697.999 are males and 636,456 are females thereby reflecting a lower sex ratio of 912 females per 1.000 males as against the state average of 920. It has also the second lowest sex ratio of 813 girls per 1,000 boys in age group 0-6 population. In this district, 867,260 persons are distributed in 291 inhabited villages and 467,260 persons reside in 10 towns. The overall density of population comes to 616 persons/km² which is far above the state average of 258 persons/km².

The district constitutes 8.7% of the scheduled castes and 1.3% of the scheduled tribes of the total population. The overall literacy rate in the district is 76.6%. The male and female literacy rates account for 87.7% and 64.6% respectively.

Of the total population of the district, the proportions of main workers, marginal workers and non-workers are 35.0%, 6.5% and 58.5% respectively. In the 2001 Census, the workers have further been divided into 4 major sectors according to their main economic activity. The proportions of cultivators, agricultural workers, workers in household industries and other workers to total workers account for 18.6%, 21.6%, 1.3% and 58.5% respectively.

Ethnic Minorities

The Schedule Caste (SC) population of Gandhinagar is 115,955; it is 8.7% of total population. Out of total SC population male SC population is 60,756 (8.7% of total population) and female SC population is 55,199 (8.7% of total population). The schedule Tribe (ST) population of the Gandhinagar is 17,681 (1.3% of total population). Out of total ST population, male ST population is 9,575 (1.4% of total population) and female ST population is 8,106 (1.3% of the total population).

DFC Specific Demographic Profile

There are 8 villages under Kalol Taluka that might get affected by DFC. Chhatral is the biggest village with over 2000 households. Adhana is the smallest village with only 88

households. Literacy rate is medium, between 55%-75% while work participation rate is quite poor, between 30%-40%. ST population is nominal here while SC population is slightly higher. Demographic profile (according to Census data) of the villages through which the DFC alignment is passing in Gandhinagar District, is presented in Table 4-38.

District/		Total	Tota	l Populati	on	SC	ST		Work	
Taluka/ Village	Name	No.of House holds	Person Male		Female	Populat ion (%)	Populatio n (%)	Literacy Rate (%)	Participat ion Rate (%)	
District	Gandhinagar	269,440	1,334,455	697,999	636,456	8.69	1.32	76.59	41.54	
Taluka	Kalol	62,381	310,081	162,845	147,236	10.47	0.41	75.96	41.052	
Village	Dhanot	239	1,224	677	547	8.33	0.00	63.74	34.64	
	Chhatral	2,111	9,744	5451	4,293	7.73	1.64	74.48	41.61	
	Hajipur	623	3,447	1,739	1,708	8.50	0.44	63.37	53.96	
	Bhimasan	202	1,170	603	567	9.49	0.00	51.79	55.21	
	Nasmed	486	2,355	1,207	1,148	10.15	1.70	54.99	40.09	
	Adhana	88	455	234	221	0.00	0.00	68.23	36.70	
	Unali	235	1,259	617	642	4.77	0.00	60.00	30.34	
	Rancharada	571	2,770	1,432	1,338	8.16	0.90	66.55	30.61	

 Table 4-38 Demographic Profile of Gandhinagar District

(5) Ahmedabad District

The district contains 25 towns and 547 villages of which only 1 village is uninhabited. According to the Surveyor General of India, the total area of the district is 8,087 km². In this district, 7,505.76 km² area belongs to rural and 581.24 km² area pertains to urban. The district has increased population from 4,587,491 persons in 1991 to 5.816.519 in 2001 and thus registering a growth rate of 26.8 %. Of the total population, it has recorded 3.074,556 persons as males and 2,741,963 persons as females and indicated a sex ratio of 892 females per 1,000 males against the state average of 920. The sex ratio in age group 0-6 population comes to 836 girls per 1,000 boys which is quite lower than the state average of 883. Out of the total population 1,152.986 persons are residing in rural areas and remaining 4,663.533 persons are living in urban areas. The district has the highest density of population of 719 persons per km² in the state.

The scheduled castes constitute 10.7% of the total population of the district against the state average of 7.1%. On the other hand, there is a very low population of only 1.0% of the scheduled tribes. The district has recorded the highest literacy rate of 79.5% in the state, and male literacy of 87.3% and female literacy of 70.8%.

Out of the total population of the district, 30.9% are main workers, 3.6% marginal workers and rest 65.5% are non-workers. In the 2001 Census, the workers have further been divided into 4 major categories according to their main economic activity. Ahmedabad, being an industrial centre as well as major commercial capital of the state, contributes 79.0% of working population engaged in other working sector. The proportions of cultivators, agricultural labourers and workers in household industries to total workers of the district account for 6.3%, 11.8% and 2.8% respectively.

Ethnic Minorities

The Schedule Caste (SC) population of Ahmedabad state is 620,765; it is 10.7% of the total population. Out of total SC population male SC population is 328,259 (10.7% of total population) and female SC population is 292,506 (10.7% of total population). The Schedule Tribe (ST) population of the state is 58,035 (1% of the total population). Out of total ST

population, male ST population is 30,819 (1% of the total population) and female ST population is 27.216 (1% of the total population).

DFC Specific Demographic Profile

There are 3 talukas in Ahmedabad District through which the DFC would pass- Sanand, Dholka and Bavla. 17 villages and 1 town in all would get affected in Ahmedabad District – all in detour section, of which 9 villages are in Sanand, 7 in Dholka and 1 in Bavla Talukas. Bavla is the only municipal town which would get affected having over 6000 structures and the third stage of public consultation was held here only. Other big villages with over 1000 households are Badarkha, Vasna Keliya, Kavitha and Chaloda. 10% to 20% proportion of population belongs to SC and marginal ST population. Literacy rate is between 60%-80% and work participation rate is medium, around 40% to 50%. Demographic profile (according to Census data) of the villages through which the DFC alignment is passing in Ahmedabad District, is presented in **Table 4-39**.

District/			Tota	al Populati	on	SC	ST	Literacy	Work
Taluka/ Village	Name	Total No.of Households	Person	Male	Female	Populat ion (%)	Populat ion (%)	Rate (%)	Participat ion Rate (%)
District	Ahmedabad	1,150,588	5,816,519	3,074,556	2,741,963	10.67	1.00	79.50	34.55
Taluka	Sanand	37,616	193,335	101,285	92050	12.25	0.31	62.05	43.13
Village	Garodiya	339	1628	849	779	0.31	0.00	66.39	28.50
	Godhavi	717	3632	1,936	1,696	13.05	0.00	79.55	30.18
	Manipur	316	1651	847	804	9.02	0.00	73.18	41.01
	Kaneti	336	1759	930	829	10.52	0.00	75.59	38.60
	Sanand (Rural) (Gibpura)	236	1270	634	636	8.82	0.00	69.47	58.03
	Kolat	654	3356	1,748	1,608	8.08	0.00	54.26	37.07
	Moraiya	768	3694	1,977	1,717	17.62	1.62	69.02	38.03
	Moti Devti	425	2316	1,185	1,131	7.12	0.00	65.10	45.51
	Vasna Chacharavadi	485	2238	1,177	1,061	32.48	1.21	74.02	43.16
Taluka	Dholka	41,404	214,836	112456	102380	14.15	0.89	68.37	45.12
Village	Badarkha	1699	8998	4,828	4,170	19.49	0.19	69.83	48.09
	Saroda	849	4124	2,201	1,923	14.79	0.00	69.24	54.10
	Chandisar	847	4039	2,123	1,916	15.33	0.10	60.37	40.11
	Vasna Keliya	1,124	5,814	2,998	2,816	21.43	0.62	75.35	52.80
	Chaloda	1,422	7,128	3,771	3,357	21.72	0.00	70.53	45.97
	Ambaliyara	696	3,550	1,868	1,682	22.37	0.23	74.12	43.75
	Sathal	785	3,940	2,081	1,859	16.24	0.53	65.93	56.04
Taluka	Bavla	26,616	135,097	70,990	64,107	10.94	5.72	61.04	43.44
Village	Kavitha	1,300	6,539	3,452	3,087	21.67	0.00	66.64	44.85
	Bavla (M)	6,265	30,871	16,368	14,503	9.48	0.77	78.49	32.84

Table 4-39 Demographic Profile of Ahmedabad District

Source: Census of India, 2001

(6) Kheda District

According to the Surveyor General of India, the district has total area of $4,219 \text{ km}^2$. In the district, $4,058.50 \text{ km}^2$ area belongs to rural and 160.50 km^2 area pertains to urban. It has a total number of 615 villages of which 612 are inhabited. The district has 8 towns. It has returned a total population of 2,024.216 persons at the 2001 Census as against 1.786.794 persons reported at the 1991 Census, thus registering an overall growth rate of 13.3 %, which is far below the state average of 22.7 %. Of the total population of the district. 1,052,823 are males

and 971,393 are females thereby indicating a sex ratio of 923 females per 1.000 males, which is just above the state average of 920. The district has recorded a sex ratio of 876 girls per 1,000 boys in age group 0-6 population. Out of the total population of the district, 1,617,766 persons reside in rural areas and 406,450 persons in urban areas. The overall density of population of the district comes to 480 persons per km² against the state average of 258 persons/km².

The scheduled castes constitute 5.2% of the total population of the district which is below the state average of 7.1%. On the other hand, there is a low population of only 1.6% of the scheduled tribes. In the district, the literacy rate is 72.0% and male literacy of 86.0% and female literacy of 56.9%.

Out of the total population of the district, 34.3% are main workers, 10.6% marginal workers and 55.1% are non-workers. In the 2001 Census, the workers have further been classified into four major sectors according to their main economic activity. The proportions of cultivators, agricultural labourers, workers in household industries and other workers to total working population work out to 27.4%, 31.3%, 1.4% and 39.8% respectively.

Ethnic Minorities

The Schedule Caste (SC) population of Kheda is 106,111; it is 5.2% of total population. Out of total SC population male SC population is 55,324 (5.3% of total population) and female SC population is 50,787 (5.2% of total population). The schedule Tribe (ST) population of the Surat is 32,394 (1.6% of total population). Out of total ST population, male ST population is 16,942 (1.6% of total population) and female ST population is 15,452 (1.2% of the total population).

DFC Specific Demographic Profile

The Table 4-40 below shows the socio-economic demographic profile of the DFC corridor in Kheda District. Literacy rate is moderate in all the villages and so is work participation rate. There is marginal SC population, and still less is ST population. Matar is the largest village with over 2500 households, followed by Radhu, nearly 2000. Naika is the third largest village with over 1000 households.

District/		Total No.of	To	tal Populat	tion	SC	ST	Literacy	Work
Taluka/ Village	Name	Households	Person	Male	Female	Population (%)	Population (%)	Rate (%)	Participation Rate (%)
District	Kheda	395,493	2,024,216	1,052,823	971,393	5.24	1.60	71.96	44.87
Taluka	Kheda	23,388	118,420	61,823	56,597	10.43	5.42	71.59	42.44
Village	Kaloli	632	3,213	1,712	1,501	8.84	0.12	64.41	44.91
	Naika	1,293	6,257	3,252	3,005	6.44	8.28	71.39	38.93
	Govindpura	181	893	474	419	15.79	1.46	65.01	55.99
	Shetra	236	1,133	575	558	6.88	1.24	55.10	52.43
	Radhu	1,861	9,464	4,860	4,604	12.64	2.97	75.92	39.91
	Vasna Bujarg	619	3,170	1,651	1,519	7.82	6.15	67.94	54.51
Taluka	Matar	28,573	147201	76,912	70,289	5.56	1.13	69.74	44.28
Village	Matar	2,542	13,421	6,953	6,468	5.84	1.92	72.02	36.77
	Garmala	328	1,841	972	869	7.22	0.49	65.67	37.10
	Traj	792	4,206	2,176	2,030	9.27	0.12	74.25	43.75
	Machhiel	553	2,858	1,490	1,368	1.36	0.00	61.77	49.76
	Khandhli	625	3,029	1,620	1,409	8.91	0.26	80.50	38.56
	Kathoda	196	1,002	535	467	11.58	0.00	57.45	39.02
	Palla	314	1,782	932	850	6.45	0.84	62.53	51.57

Table 4-40 Demographic Profile of Kheda District

(7) Anand District

The district contains 12 towns and 350 villages. All these 350 villages are inhabited. According to the Surveyor General of India, the total area of the district is 2,941 km². In the district, 2,676.33 km² area belongs to rural and 264.67 km² area pertains to urban. The district has increased population from 1,642,615 persons in 1991 to 1.856.872 persons in 2001 and thus registering a low growth rate of 13.0% as against the state average of 22.7%. Of the total population, it has recorded 972,000 persons as males and 884,872 persons as females and indicated a sex ratio of 910 females per 1,000 males. Further, the district possesses a low sex ratio of 849 girls per 1.000 boys in age group 0-6 population as against the state average of 883. Out of the total population 1.348.901 persons are residing in rural areas and remaining 507,971 persons in urban areas. The district has recorded the third highest density of population of 634 persons per km² in the state. The scheduled caste and the scheduled tribe population comprise 5.3% and 1.2% respectively of the total population of the district.

In the district, literates account for 74.5% which is quite above the state average of 69.1%. The male and female literates are 86.1% and 61.9% respectively. Out of the total population of the district, 33.3% have been classified as main workers, 9.0% as marginal workers and 57.7% as non-workers. The workers have further been divided into four major sectors according to their main economic activity. The proportions of cultivators, agricultural labourers, workers in household industries and other workers to total working population work out to 19.8%, 36.6%, 2.4% and 41.2% respectively.

Ethnic Minorities

The Schedule Caste (SC) population of Anand is 98,485; it is 5.3% of total population. Out of total SC population male SC population is 52,002 (5.4% of total population) and female SC population is 46,483 (5.3% of total population). The schedule Tribe (ST) population of the mahesana is 22,835 (1.2% of total population). Out of total ST population, male ST population is 12,019 (1.2% of total population) and female ST population is 10,816 (1.2% of the total population).

DFC Specific Demographic Profile

The proposed DFC traverses through the administrative boundaries of 28 villages under 5 Talukas as seen in table below. Total population, percentage of SC population to total population, percentage of ST population to total population, literacy rate and work participation rate is provided in the table. Kasor, Sunav and Mahelav are villages with over 1000 households. Anklav and Karamsad are the only towns with the later having over 6000 household population. Anklav is a comparatively smaller town. Proportion of SC population is marginal whereas ST population is still lower. Literacy rate is quite high while work participation rate is moderate. Table 4-41 below shows the socio-economic demographic profile of the DFC corridor in Anand District.

Taluka/ Village Name Total No. of Households Persons Male Female Population (%) Population (%) Literacy Rate (%) Participa Rate (%) District Anand 360,808 1,856,872 972,000 884,872 5.30 1.23 74.51 42.26 Taluk Sojitra 19,359 96,138 50,475 45,663 6.00 0.45 69.75 44.42 Village/ Bhadkad 597 2.862 1.499 1,363 7.34 0.49 75.92 59.29 Dabho 1,135 5.576 2.958 2.618 8.32 1.49 76.53 38.36 Kasor 2.434 12.031 6.286 5.745 3.663 0.03 61.54 48.15 Taluk Anand 100.298 513.900 269971 243929 4.04 2.48 80.73 36.62 Village/ Sandesar 1.015 5.091 2.698 1.375 1.424 80.00 67.09 3.266	District/			Population			SC	ST		Work
Taluk Sojitra 19,359 96,138 50,475 45,663 6.00 0.45 69.75 44.42 Village/ Town Bhadkad 597 2,862 1,499 1,363 7.34 0.49 75.92 59.29 Town Bantwa 255 1,177 627 550 1.27 0.00 54.13 55.56 Dabhou 1,135 5,576 2,958 2,618 8.32 1.49 76.53 38.36 Malataj 929 4,666 2,435 2,231 8.72 1.03 71.57 34.87 Kasor 2,438 12,031 6.286 5,745 3.63 0.03 61.54 48.15 Town Gana 764 3,569 1,900 1.669 14.49 2.30 84.46 33.62 Village/ Sandesar 1,015 5,575 1,214 1.20 0.00 67.09 35.22 Town Gana 764 3,569 1,3751 1.44.9	Taluka/	Name		Persons	Male	Female	Population (%)	Population		Participation Rate (%)
Village/ Town Bhadkad 597 2,862 1,499 1,363 7.34 0.49 75.92 59.29 Town Bantwa 255 1,177 627 550 1.27 0.00 54.13 55.56 Dabhou 1,135 5,576 2,958 2,618 8.32 1.49 76.53 38.36 Virsadpura) - - - - - 76.53 38.36 Malataj 929 4,666 2,435 2,231 8.72 1.03 71.57 34.87 Kasor 2,438 12,031 6,286 5,745 3.63 0.03 61.54 48.15 Taluk Anand 100,298 513,900 2,6991 2,393 4.62 1.61 76.37 40.09 Town Gana 764 3,569 1,900 1,669 14.49 2.30 84.46 33.62 Village/ Mahelav 2,338 1,3603 2.86 1.46 86.37 33.	District	Anand	360,808	1,856,872	972,000	884,872	5.30	1.23	74.51	42.26
Town Bantwa 255 1,177 627 550 1.27 0.00 54.13 55.56 Dabhou 1,135 5,576 2,958 2,618 8.32 1.49 76.53 38.36 Malataj 929 4,666 2,435 2,231 8.72 1.03 71.57 34.87 Kasor 2,438 12,031 6,286 5,745 3.63 0.03 61.54 48.15 Taluk Anand 100,298 513,900 2,69971 243929 4.04 2.48 80.73 36.62 Village/ Gana 7044 3,569 1,900 1,669 14.49 2.30 84.46 33.62 Vans Khiliya 520 2,589 1,375 1,214 1.20 0.00 67.09 35.26 Khandhali 361 1,664 862 802 5.47 2.34 80.10 52.46 Village/ Mabelav 2,338 11.398 6.021 5.377 5.59		Sojitra	/	96,138		45,663				44.42
Dabhou (Virsalpura) 1,135 5,576 2,958 2,618 8.32 1.49 76.53 38.36 Malataj 929 4,666 2,435 2,231 8.72 1.03 71.57 34.87 Kasor 2,438 12,031 6,286 5,745 3,63 0.03 61.54 48.15 Taluk Anand 100,298 513,900 269971 243929 4.04 2.48 80.73 36.62 Village/ Sandesar 1,015 5,091 2,698 2,393 4.62 1.61 76.37 40.09 Town Gana 764 3,569 1,900 1,664 842 3.01 52.46 Karamsad (M) 6,179 28,955 15,352 13,603 2.86 1.46 86.37 33.23 Taluk Petad 52,894 265455 138924 126531 6.62 0.97 74.74 42.30 Village/ Mahelav 2,338 11,398 6.021 5.37<										
(Virsadpura) (Virsadpura) (Virsadpura) (Virsadpura) (Virsadpura) Malataj 929 4,666 2,435 2,231 8.72 1.03 71.57 34.87 Kasor 2,438 12,031 6,286 5,745 3.63 0.03 61.54 48.15 Taluk Anand 100,298 513,900 269971 243929 4.04 2.48 80.73 36.62 Village/ Sandesar 1.015 5.091 2,698 2,393 4.62 1.61 76.37 40.09 Gana 764 3,569 1,900 1.669 14.49 2.30 84.46 33.62 Vans Khiliya 520 2,589 1,375 1,214 1.20 0.00 67.09 32.33 Taluk Petlad 52,894 265455 138924 126,531 6.62 0.97 74.74 42.30 Village/ Mahelav 2,388 1,398 6.021 5.377 5.59 0.40 65.35 <td>Town</td> <td></td> <td></td> <td>,</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Town			,						
Kasor 2,438 12,031 6,286 5,745 3,63 0.03 61.54 48.15 Taluk Anand 100,298 513,900 269971 243929 4.04 2.48 80.73 36.62 Town Gana 764 3,569 1,900 1,669 14.49 2.30 84.46 33.62 Vans Khiliya 520 2,589 1,375 1,214 1.20 0.00 67.09 35.26 Khandhali 361 1,664 862 802 5.47 2.34 80.10 52.46 Karamsad (M) 6,179 28,955 15,352 13,603 2.86 1.46 86.37 33.23 Taluk Petlad 52,894 265455 138924 126,531 6.62 0.97 74.74 42.30 Village/ Mahelav 2,338 1,398 6,021 5,377 5.59 0.40 69.55 46.64 Morad 792 3,936 2,108 1,828 <t< td=""><td></td><td></td><td>1,135</td><td>5,576</td><td>2,958</td><td>2,618</td><td>8.32</td><td>1.49</td><td>76.53</td><td>38.36</td></t<>			1,135	5,576	2,958	2,618	8.32	1.49	76.53	38.36
Taluk Anand 100,298 513,900 269971 243929 4.04 2.48 80.73 36.62 Village/ Town Sandesar 1,015 5,091 2,698 2,393 4.62 1.61 76.37 40.09 Gana 764 3,569 1,000 1,669 14.49 2.30 84.46 33.62 Khandhali 361 1,664 862 802 5.47 2.34 80.10 52.46 Khandhali 361 1,664 862 802 5.47 2.34 80.10 52.46 Karamsad (M) 6,179 28,955 15,352 13,603 2.86 1.46 86.37 33.23 Taluk Petlad 52,894 265455 138924 126,531 6.62 0.97 74.74 42.30 Village/ Town Mahelav 2,338 11,398 6,021 5,377 5,59 0.40 69.55 44.64 Morad 792 3,936 2,036 1,879		Malataj	929	4,666	2,435	2,231	8.72	1.03	71.57	34.87
Village/ Town Sandesar 1,015 5,091 2,698 2,393 4.62 1.61 76.37 40.09 Gana 764 3,569 1,900 1,669 14.49 2.30 84.46 33.62 Vans Khiliya 520 2,589 1,375 1,214 1.20 0.00 67.09 35.26 Khandhali 361 1,664 862 802 5.47 2.34 80.10 52.46 Karamsad (M) 6,179 28,955 138924 126,531 6.62 0.97 74.74 42.30 Village/ Town Mahelav 2,338 11,398 6,021 5,377 5.59 0.40 69.55 46.64 Morad 792 3,936 2,108 1,828 3.71 1.42 65.35 49.87 Morad 792 3,936 2,036 1,879 4.88 1.56 70.63 43.83 Sunav 1,156 5,399 2,694 2,705 9.21 0.33		Kasor	2,438	12,031	6,286	5,745	3.63	0.03	61.54	48.15
Town Gana 764 3,569 1,900 1,669 14.49 2.30 84.46 33.62 Vans Khiliya 520 2,589 1,375 1,214 1.20 0.00 67.09 35.26 Khandhali 361 1,664 862 802 5.47 2.34 80.10 52.46 Karamsad (M) 6,179 28,955 15,352 13,603 2.86 1.46 86.37 33.23 Taluk Petlad 52,894 265455 138924 126,531 6.62 0.97 74.74 42.30 Village/ Mahelav 2,338 11,398 6,021 5,377 5.59 0.40 69.55 446.64 Town Bandhni 1,667 8,221 4,274 3,947 4.61 0.47 69.59 42.62 Morad 792 3,936 2,108 1,828 3.71 1.42 65.35 49.87 Village/ Morad 6,512 2,913 1,540 <td< th=""><th>Taluk</th><th>Anand</th><th>100,298</th><th>513,900</th><th>269971</th><th>243929</th><th>4.04</th><th>2.48</th><th>80.73</th><th>36.62</th></td<>	Taluk	Anand	100,298	513,900	269971	243929	4.04	2.48	80.73	36.62
Vans Khiliya 520 2,589 1,375 1,214 1.20 0.00 67.09 35.26 Khandhali 361 1,664 862 802 5.47 2.34 80.10 52.46 Karamsad (M) 6,179 28,955 15,352 13,603 2.86 1.46 86.37 33.23 Taluk Petlad 52,894 265455 138924 126,531 6.62 0.97 74.74 42.30 Village/ Mahelav 2,338 11,398 6,021 5,377 5.59 0.40 69.55 46.64 Bandhni 1,667 8,221 4,274 3,947 4.61 0.47 69.55 44.62 Morad 792 3,936 2,108 1,879 4.88 1.56 70.63 43.83 Sunav 1,156 5,399 2,694 2,705 9.21 0.33 86.13 41.90 Vishnoli 551 2,913 1,540 1,373 3.30 0.00	Village/	Sandesar	1,015	/	2,698	2,393	4.62		76.37	40.09
Khandhali 361 1,664 862 802 5.47 2.34 80.10 52.46 Karamsad (M) 6,179 28,955 15,352 13,603 2.86 1.46 86.37 33.23 Taluk Petlad 52,894 265455 138924 126,531 6.62 0.97 74.74 42.30 Village/ Town Mahelav 2,338 11,398 6,021 5,377 5.59 0.40 69.55 46.64 Morad 792 3,936 2,108 1,828 3.71 1.42 65.35 49.87 Morad 792 3,936 2,036 1,879 4.88 1.56 70.63 43.83 Sunav 1,156 5,399 2,694 2,705 9.21 0.33 86.13 41.90 Vishnoli 551 2,913 1,540 1,373 3.30 0.00 77.61 37.90 Taluk Borsad 67,252 347,409 181,961 165,448 4.54	Town	Gana	764	3,569	1,900	1,669		2.30		
Karamsad (M) 6,179 22,955 15,352 13,603 2.86 1.46 86.37 33.23 Taluk Petlad 52,894 265455 138924 126,531 6.62 0.97 74.74 42.30 Village/ Town Mahelav 2,338 11,398 6,021 5,377 5.59 0.40 69.55 46.64 Morad 792 3,936 2,108 1,828 3.71 1.42 65.35 49.87 Morad 792 3,936 2,036 1,879 4.88 1.56 70.63 43.83 Sunav 1,156 5,399 2,694 2,705 9.21 0.33 86.13 41.90 Visholi 551 2,913 1,540 1,373 3.30 0.00 77.61 37.90 Boriya 758 3.852 2,010 1.842 1.54 0.67 72.19 44.32 Village/ Town Map Vanto 971 5,436 2,838 2,598 0.92		Vans Khiliya	520	2,589	1,375	1,214	1.20	0.00	67.09	35.26
Taluk Petlad 52,894 265455 138924 126,531 6.62 0.97 74.74 42.30 Village/ Town Mahelav 2,338 11,398 6,021 5,377 5.59 0.40 69.55 46.64 Town Bandhni 1,667 8,221 4,274 3,947 4.61 0.47 69.59 42.62 Morad 792 3,936 2,108 1,828 3.71 1.42 65.35 49.87 Porda 844 3,915 2,036 1,879 4.88 1.56 70.63 43.83 Sunav 1,156 5,399 2,694 2,705 9.21 0.33 86.13 41.90 Vishnoli 551 2,913 1,540 1,373 3.30 0.00 70.40 41.61 Ardi 654 3,190 1,652 1,538 5.36 0.34 67.05 52.04 Boriya 758 3,852 2,010 1,842 15.91 0.00		Khandhali	361	1,664	862	802	5.47	2.34	80.10	52.46
Village/ Town Mahelav 2,338 11,398 6,021 5,377 5.59 0.40 69.55 46.64 Town Bandhni 1,667 8,221 4,274 3,947 4.61 0.47 69.59 42.62 Morad 792 3,936 2,108 1,828 3.71 1.42 65.35 49.87 Porda 844 3,915 2,036 1,879 4.88 1.56 70.63 43.83 Sunav 1,156 5,399 2,694 2,705 9.21 0.33 86.13 41.90 Vishnoli 551 2,913 1,540 1,373 3.30 0.00 70.40 41.61 Ardi 654 3,190 1,652 1,538 5.36 0.34 67.05 52.04 Boriya 758 3,852 2,010 1,842 15.91 0.00 77.61 37.90 Taluk Borsad 67,252 347,409 181,961 165,448 4.54 0.67		Karamsad (M)	6,179	28,955	15,352	13,603	2.86	1.46	86.37	33.23
Town Bandhni 1,667 8,221 4,274 3,947 4.61 0.47 69.59 42.62 Morad 792 3,936 2,108 1,828 3.71 1.42 65.35 49.87 Porda 844 3,915 2,036 1,879 4.88 1.56 70.63 43.83 Sunav 1,156 5,399 2,694 2,705 9.21 0.33 86.13 41.90 Vishnoli 551 2,913 1,540 1,373 3.30 0.00 70.40 41.61 Ardi 654 3,190 1,652 1,538 5.36 0.34 67.05 52.04 Boriya 758 3,852 2,010 1,842 15.91 0.00 77.61 37.90 Town Mapa Vanto 971 5,436 2,838 2,598 0.92 0.00 70.01 43.78 Kasumbad 557 2,488 1,265 1,223 4.46 0.00 70.77 59.81	Taluk	Petlad	52,894	265455	138924	126,531	6.62	0.97	74.74	42.30
Morad 792 3,936 2,108 1,828 3.71 1.42 65.35 49.87 Porda 844 3,915 2,036 1,879 4.88 1.56 70.63 43.83 Sunav 1,156 5,399 2,694 2,705 9.21 0.33 86.13 41.90 Vishnoli 551 2,913 1,540 1,373 3.30 0.00 70.40 41.61 Ardi 654 3,190 1,652 1,538 5.36 0.34 67.05 52.04 Boriya 758 3,852 2,010 1,842 15.91 0.00 77.61 37.90 Taluk Borsad 67,252 347,409 181,961 165,448 4.54 0.67 72.19 45.32 Village/ Napa Vanto 971 5,436 2,838 2,598 0.92 0.00 70.01 43.78 Kasumbad 557 2,488 1,265 1,223 4.46 0.00 70.77			2,338							46.64
Porda 844 3,915 2,036 1,879 4.88 1.56 70.63 43.83 Sunav 1,156 5,399 2,694 2,705 9.21 0.33 86.13 41.90 Vishnoli 551 2,913 1,540 1,373 3.30 0.00 70.40 41.61 Ardi 654 3,190 1,652 1,538 5.36 0.34 67.05 52.04 Boriya 758 3,852 2,010 1,842 15.91 0.00 77.61 37.90 Taluk Borsad 67,252 347,409 181,961 165,448 4.54 0.67 72.19 45.32 Village/ Napa Vanto 971 5,436 2,838 2,598 0.92 0.00 71.92 48.73 Town Dahemi 907 4,258 2,223 2,035 4.79 0.00 70.01 43.78 Kasumbad 557 2,488 1,265 1,223 4.46 0.00		Bandhni	1,667	8,221	4,274	3,947	4.61	0.47	69.59	42.62
Sunav 1,156 5,399 2,694 2,705 9,21 0,33 86.13 41.90 Vishnoli 551 2,913 1,540 1,373 3.30 0.00 70.40 41.61 Ardi 654 3,190 1,652 1,538 5.36 0.34 67.05 52.04 Boriya 758 3,852 2,010 1,842 15.91 0.00 77.61 37.90 Taluk Borsad 67,252 347,409 181,961 165,448 4.54 0.67 72.19 45.32 Village/ Napa Vanto 971 5,436 2,838 2,598 0.92 0.00 71.92 48.73 Town Mapa Vanto 971 5,436 2,838 2,598 0.92 0.00 70.01 43.78 Kasumbad 557 2,488 1,265 1,223 4.46 0.00 70.77 59.81 Harkhapura 374 1,779 955 824 4.38 0.00		Morad	792	3,936	2,108	1,828	3.71	1.42	65.35	49.87
Vishnoli 551 2,913 1,540 1,373 3.30 0.00 70.40 41.61 Ardi 654 3,190 1,652 1,538 5.36 0.34 67.05 52.04 Boriya 758 3,852 2,010 1,842 15.91 0.00 77.61 37.90 Taluk Borsad 67,252 347,409 181,961 165,448 4.54 0.67 72.19 45.32 Village/ Napa Vanto 971 5,436 2,838 2,598 0.92 0.00 71.92 48.73 Town Dahemi 907 4,258 2,223 2,035 4.79 0.00 70.01 43.78 Kasumbad 557 2,488 1,265 1,223 4.46 0.00 70.77 59.81 Harkhapura 374 1,779 955 824 4.38 0.00 67.44 59.08 Village/ Haldari 508 2,249 1,155 1,094 1.69		Porda	844	3,915	2,036	1,879	4.88	1.56	70.63	43.83
Ardi 654 3,190 1,652 1,538 5.36 0.34 67.05 52.04 Boriya 758 3,852 2,010 1,842 15.91 0.00 77.61 37.90 Taluk Borsad 67,252 347,409 181,961 165,448 4.54 0.67 72.19 45.32 Village/ Town Napa Vanto 971 5,436 2,838 2,598 0.92 0.00 71.92 48.73 Town Dahemi 907 4,258 2,223 2,035 4.79 0.00 70.01 43.78 Kasumbad 557 2,488 1,265 1,223 4.46 0.00 70.77 59.81 Harkhapura 374 1,779 955 824 4.38 0.00 67.44 59.08 Village/ Town Haldari 508 2,249 1,155 1,094 1.69 0.00 62.58 53.80 Model Asodar 1,697 8.811 4,580 4		Sunav	1,156	5,399	2,694	2,705	9.21	0.33	86.13	41.90
Boriya 758 3,852 2,010 1,842 15.91 0.00 77.61 37.90 Taluk Borsad 67,252 347,409 181,961 165,448 4.54 0.67 72.19 45.32 Village/ Town Napa Vanto 971 5,436 2,838 2,598 0.92 0.00 71.92 48.73 Kasumbad 557 2,488 1,265 1,223 4.46 0.00 70.77 59.81 Harkhapura 374 1,779 955 824 4.38 0.00 67.44 59.08 Village/ Haldari 508 2,249 1,155 1,094 1.69 0.00 62.58 53.80 Village/ Haldari 508 2,249 1,155 1,094 1.69 0.00 62.58 53.80 Village/ Haldari 508 2,249 1,155 1,094 1.69 0.00 62.58 53.80 Mown Asodar 1,697 8,811		Vishnoli	551	2,913	1,540	1,373	3.30	0.00	70.40	41.61
Taluk Borsad 67,252 347,409 181,961 165,448 4.54 0.67 72.19 45.32 Village/ Town Napa Vanto 971 5,436 2,838 2,598 0.92 0.00 71.92 48.73 Town Dahemi 907 4,258 2,223 2,035 4.79 0.00 70.01 43.78 Kasumbad 557 2,488 1,265 1,223 4.46 0.00 70.77 59.81 Harkhapura 374 1,779 955 824 4.38 0.00 67.44 59.08 Taluk Anklav 26,801 134,680 70,758 63,922 3.98 0.65 69.47 49.50 Village/ Town Haldari 508 2,249 1,155 1,094 1.69 0.00 62.58 53.80 Mosdar 1,697 8,811 4,580 4,231 5.57 1.77 74.19 46.39 Metasi 257 1,218 656		Ardi	654	3,190	1,652	1,538	5.36	0.34	67.05	52.04
Village/ Town Napa Vanto 971 5,436 2,838 2,598 0.92 0.00 71.92 48.73 Main 907 4,258 2,223 2,035 4.79 0.00 70.01 43.78 Kasumbad 557 2,488 1,265 1,223 4.46 0.00 70.77 59.81 Harkhapura 374 1,779 955 824 4.38 0.00 67.44 59.08 Taluk Anklav 26,801 134,680 70,758 63,922 3.98 0.65 69.47 49.50 Village/ Town Haldari 508 2,249 1,155 1,094 1.69 0.00 62.58 53.80 Modar 1,697 8,811 4,580 4,231 5.57 1.77 74.19 46.39 Bhetasi 257 1,218 656 562 17.49 0.00 76.71 44.17 Mabali 839 4,027 2,086 1,941 3.18 0.05 <td></td> <td>Boriya</td> <td>758</td> <td>3,852</td> <td>2,010</td> <td>1,842</td> <td>15.91</td> <td>0.00</td> <td>77.61</td> <td>37.90</td>		Boriya	758	3,852	2,010	1,842	15.91	0.00	77.61	37.90
Town Dahemi 907 4,258 2,223 2,035 4.79 0.00 70.01 43.78 Kasumbad 557 2,488 1,265 1,223 4.46 0.00 70.77 59.81 Harkhapura 374 1,779 955 824 4.38 0.00 67.44 59.08 Taluk Anklav 26,801 134,680 70,758 63,922 3.98 0.65 69.47 49.50 Village/ Haldari 508 2,249 1,155 1,094 1.69 0.00 62.58 53.80 Town Asodar 1,697 8,811 4,580 4,231 5.57 1.77 74.19 46.39 Bhetasi 257 1,218 656 562 17.49 0.00 76.71 44.17 Ambali 839 4,027 2,086 1,941 3.18 0.05 68.69 54.08 Amrol 969 5,006 2,655 2,351 1.36 0	Taluk	Borsad	67,252	347,409	181,961	165,448	4.54	0.67	72.19	45.32
Kasumbad 557 2,488 1,265 1,223 4.46 0.00 70.77 59.81 Harkhapura 374 1,779 955 824 4.38 0.00 67.44 59.08 Taluk Anklav 26,801 134,680 70,758 63,922 3.98 0.65 69.47 49.50 Village/ Town Haldari 508 2,249 1,155 1,094 1.69 0.00 62.58 53.80 Makiav 26,801 134,680 70,758 63,922 3.98 0.65 69.47 49.50 Village/ Town Haldari 508 2,249 1,155 1,094 1.69 0.00 62.58 53.80 Bhetasi (Talpad) 257 1,218 656 562 17.49 0.00 76.71 44.17 Ambali 839 4,027 2,086 1,941 3.18 0.05 68.69 54.08 Amrol 969 5,006 2,655 2,351 1.36	Village/	Napa Vanto	971	5,436	2,838	2,598	0.92	0.00	71.92	48.73
Harkhapura 374 1,779 955 824 4.38 0.00 67.44 59.08 Taluk Anklav 26,801 134,680 70,758 63,922 3.98 0.65 69.47 49.50 Village/ Town Haldari 508 2,249 1,155 1,094 1.69 0.00 62.58 53.80 Bhetasi 257 1,218 656 562 17.49 0.00 76.71 44.17 Ambali 839 4,027 2,086 1,941 3.18 0.05 68.69 54.08 Amrol 969 5,006 2,655 2,351 1.36 0.00 68.59 56.11	Town		907	4,258	2,223	2,035		0.00		43.78
Taluk Anklav 26,801 134,680 70,758 63,922 3.98 0.65 69.47 49.50 Village/ Town Haldari 508 2,249 1,155 1,094 1.69 0.00 62.58 53.80 Modar 1,697 8,811 4,580 4,231 5.57 1.77 74.19 46.39 Bhetasi 257 1,218 656 562 17.49 0.00 76.71 44.17 Ambali 839 4,027 2,086 1,941 3.18 0.05 68.69 54.08 Amrol 969 5,006 2,655 2,351 1.36 0.00 68.59 56.11		Kasumbad	557	2,488	1,265	1,223	4.46	0.00	70.77	59.81
Village/ Town Haldari 508 2,249 1,155 1,094 1.69 0.00 62.58 53.80 Asodar 1,697 8,811 4,580 4,231 5.57 1.77 74.19 46.39 Bhetasi 257 1,218 656 562 17.49 0.00 76.71 44.17 Ambali 839 4,027 2,086 1,941 3.18 0.05 68.69 54.08 Amrol 969 5,006 2,655 2,351 1.36 0.00 68.59 56.11		Harkhapura	374	1,779	955	824	4.38	0.00	67.44	59.08
Town Asodar 1,697 8,811 4,580 4,231 5.57 1.77 74.19 46.39 Bhetasi 257 1,218 656 562 17.49 0.00 76.71 44.17 (Talpad) Ambali 839 4,027 2,086 1,941 3.18 0.05 68.69 54.08 Amrol 969 5,006 2,655 2,351 1.36 0.00 68.59 56.11	Taluk	Anklav		134,680	70,758	63,922		0.65		49.50
Bhetasi (Talpad) 257 1,218 656 562 17.49 0.00 76.71 44.17 Ambali 839 4,027 2,086 1,941 3.18 0.05 68.69 54.08 Amrol 969 5,006 2,655 2,351 1.36 0.00 68.59 56.11	Village/	Haldari	508	2,249	1,155	1,094		0.00	62.58	53.80
(Talpad) Ambali 839 4,027 2,086 1,941 3.18 0.05 68.69 54.08 Amrol 969 5,006 2,655 2,351 1.36 0.00 68.59 56.11	Town	Asodar	1,697	8,811	4,580	4,231		1.77		46.39
Amrol 969 5,006 2,655 2,351 1.36 0.00 68.59 56.11			257	1,218	656	562	17.49	0.00	76.71	44.17
		Ambali	839	4,027	2,086	1,941	3.18	0.05	68.69	54.08
		Amrol	969	5,006	2,655	2,351	1.36	0.00	68.59	56.11
Anklav(M) = 3,877 19,803 10,420 9,383 4.56 1.81 71.50 48.23		Anklav (M)	3,877	19,803	10,420	9,383	4.56	1.81	71.50	48.23

 Table 4-41 Demographic Profile of Anand District

Source: Census of India, 2001

(8) Vadodara District

The district contains 16 towns and 1,553 villages. Of which 1,548 villages are inhabited. According to the Surveyor General of India, its geographical area is 7,550 km². In this district, 7,278.8 km² area belongs to rural and 271.2 km² area pertains to urban. It has returned a total population of 3,641,802 persons at the 2001 Census as against 3,038,127 persons reported at the 1991 Census and thus registering an overall growth rate of 19.9% against the state average of 22.7%. Of the total population, 1,897,368 persons are males and 1,744,434 persons are females thereby reflecting a sex ratio of 919 females per 1,000 males which is just below the state average of 920. The district has recorded the child sex ratio of 886 girls per 1,000 boys. In this district, as many as 1,995,580 persons are residing in rural areas and rest 1,646,222 persons in urban areas. The density of population of the district comes to 482 persons/km².

The literacy rate in the district is 70.8% which is above the state average of 69.1%. Further, the male and female literacy rates account for 80.0% and 60.7% respectively. Out of the total population of the district, 33.0% have been classified as main workers, 8.7% as marginal workers and 58.3% as non-workers. Further, the working population has been divided into four major categories according to their economic activity. The percentage shares of cultivators, agricultural labourers, workers in household industries and other workers are 22.0%, 31.0%, 1.5% and 45.5% respectively.

Agriculture is the main occupation of the people of the district and they grow cotton, jowar, rice, bajri, tobacco and groundnut as principal crops.

Ethnic Minorities

The Schedule Caste (SC) population of Vadodara is 204,285; it is 5.6 % of total population. Out of total SC population male SC population is 106,497 (5.6% of total population) and female SC population is 97,788 (5.6% of total population). The schedule Tribe (ST) population of the Vadodara is 967,393 (26.6% of total population). Out of total ST population, male ST population is 496,058 (26.1% of total population) and female St population is 471,335 (27.0% of the total population).

DFC Specific Demographic Profile

Vadodara District is divided into two talukas- Vadodara and Karjan. While the former is mostly in detour section, Karjan lies in the parallel section of DFC. The proposed DFC traverses through the administrative boundaries of 27 villages (17 in Vadodara and 10 in Karjan), 1 town and 1 city with outgrowth under 2 Talukas as seen in Table 4-42. Besides Vadodara City and out growth, Karjan is another important town with over 5,000 population. Of all 27 villages, Valan (1,611) and Bhayli (1,553) are the bigger villages with over 1,500 population. Other villages over 1,000 households are Sindhrot, Kandari, Miyagam and Sansrod.

ST population is remarkably more than SC population in most villages; literacy rate is quite high across all villages but highest in Vadodara city as is expected (famous with many educational institutions) but work participation rate is moderate though, hardly crossing 50% mark. Table 4-42 below shows the socio-economic demographic profile of the DFC corridor in Vadodara district.

District/		Total No.of	Total Population			SC	ST	Literacy	Work
Taluka/ Village	Name	Households	Person	Male	Female	Populat ion (%)	Population (%)	Rate (%)	Participation Rate (%)
District	Vadodara	739,276	3,641,802	1,897,368	1,744,434	5.61	26.56	70.76	41.71
Taluka	Vadodara	363,886	1,705,989	894,780	811,209	6.87	4.71	85.06	33.19
Village	Anagadh	2,560	13,531	6,931	6,600	3.30	0.35	69.44	35.65
	Kotna	379	2,051	1,062	989	0.88	0.00	69.08	39.69
	Sindhrot	1,262	6,174	3,220	2,954	1.44	3.58	59.63	35.76
	Hinglot	182	988	494	494	1.52	0.20	68.69	49.39
	Ampad	251	1,328	706	622	2.33	0.00	76.82	50.00
	Bhayli	1,553	7,096	3,682	3,414	14.35	9.75	79.81	42.08
	Raypura	870	4,594	2,393	2,201	0.26	0.00	76.55	41.47
	Bil	966	4,471	2,339	2,132	9.06	17.54	76.85	45.47
	Talsat	177	856	438	418	1.64	0.00	51.95	48.48
	Chapad	496	2,280	1,200	1,080	10.66	16.62	69.77	49.56
	Maretha*	370	1,852	969	883	7.07	13.55	76.86	39.31
	Alamgir	146	763	418	345	11.14	20.84	71.62	30.93
	Varnama	899	4,177	2,219	1,958	13.48	20.25	73.94	37.51
	Itola	861	3,826	1,971	1,855	10.35	27.26	71.69	41.17
	Vadsala	709	3,115	1,640	1,475	12.07	23.43	79.71	31.27
	Sarar	486	2,258	1,158	1,100	12.58	19.18	65.47	40.30
	Kashipura	198	942	499	443	14.44	31.74	74.13	32.06
	Vadodara (M Corp+OG)	303,130	1,411,228	739,675	671,553	6.69	3.95	86.86	32.14
	Vadodara (M Corp.)	280,873	1,306,227	684,013	622,214	6.61	3.58	87.55	32.05
Taluka	Karjan	33,349	162,486	85,044	77,442	7.39	25.37	68.82	43.94
Village	Kherda	182	959	496	463	3.13	18.98	56.88	57.04
	Kandari	1,156	5,845	3,326	2,519	7.34	40.00	64.37	43.82
	Miyagam	1,050	5,155	2,658	2,497	4.25	3.82	66.21	42.19
	Lakodara	358	1,912	1,014	898	7.64	17.99	71.48	43.10
	Vadava	14	54	28	26	24.07	46.30	28.89	40.74
	Dethan	462	2,134	1,142	992				
	Valan	1,611	9,250	4,800	4,450				
	Mankan	321	1,766	895	871	7.97	20.06	75.12	39.55
	Sansrod	1,054	5,561	2,786	2,775	3.18	13.73	77.52	33.33
	Haldarva	377	2,191	1,183	1,008	4.64	21.63	75.72	36.69
	Karjan (M)	5,487	26,358	13,764	12,594	6.53	25.46	73.53	32.19

Table 4-42	Demographic	Profile of	f Vadodara	District
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N.B. - * Maretha village is where the detour and parallel alignment of DFC merge. From thereon, it runs parallel towards Karjan (south).

Source: Census of India, 2001

4.4.2 Economic Condition

(1) Banaskantha District

The economy of this district predominantly is agrarian and it provides direct and indirect employment to the major chunk of population. Jowar, bajri, wheat, cotton and potato are the principal crops grown in the district.

- **Industry:** There are 4,158 small and large-scale industries in which 2,617 in rural areas and 1,541 in urban areas.
- **Social Infrastructure:** The main infrastructure comes from agriculture. Banaskantha is rich in Marble quarries and Copper deposits. India's diamond industry has its origins in Palanpur.

It has got prestigious State Agricultural University Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar. The main agriculture is of Bajra crops.

- **Transportation:** Transportation plays a principle role in Economic and general development. A well laid out road network is essential for efficient and cost effective movement of men and materials, without which trade and industry cannot maintain a competitive edge. Transport network in this district is mainly formed by roads and broad/meter gauge railway lines. National Highway No. 15, state highways and other metalled roads also passes through this district.

(2) Patan District

- **Industry Facility:** There are 2,582 small and large-scale industries in which 1,015 in rural areas and 1,567 in urban areas.
- **Social Infrastructure:** The main economy of Patan District comes from Agricultural sector. Main Crops grown in the district are Bajra, Jowar, cotton and oilseeds.
- **Transportation:** There is a well-developed network of roads and railways in this district.

(3) Mehasana District

- **Industry:** Gujarat is developing industries. A large no of small scale and large-scale industries in the state. There are 4,857 small and large-scale industries in which 2336 in rural area and 2,521 in urban area.
- **Major Infrastructure:** Mahesana being the earliest gas fields discovered in the country. During 2003-04, Gujarat produced 2216 MCM of gas, which was 7% of the country's production. Gujarat has 26.02 MMSCD of gas allocation, which is 25% of the country's total allocation. Gujarat holds the unique distinction of being the only state with more than one gas producer. Apart from ONGC, Gujarat State Petroleum Corporation Ltd. (GSPC), Cairn Energy and Niko Resources are engaged in the production of natural gas in the state.
- **Transportation:** There is a well-developed transportation system in this district.

(4) Gandhinagar District

- **Industry:** There are 3,137 small and large-scale industries in which 1,203 in rural areas and 1,934 in urban areas.
- **Transportation:** Gandhinagar is capital of Gujarat. It is well linked by rail and road.

(5) Ahmedabad District

- Industry: The State has constituted a mechanism of single window clearance in the form of Gujarat Infrastructure Development Board (GIDB), headed by Chief Minister. Concession agreements are finalised in a transparent manner. GIDB had prepared a detailed Master Plan. "Infrastructure Agenda Vision 2010", laying down 383 projects estimating an investment of Rs. 1.16,993 crore. Almost 70% of the investment is envisaged to come from private sector Blue prints for development of power generating plants, ports, roads, LNG platforms, a common gas grid, industrial parks, urban infrastructure, airports and information infrastructure have been detailed to form a part of the Infrastructure Agenda : Vision 2010. In fact. Gujarat is the first State to have legislated a law governing private sector investment in infrastructure. The statute, interalia. lays down the framework and methodology to be used in awarding of projects, concession agreements, develop risk allocating mechanisms, the rights and obligations of not only the private investors but that of the role of Government itself.
- Major Infrastructure: Ahmedabad is the largest inland industrial centre in western India,

and has historically enjoyed a reputation as an important base of commerce, trade and industry. Under Muzaffarid rule, the city was a major trade destination for western India, because of its proximity to the port at Surat and for its access to the hinterland of Gujarat. In the 19th century, the textile and garments industry developed and thrived in the city — on 30 May 1861 Ranchhodlal Chhotalal founded the first Indian textile mill, the Ahmedabad Spinning and Weaving Company Limited. This was followed by the establishment of a series of textile mills such as the Calico Mills in 1880 by Maganbhai, and mills founded by industrialists such as Ambalal Sarabhai and Kasturbhai Lalbhai. Arvind Mills, located in Ahmedabad, is one of the largest textile mills in the country.

Ahmedabad has a thriving chemicals and pharmaceuticals industry. Two of the biggest pharmaceutical companies of India — Zydus Cadila and Torrent Pharmaceuticals — are based in the city. The city serves as the corporate headquarters of the Adani Group, which is a leading multinational trading company. The Nirma group of industries, which runs a large number of detergent and chemical industrial units, has its corporate headquarters in the city. In recent year many foreign companies have set up their sales offices and production facilities in Ahmedabad. Amongst them are Bosch Rexroth, Germany (hydraulic components); Stork, Netherlands (textile machinery; joint venture with ATE, India's leading textile equipment trading house); Rollepaal, Netherlands (pipe extrusion equipment); and Johnson Pumps, Sweden.

The completion and operation of the Sardar Sarovar Project of dams and canals has improved the supply of potable water and electricity for the city. In recent years, the Gujarat government has increased investment in the modernisation of the city's infrastructure, providing for the construction of larger roads and improvements to water supply, electricity and communications. The information technology industry has developed significantly in Ahmedabad. A NASSCOM survey in 2002 on the "Super Nine Indian Destinations" for ITenabled services ranked Ahmedabad fifth among the top nine most competitive cities in the country.

Transportation: Ahmedabad is one of the six operating divisions of the Western Railway. Railway lines connect the city to all towns in Gujarat, and to major cities in the rest of India. The Ahmedabad Railway Station and the Maninagar Railway Station are the main terminals for the city. The Sardar Vallabhbhai Patel International Airport provides for both domestic and international aviation for the city and the neighbouring cities of Gandhinagar, Mahesana and Nadiad. The airport connects the city with destinations across India and to cities in the Middle East, East Asia and destinations in Western Europe.

National Highway 8, linking Delhi to Mumbai, passes though Ahmedabad. Ahmedabad is connected to Vadodara through National Expressway 1, a 94 km (58 mi) long highway with only two exits. This expressway is part of the Golden Quadrilateral project. Ahmedabad is directly connected by highways to Bhavnagar, Nadiad, Mahesana, Surendranagar, Bhuj, Rajkot and Gandhinagar.

The city's main traffic arteries are the Mahatma Gandhi Road, C. G. Road, the Jawaharlal Nehru Road, the Ashram Road and the Sarkhej-Gandhinagar highway (S.G. Highway).

(6) Kheda District

- **Industry Facility:** There are 3282 small and large-scale industries in which 2,138 in rural areas and 1,144 in urban areas.
- **Transportation:** There is a very well developed network of roads and railways in this district.

(7) Anand District

- **Industry Facility:** There are 4,399 small and large-scale industries in which 1,703 in rural areas and 2,696 in urban areas.

(8) Vadodara District

- **Industry:** At a state level, Vadodara has only 3.1% of the total state functioning units and attracts a fixed investment of Rs. 46,941 crores. However, this investment is not substantial enough and forms only 6.3% of the total state investment; it cannot provide any impetus for industrial growth. Employment in Vadodara's small-scale industries (SSI) is 4% as against 17.5% and 14.1% respectively in Ahmedabad and Surat. The exports from SSI in Vadodara amount to only 1% against 5.4% in the case of Ahmedabad. The percentage of plant and machinery to fixed investments is 36% in Vadodara, implying that the industries are mostly labour intensive in nature.
- **Industry Facility:** There are 11,088 small and large-scale industries in which 2,202 in rural areas and 8886 in urban areas, 217 medium and large-scale industries (MLI) in and around Vadodara. The maximum number of Medium and Large Industries (MLI) is concentrated in Nandesari and account for 40% of MLI. Some of these are: Gujarat State Fertilizers and Chemicals Limited, Gujarat Refinery, Indian Petrochemicals Corporation Limited and Gujarat Alkalis and Chemicals Limited.
- **Major Infrastructure:** In Vadodara various large-scale industries such as Gujarat State Fertilisers & Chemicals, Indian Petrochemicals Corporation Limited and Gujarat Alkalies and Chemicals Limited have come up in the vicinity of Gujarat Refinery and all of them are dependent on it for their fuel and feedstock. Other large-scale public sector units are Heavy Water Project, Gujarat Industries Power Company Limited, ONGC & GAIL. In addition to these public sector enterprises, a number of other large-scale enterprises have come up in the private sector. The products of these industries have wide applications in various sectors of the Indian economy.

The discovery of oil and gas in Ankleshwar led to the industrial development of Gujarat in a big way. The Vadodara region is the largest beneficiary in the process of this industrialisation. Gujarat Refinery went into the first phase of production in 1965. The refinery being a basic industry made vital contributions on several fronts at the regional and national levels.

- **Transportation:** The city is on the major rail and road arteries joining Mumbai with Delhi and Mumbai with Ahmedabad. Because of this Vadodara is known as a 'Gateway to the Golden Corridor'. National Highway No. 8 passes through the city. Vadodara is also connected with Ahmedabad through National Expressway No. 1, a stretch of 97 km Super Highway with only 2 exits. The Vadodara Railway Station belongs to the Western Railways division of Indian Railways and is a major station on the Mumbai-Delhi and Mumbai-Ahmedabad routes. Public transport vehicles within the city include buses, autorickshaws and taxis.

4.4.3 Education

(1) Banaskantha District

- **Literacy level:** In the district, the overall literacy rate is 51.0% which is far below the state average of 69.1 %. The male and female literacy rates of the district account for 66.5% and 34.4 % respectively. The total number of literate in district is 10,37,619 out of which male literate population is 6,99,080 and female literate population is 3,38,539. The literacy rate of Banaskantha is 51.0%, out of this literacy rate of male is 66.5% and female literacy rate is 34.4%.
- **Education Facility:** There are 3,838 school and colleges out of which 3,566 in rural area and 272 in urban area.

(2) Patan District

- **Literacy level:** The total number of literate in district is 5.99.082 out of which male literate population is 375,588 and female literate population is 223,494. The literacy rate of Patan 60.4%, out of this literacy rate of male is 73.6% and female literacy rate is 46.3%.
- Education Facility: There are 1,725 school and colleges out of which, 300 in rural area and 2,626 in urban area

(3) Mahesana District

- **Education Level:** The total number of literate in district is 1,188,224 out of which male literate population is 698,626 and female literate population is 489,598.
- Literacy Rate: The literacy rate of Mahesana is 75.2%, out of this literacy rate of male is 86.2% and female literacy rate is 63.6%.
- Education Facility: There are 2,626 schools, colleges in which 2,184 in rural area and 442 in urban area. Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar is one of the study centre in the district.

(4) Gandhinagar District

- **Education level:** The total number of literate in district is 1,879,834 out of which male literate population is 522,575 and female literate population is 357,259.
- **Literacy Rate:** The literacy rate of Gandhinagar 76.6%, out of this literacy rate of male is 87.7% and female literacy rate is 64.6%.
- Education Facility: There are 1,718 school and colleges out of which, 1,350 in rural area and 368 in urban area

(5) Ahmedabad District

- **Literacy Level:** The total number of literate in Ahmedabad is 40,12,140 out of which male literate population is 23,18,295 and female literate population is 16,93,845. The literacy rate of Ahmedabad is 79.5%, out of this literacy rate of male is 10.7% and female literacy rate is 70.8%.
- **Education Facility:** Education has a multiplier effect on other social sectors like health, women development, employment, child development, labour etc. It is also of great instrumental value in the process of economic growth and development. Education not only improves the quality of life of the people, it also provides opportunities for progress.

(6) Kheda District

- **Education level:** The total number of literate in district is 1,243,363 out of which male literate population is 769,426 and female literate population is 473,937.
- **Literacy Rate:** The literacy rate of Kheda 72.0%, out of this literacy rate of male is 86.0 % and female literacy rate is 56.9%.
- Education Facility: There are 3,263 school and colleges out of which, 2,895 in rural area and 368 in urban area

(7) Anand District

- Education Level: The total number of literate in district is 1,193,404 out of which male

literate population is 717,909 and female literate population is 475,495.

- **Literacy Rate:** The literacy rate of Anand is 74.5%, out of this literacy rate of male is 86.1% and female literacy rate is 61.9%.
- Education Facility: There are 2,180 school and colleges out of which, 1,645 in rural area and 535 in urban area.

Anand Agricultural University, Anand

Institute of Rural Management, Anand

Dadabhai Navaroji High School, Anand (Mostly Known as D N High School)

Anand homeopathic college, Anand

Anandalaya Education Society, Anand

(8) Vadodara District

- **Education Level:** The total number of literate in district is 2,228,008 out of which male literate population is 1,309,347 and female literate population is 918,661.
- **Literacy Rate:** The literacy rate of Vadodara is 70.8%, out of this literacy rate of male is 80.0% and female literacy rate is 60.7%.
- Education Facility: There are 5,242 school and colleges out of which, 3947 in rural area and 1295 in urban area. Vadodara has a legacy of being a rich cultural and educational centre. Vadodara is known for imparting quality education. The patronage of educational institutions in Vadodara started with Maharaja Sayajirao; the city has built further on the academic infrastructure established by him.

4.4.4 Employment

(1) Banaskantha District

- Occupational Structure: The occupational structure of the population in Banaskantha has been taken from census of India. The study area has been studied with reference to total workers, main workers, marginal workers and non-workers. The total workers in the district are 1,092,201 (43.6% of total population), out of which 664,253 (51.2%) are male and 427,945 (35.5%) are female. Total main workers of district are 830,579 (33.2% of total population), out of which 619,198 (47.7%) are male and 211,381 (17.5%) are female. Of the total population of the district, the proportions of main workers, marginal workers and non workers are 33.2%, 10.4% and 56.4% respectively. In the 2001 census, the workers have further been divided into 4 major sectors according to their main economic activity. The proportions of cultivators, agricultural labourers, workers in the household industries and other workers to total workers account for 44.2 %, 22.2%, 1.7 % and 31.8% respectively. Apart from the above said values workers, the occupational structure also consists of cultivators, agricultural labourers, workers in household industries and other workers.
- **Cultivators:** The person who is engaged either as employer, single workers or family worker in cultivation of land owned is termed as cultivator. Total cultivator in the district are 482,803 (44.2% of total working population), out of which 336,184 (50.6%) are male and 146,679 (34.3%) are female.
- Agricultural labourers: Persons working on the land of others for wages or share in the yield have been treated as agricultural labourers. The total workers of this category are about 242,728 (22.2% of total working population), out of which 116,893 (17.6%) are male and 125,835 (29.4%) are female.
- Workers in household industries: Household in industry is defined as an industry conducted by one or more members of the household at home or within the village in rural

area and only within the precincts of the house where the household lives in urban areas. The larger proportion of workers in the household industry consists of members of the household. The industry is not run on the scale of a registered factory, which could qualify or has to be registered under the Indian Factories Act. The total numbers of workers in household factories under the study area is 18,875 (1.7% of total population), out of which 10,726 (1.6%) are male and 8,149 (1.9%) are female.

- **Other workers:** All workers other than cultivators or agricultural labourers, who have been engaged in some economic activity, are other workers. The workers that come under this category include plantation workers, commerce, business, transport, mining, construction, workers etc. the total number of other workers under the study area is 347,795 (31.8% of total population), out of which 200,450 (30.2%) are male and 147,345 (34.4%) are female.
- **Marginal Workers:** The marginal workers are those workers, who are engaged in some work for a period of less than six months, during the reference year prior to the census survey. The total marginal workers in the district are 261,622 (10.4% of total population), out of which 45,055 (3.5%) are male and 216,567 (17.9%) are female
- **Non-Workers:** The non-workers include those engaged in unpaid household duties, students, retired persons, dependents, beginners etc. The total non-workers in the district are 1,412,043 (56.4% of total population), out of which 633,151 (48.8%) are male and 778,892 (64.5%) are female.

(2) Patan District

- Occupational Structure: The occupational structure of the population in Patan has been taken from census of India. The study area has been studied with reference to total workers, main workers, marginal workers and non-workers. The total workers in the district are 533,078 (45.1% of total population), out of which 325,825 (53.2%) are male and 207,253 (36.3%) are female. Total main workers of district are 395,470 (33.4% of total population), out of which 298,380 (48.7%) are male and 97,090 (17.0%) are female. Apart from the above said values workers, the occupational structure also consists of cultivators, agricultural labourers, workers in household industries and other workers. The details of these are given below:
- **Cultivators:** The person who is engaged either as employer, single workers or family worker in cultivation of land owned is termed as cultivator. Total cultivator in the district are 151,828 (28.5% of total population), out of which 110,477 (33.9%) are male and 41,351 (20.0%) are female
- Agricultural Labourers: Persons working on the land of others for wages or share in the yield have been treated as agricultural labourers. The total workers of this category are about 188,699 (35.4% of total working population), out of which 88,443 (27.1%) are male and 100,256 (48.4%) are female.
- Workers in household industries: Household in industry is defined as an industry conducted by one or more members of the household at home or within the village in rural area and only within the precincts of the house where the household lives in urban areas. The larger proportion of workers in the household industry consists of members of the household. The industry is not run on the scale of a registered factory, which could qualify or has to be registered under the Indian Factories Act. The total numbers of workers in household factories under the study area is 9,057 (1.7% of total population), out of which 4,406(1.4%) are male and 4,651 (2.2%) are female.
- Other Workers: All workers other than cultivators or agricultural labourers, who have been engaged in some economic activity, are other workers. The workers that come under this category include plantation workers, commerce, business, transport, mining, construction, workers etc. the total number of other workers under the study area is 183,494 (34.4% of total population), out of which 122,499 (37.6%) are male and 60,995 (29.4%) are female.

- Marginal Workers: The marginal workers are those workers, who are engaged in some work for a period of less than six months, during the reference year prior to the census survey. The total marginal workers in the district are 137,608 (11.6% of total population), out of which 27,445 (4.5%) are male and 110,163 (19.3%) are female
- **Non-Workers:** The non-workers include those engaged in unpaid household duties, students, retired persons, dependents, beginners etc. The total non-workers in the district are 649,631 (54.9% of total population), out of which 286,275 (46.8%) are male and 363,356 (63.7%) are female.

(3) Mehasana District

- Occupational Structure: The occupational structure of the population in Mahesana has been taken from census of India. The study area has been studied with reference to total workers, main workers, marginal workers and non-workers. The total workers in the district are 828,519 (45.1% of total population), out of which 512,458 (61.9%) are male and 316,061 (38.1%) are female. Total main workers of district are 665,080 (36.2% of total population), out of which 474,349 (71.3%) are male and 190,731 (28.7%) are female.

Apart from the above said values workers, the occupational structure also consists of cultivators, agricultural labourers, workers in household industries and other workers. The details of these are given below:

- **Cultivators:** The person who is engaged either as employer, single workers or family worker in cultivation of land owned is termed as cultivator. Total cultivator in the district are 193,337 (23.3 % of total working population), out of which 159,654 (31.2 %) are male and 33,683 (10.7 %) are female.
- **Agricultural Labourers:** Persons working on the land of others for wages or share in the yield have been treated as agricultural labourers. The total workers of this category are about 202,733 (24.5 % of total working population), out of which 104,160 (20.3%) are male and 98,573 (31.2%) are female.
- Workers in Household Industries: Household in industry is defined as an industry conducted by one or more members of the household at home or within the village in rural area and only within the precincts of the house where the household lives in urban areas. The larger proportion of workers in the household industry consists of members of the household. The industry is not run on the scale of a registered factory, which could qualify or has to be registered under the Indian Factories Act.

The total numbers of workers in household factories under the study area is 13,967 (1.7% of total population), out of which 7,302 (1.4%) are male and 6,665 (2.1%) are female.

- **Other Workers:** All workers other than cultivators or agricultural labourers, who have been engaged in some economic activity, are other workers. The workers that come under this category include plantation workers, commerce, business, transport, mining, construction, workers etc. the total number of other workers under the study area is 418,482 (50.5 % of total population), out of which 241,342 (47.1%) are male and 177,140 (56.0%) are female.

Marginal Workers: The marginal workers are those workers, who are engaged in some work for a period of less than six months, during the reference year prior to the census survey. The total marginal workers in the district are 163,439 (8.9 % of total population), out of which 38,109 (4.0%) are male and 125,330 (14.2%) are female

- **Non-Workers:** The non-workers include those engaged in unpaid household duties, students, retired persons, dependents, beginners etc. The total non-workers in the district are 1,009,373 (54.9 % of total population), out of which 441,384 (46.3 %) are male and 567,989 (64.2 %) are female.

(4) Gandhinagar District

- Occupational Structure: The occupational structure of the population in Gandhinagar has been taken from census of India. The study area has been studied with reference to total workers, main workers, marginal workers and non-workers. The total workers in the district are 554,336 (41.5% of total population), out of which 370,462 (53.1%) are male and 183,874 (28.9%) are female. Total main workers of district are 467,413 (35.0% of total population), out of which 343,992 (49.3%) are male and 123,874 (19.4%) are female.

Apart from the above said values workers, the occupational structure also consists of cultivators, agricultural labourers, workers in household industries and other workers. The details of these are given below:

- **Cultivators:** The person who is engaged either as employer, single workers or family worker in cultivation of land owned is termed as cultivator. Total cultivator in the district are 102,849 (18.6% of total working population), out of which 90,404 (24.4%) are male and 12,446 (6.8%) are female.
- **Agricultural Labourers:** Persons working on the land of others for wages or share in the yield have been treated as agricultural labourers. The total workers of this category are about 120,849 (21.6% of total working population), out of which 68,607 (18.5%) are male and 51,396 (28.0%) are female.
- Workers in Household Industries: Household in industry is defined as an industry conducted by one or more members of the household at home or within the village in rural area and only within the precincts of the house where the household lives in urban areas. The larger proportion of workers in the household industry consists of members of the household. The industry is not run on the scale of a registered factory, which could qualify or has to be registered under the Indian Factories Act.

The total numbers of workers in household factories under the study area is 7,195 (1.3 % of total population), out of which 4,313(1.2%) are male and 2,882 (1.6 %) are female.

- Other Workers: All workers other than cultivators or agricultural labourers, who have been engaged in some economic activity, are other workers. The workers that come under this category include plantation workers, commerce, business, transport, mining, construction, workers etc. the total number of other workers under the study area is 324,289 (58.5 % of total population), out of which 207,138 (55.9 %) are male and 117,151 (63.7%) are female.
- **Marginal Workers:** The marginal workers are those workers, who are engaged in some work for a period of less than six months, during the reference year prior to the census survey. The total marginal workers in the district are 86,923 (6.5% of total population), out of which 26,470 (3.8%) are male and 60,453 (9.5%) are female
- **Non-Workers:** The non-workers include those engaged in unpaid household duties, students, retired persons, dependents, beginners etc. The total non-workers in the district are 780,119 (58.5% of total population), out of which 327,537 (46.9%) are male and 452,582 (71.1%) are female.

(5) Ahmedabad District

- The occupational structure of the population in Ahmedabad state has been taken from Census of India. The study area has been studied with reference to total workers, main workers, marginal workers and non-workers. The total workers in the state are 2,009,365 (34.5% of total population), out of which 632,223 (53.1%) are male and 377,142 (13.8%) are female. Total main workers of Ahmedabad are 1,799,126 (30.9% of total population), out of which 1,562,354 (50.8%) are male and 236,772 (8.6%) are female.
- Apart from the above-said workers, the occupational structure also consists of cultivators, agricultural labourers, workers in household industries and other workers. The details of these are given below:

- **Cultivators:** The person who is engaged either as employer; single worker or family worker in cultivation of land owned is termed as cultivator. Total cultivators in the district are 127,345 (6.3% of total working population), where 103,807 (6.4%) are male and 23,538 (6.2%) are female.
- **Agricultural Labourers:** Persons working on the land of others for wages or share in the yield have been treated as agricultural labourers. The total workers of this category are about 237,871 (11.8% of total working population), where 123,479 (7.6%) are male and 114,392 (30.3%) are female.
- Workers in Household Industries: Household Industry is defined as an industry conducted by one or more members of the household at home or within the village in rural areas and only within the precincts of the house where the household lives in urban areas. The larger proportion of workers in the household industry consists of members of the household. The industry is not run on the scale of a registered factory, which would qualify or has to be registered under the Indian Factories Act. The total number of workers in household industries under the study area is 56,715 (2.8 % of the total working population) out of which 27,287 (1.7 %) are male and 29,428 (7.8 %) are female.
- Other Workers: All workers other than cultivators or agricultural labourers, who have been engaged in some economic activity, are other workers. The workers that come under this category include plantation workers, commerce, business, transport, mining, construction worker etc. The total number of other workers under the study area is 1,587,434 (79 % of the total working population) out of which 1,377,650 (84.4 %) are male and 209,784 (55.6 %) are female.
- **Marginal Workers:** The marginal workers are those workers, who are engaged in some work for a period of less than six months, during the reference year prior to the census survey. The total marginal workers in the state are 210,239 (3.6 % of total working population), out of which 69,869 (2.3 %) are male and 140,370 (5.1 %) are female.
- **Non-Workers:** The non-workers include those engaged in unpaid household duties, students, retired persons, dependants, beggars etc. The total non-workers in the state are 3,807,154 (65.5 % of total working population), out of which 1,442,333 (46.9 %) are male and 2,364,821 (86.2%) are female.

(6) Kheda District

- **Occupational Structure:** The occupational structure of the population in Kheda has been taken from census of India. The study area has been studied with reference to total workers, main workers, marginal workers and non-workers. The total workers in the district are 908,180 (44.9% of total population), out of which 579,830 (55.1%) are male and 328,350 (33.8%) are female. Total main workers of district are 694,400 (34.3% of total population), out of which 524,383 (49.8%) are male and 170,017 (17.5%) are female.

Apart from the above said values workers, the occupational structure also consists of cultivators, agricultural labourers, workers in household industries and other workers. The details of these are given below:

- **Cultivators:** The person who is engaged either as employer, single workers or family worker in cultivation of land owned is termed as cultivator. Total cultivator in the district are 248,958 (27.4% of total working population), out of which 210,955 (36.4%) are male and 38,003 (11.6%) are female.
- **Agricultural Labourers:** Persons working on the land of others for wages or share in the yield have been treated as agricultural labourers. The total workers of this category are about 284,703 (31.3% of total working population), out of which 157,371 (27.1%) are male and 127,332 (38.8%) are female.
- Workers in Household Industries: Household in industry is defined as an industry conducted by one or more members of the household at home or within the village in rural

area and only within the precincts of the house where the household lives in urban areas. The larger proportion of workers in the household industry consists of members of the household. The industry is not run on the scale of a registered factory, which could qualify or has to be registered under the Indian Factories Act.

The total numbers of workers in household factories under the study area is 12,940 (1.4% of total population), out of which 7,520 (1.3%) are male and 5,420 (1.7%) are female.

- Other Workers: All workers other than cultivators or agricultural labourers, who have been engaged in some economic activity, are other workers. The workers that come under this category include plantation workers, commerce, business, transport, mining, construction, workers etc. the total number of other workers under the study area is 361,579 (39.8% of total population), out of which 203,984 (35.2%) are male and 157,595(48.0%) are female.
- **Marginal Workers:** The marginal workers are those workers, who are engaged in some work for a period of less than six months, during the reference year prior to the census survey. The total marginal workers in the district are 213,780 (10.6% of total population), out of which 55,447 (5.3%) are male and 158,333 (16.3%) are female
- **Non-Workers:** The non-workers include those engaged in unpaid household duties, students, retired persons, dependents, beginners etc. The total non-workers in the district are 1,116,036 (55.1% of total population), out of which 472,993 (44.9%) are male and 643,043 (66.2%) are female.

(7) Anand District

- **Occupational Structure:** The occupational structure of the population in Anand has been taken from census of India. The study area has been studied with reference to total workers, main workers, marginal workers and non-workers. The total workers in the district are 784,711 (42.3% of total population), out of which 535,444 (55.1%) are male and 249,267 (28.2%) are female. Total main workers of district are 617,669 (33.3% of total population), out of which 489,100 (50.3%) are male and 128,569 (14.5%) are female.

Apart from the above said values workers, the occupational structure also consists of cultivators, agricultural labourers, workers in household industries and other workers. The details of these are given below:

- **Cultivators:** The person who is engaged either as employer, single workers or family worker in cultivation of land owned is termed as cultivator. Total cultivator in the district are 155,403 (19.8% of total working population), out of which 138,969 (26.0%) are male and 16,434 (6.6%) are female.
- **Agricultural Labourers:** Persons working on the land of others for wages or share in the yield have been treated as agricultural labourers. The total workers of this category are about 287,179 (36.6% of total working population), out of which 173,485 (32.4%) are male and 113,694 (45.6%) are female.
- Workers in Household Industries: Household in industry is defined as an industry conducted by one or more members of the household at home or within the village in rural area and only within the precincts of the house where the household lives in urban areas. The larger proportion of workers in the household industry consists of members of the household. The industry is not run on the scale of a registered factory, which could qualify or has to be registered under the Indian Factories Act.

The total numbers of workers in household factories under the study area is 18,864 (2.4% of total population), out of which 14,017 (2.6%) are male and 4,847 (1.9%) are female.

- Other Workers: All workers other than cultivators or agricultural labourers, who have been engaged in some economic activity, are other workers. The workers that come under this category include plantation workers, commerce, business, transport, mining, construction, workers etc. the total number of other workers under the study area is 323,265 (41.2% of

total population), out of which 208,973 (39.20 %) are male and 114,292 (45.9 %) are female.

- **Marginal Workers:** The marginal workers are those workers, who are engaged in some work for a period of less than six months, during the reference year prior to the census survey. The total marginal workers in the district are 167,042 (9.0 % of total population), out of which 46,344 (4.8%) are male and 120,698 (13.6 %) are female
- **Non-Workers:** The non-workers include those engaged in unpaid household duties, students, retired persons, dependents, beginners etc. The total non-workers in the district are 1,072,161 (57.7% of total population), out of which 436,556 (44.9%) are male and 635,605 (71.8%) are female.

(8) Vadodara District

- **Occupational Structure:** The occupational structure of the population in Vadodara has been taken from census of India. The study area has been studied with reference to total workers, main workers, marginal workers and non-workers. The total workers in the district are 1,518,845 (41.7% of total population), out of which 1,059,861 (55.9%) are male and 458,984 (26.3%) are female. Total main workers of district are 1,202,620 (51.5% of total population), out of which 977,232 (51.5%) are male and 225,388 (12.9%) are female.

Apart from the above said values workers, the occupational structure also consists of cultivators, agricultural labourers, workers in household industries and other workers. The details of these are given below:

- **Cultivators:** The person who is engaged either as employer, single workers or family worker in cultivation of land owned is termed as cultivator. Total cultivator in the district are 334,590 (22.0% of total working population), out of which 240,500 (22.7%) are male and 94,090 (20.5%) are female.
- **Agricultural Labourers:** Persons working on the land of others for wages or share in the yield have been treated as agricultural labourers. The total workers of this category are about 471,256 (31.0% of total working population), out of which 232,602 (21.9%) are male and 238,654 (52.0%) are female.
- Workers in Household Industries: Household in industry is defined as an industry conducted by one or more members of the household at home or within the village in rural area and only within the precincts of the house where the household lives in urban areas. The larger proportion of workers in the household industry consists of members of the household. The industry is not run on the scale of a registered factory, which could qualify or has to be registered under the Indian Factories Act.

The total numbers of workers in household factories under the study area is 22,645 (1.5% of total population), out of which 13,468 (1.3%) are male and 9,177 (2.0%) are female.

- Other Workers: All workers other than cultivators or agricultural labourers, who have been engaged in some economic activity, are other workers. The workers that come under this category include plantation workers, commerce, business, transport, mining, construction, workers etc. the total number of other workers under the study area is 690,354 (45.5% of total population), out of which 573,291 (54.1%) are male and 117,063 (25.5%) are female.
- **Marginal Workers:** The marginal workers are those workers, who are engaged in some work for a period of less than six months, during the reference year prior to the census survey. The total marginal workers in the district are 316,225 (8.7% of total population), out of which 82,629 (4.4%) are male and 233,596 (13.4%) are female
- **Non-Workers:** The non-workers include those engaged in unpaid household duties, students, retired persons, dependents, beginners etc. The total non-workers in the district are 2,122,957 (58.3% of total population), out of which 837,507 (44.1%) are male and 1285,450 (73.7%) are female.
- **Poverty Level:** A survey of basic services in the urban slums of Vadodara identified 96,000

families (2.8 lakhs) as falling below the poverty line i.e. the families were drawing an income of Rs 373 per capita per month. In other words, it would appear that 36% of the population of Vadodara lives below the poverty line. No analogies could be drawn between VMC data and the recent survey carried out by SEWA in the year 2006.

4.4.5 Health

(1) Banaskantha District

There are 907 hospitals, dispensaries in which 641 in rural area and 266 in urban areas.

(2) Patan District

There are 364 hospitals, dispensaries in which 302 in rural area and 1,143 in urban areas.

(3) Mehasana District

There are 1143 hospitals and dispensaries in which 623 in rural area and 520 in urban area.

(4) Gandhinagar District

There are 890 hospitals, dispensaries in which 504 in rural area and 386 in urban areas.

(5) Ahmedabad District

There are well equipped and modern type hospital , health centre, eye care centre are found in city.

(6) Kheda District

There are 1,118 hospitals, dispensaries in which 566 in rural area and 552 in urban areas.

(7) Anand District

There are 1,155 hospitals, dispensaries in which 522 in rural area and 633 in urban areas.

(8) Vadodara District

There are 2744 hospitals, dispensaries in which 644 in rural area and 2100 in urban areas. There are four hospitals run by the state government in the city. In addition to these hospitals, a number of hospitals are run by various trusts.

4.4.6 Historical and Cultural Heritage

(1) Banaskantha District

Famous Ambaji temple in Ambaji in Banaskantha District, is at the foot of Aravalli mountains near the mouth of Saraswati River. One of the well-known religious place is Dhima which is 12 km away from Vav and Tharad and has a great *Shamlaji* Temple. A lot of people visit this temple for worship and especially when it's a *full-moon-day*. The list of archaeological sites along with details of location and district is given in **Table 4-43**.

Sl. No.	Name of Monument / Sites	Location	District
1.	Gate of Khan Sarover	Patan	Patan
2.	Rani Vav	Patan	Patan
3.	Sahastralinga Talao (Excavated)	Anavada	Patan
4.	Shaikh Farid Dargah	Patan	Patan
5.	Jami Masjid	Sidhpur	Patan
6.	Ruins of Rudra Mahalaya	Sidhpur	Patan
7.	Nilkantheswar Mahadev Temple	Sunak	Patan
8.	Sivai Mata Temple	Sunak	Patan
9.	Nilkantheswar Mahadev Temple	Ruhavi	Patan
10.	Two small shrines near Sanderi Mata Temple	Sander	Patan
11.	Sitalamata Temple	Piludra	Patan
12.	Torana of Surya Temple	Piludra	Patan
13.	Limboji Mata Temple	Delmal	Patan
14.	Malai Mata Temple	Paladdar	Mahesana
15.	Hingloji Mata Temple	Khandosan	Mahesana
16	Sabha Mandapa and two ancient shrines near		Mahesana
10	Hingloji Temple	- inuna Obum	
17.	Jasmalnathji Mahadev Temple	Asoda	Mahesana
18.	Ajapal Kund	Vadnagar	Mahesana
10.	Inscription and Arjun Bari Gate	Vadnagar	Mahesana
20.	Torana	Vadnagar	Mahesana
20.	Vijapur Kund	Vijapur	Mahesana
21.	Sun Temple, Sun tank , kund and carved stones	Modhera	Mahesana
<i></i> .	with images, temples and underground cells		manosalla
23.	Stepwell with inscription	Adalaj	Gandhinagar
23.	Three gates besides Bhadrakali temple	Ahmedabad	Ahmedabad
25.	Bhadra Tower	Ahmedabad	Ahmedabad
25.	Sidi Saiyad's Masjid	Ahmedabad	Ahmedabad
20.	Ahmed Shah's Mosque	Ahmedabad	Ahmedabad
27.	Teen Darwaja or Tripolia Gate	Ahmedabad	Ahmedabad
20.	Shah Khupai's Masjid	Ahmedabad	Ahmedabad
30.	Jami Masjid	Ahmedabad	Ahmedabad
31.	Tombs of Queens of Ahmed Shah	Ahmedabad	Ahmedabad
32.	Ahmad Shah's Tomb	Ahmedabad	Ahmedabad
32.	Panch Kuwa gate	Ahmedabad	Ahmedabad
<u> </u>	Queen's Mosque in Sarangpur	Ahmedabad	Ahmedabad
35.	Tomb near queen's Mosque in Sarangpur	Ahmedabad	Ahmedabad
<u> </u>	Brick Minars at railway station platform	Ahmedabad	Ahmedabad
37.	Sidi Bashir's Minar & Tomb	Ahmedabad	Ahmedabad
37.	Delhi Gate	Ahmedabad	Ahmedabad
<u> </u>	Kutub Shah's Mosque	Ahmedabad	Ahmedabad
40.	Dada Harir's Mosque & Tomb	Ahmedabad	Ahmedabad
40.	Dada (Bai) Harir's Well	Ahmedabad	Ahmedabad
	Kalulpur Gate	Ahmedabad	Ahmedabad
12	1		
42.	Sarangpur Gata	Ahmadahad	Ahmadahad
43.	Sarangpur Gate	Ahmedabad	Ahmedabad
43. 44.	Dariya pur Gate	Ahmedabad	Ahmedabad
43. 44. 45.	Dariya pur Gate Premabhai Gate	Ahmedabad Ahmedabad	Ahmedabad Ahmedabad
43. 44. 45. 46.	Dariya pur Gate Premabhai Gate Mata Bhawani's Well	Ahmedabad Ahmedabad Ahmedabad	Ahmedabad Ahmedabad Ahmedabad
43. 44. 45. 46. 47.	Dariya pur Gate Premabhai Gate Mata Bhawani's Well Achyut Bibi's Masjid & Tomb	Ahmedabad Ahmedabad Ahmedabad Ahmedabad	Ahmedabad Ahmedabad Ahmedabad Ahmedabad
43. 44. 45. 46. 47. 48.	Dariya pur Gate Premabhai Gate Mata Bhawani's Well Achyut Bibi's Masjid & Tomb Dariya Khan's Tomb	Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad	Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad
43. 44. 45. 46. 47. 48. 49.	Dariya pur Gate Premabhai Gate Mata Bhawani's Well Achyut Bibi's Masjid & Tomb Dariya Khan's Tomb Muhafiz Khan's Mosque	Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad	AhmedabadAhmedabadAhmedabadAhmedabadAhmedabadAhmedabadAhmedabad
43. 44. 45. 46. 47. 48.	Dariya pur Gate Premabhai Gate Mata Bhawani's Well Achyut Bibi's Masjid & Tomb Dariya Khan's Tomb	Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad	Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad

Table 4-43 List of Archaeological Sites

Sl. No.	Name of Monument / Sites	Location	District
53.	Shah Alam's Tomb with all surrounding		Ahmedabad
	buildings in the group		
54.	Small stone Mosque (Rani Masjid)	Ahmedabad	Ahmedabad
55.	Rauza of Azam Khan Mauzzam Khan	Ahmedabad	Ahmedabad
56.	Dastur Khan's Masjid	Ahmedabad	Ahmedabad
57.	Rani Sipri's Mosque & Tomb	Ahmedabad	Ahmedabad
58.	Astodia Gate	Ahmedabad	Ahmedabad
59.	Malik Alam's Mosque	Ahmedabad	Ahmedabad
60.	Raipur Gate	Ahmedabad	Ahmedabad
61.	Inlet to Kankaria Tank	Ahmedabad	Ahmedabad
62.	Bibiji's Masjid at Raipur	Ahmedabad	Ahmedabad
63.	Haibatkhan's Masjid	Ahmedabad	Ahmedabad
64.	Baba Lului's Masjid	Ahmedabad	Ahmedabad
65.	Nawab Sardar Khan Masjid and outer gate in		Ahmedabad
	survey No6814.%		
66.	compound bearing C.S.No6811	Ahmedabad	Ahmedabad
67.	Tomb of Mir Abu Turab	Ahmedabad	Ahmedabad
68.	Jethabhai's Stepwell	Isanpur	Ahmedabad
69.	Small Stone Masjid (Gumle Masjid)	Isanpur	Ahmedabad
70.	Tombs (Qutub-i-Alam)	Batva	Ahmedabad
71.	Great Mosque	Makarba	Ahmedabad
		(Sarkhej Roza)	
72.	Great Tank, Palace & Harem	Makarba	Ahmedabad
		(Sarkhej Roza)	
73.	Pavilion before the tomb of Sheikh Ahmed (Khata Ganj Baksh)		Ahmedabad
		(Sarkhej Roza)	
74			
74.	Rauza's of Baba Alisar and Bawa Ganj Bhaks	Makarba	Ahmedabad
74.	Č. Č	(Sarkhej Roza)	
74.	Rauza's of Baba Alisar and Bawa Ganj Bhaks Tomb of Bibi (Rani) Rajbai		Ahmedabad Ahmedabad
	Č. Č	(Sarkhej Roza)	
	Č. Č	(Sarkhej Roza) Makarba	
75.	Tomb of Bibi (Rani) Rajbai	(Sarkhej Roza) Makarba (Sarkhej Roza)	Ahmedabad
75.	Tomb of Bibi (Rani) Rajbai	(Sarkhej Roza) Makarba (Sarkhej Roza) Makarba	Ahmedabad
75. 76.	Tomb of Bibi (Rani) Rajbai Tomb of Mohammed Begarh	(Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza)	Ahmedabad Ahmedabad
75. 76.	Tomb of Bibi (Rani) Rajbai Tomb of Mohammed Begarh	(Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Makarba	Ahmedabad Ahmedabad
75. 76. 77.	Tomb of Bibi (Rani) Rajbai Tomb of Mohammed Begarh Tomb of Shaikh Ahmed Khata Ganj Baksh	(Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Makarba	Ahmedabad Ahmedabad Ahmedabad
75. 76. 77. 78.	Tomb of Bibi (Rani) Rajbai Tomb of Mohammed Begarh Tomb of Shaikh Ahmed Khata Ganj Baksh Jami Masjid	(Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Dholka	Ahmedabad Ahmedabad Ahmedabad Ahmedabad
75. 76. 77. 78. 79.	Tomb of Bibi (Rani) Rajbai Tomb of Mohammed Begarh Tomb of Shaikh Ahmed Khata Ganj Baksh Jami Masjid Malav Tank Khan Masjid	(Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Dholka Dholka	Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad
75. 76. 77. 78. 79. 80.	Tomb of Bibi (Rani) Rajbai Tomb of Mohammed Begarh Tomb of Shaikh Ahmed Khata Ganj Baksh Jami Masjid Malav Tank Khan Masjid Mosque of Balal (Bahlol) Khan Gazi	(Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Dholka Dholka Dholka	Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad
75. 76. 77. 78. 79. 80. 81. 82.	Tomb of Bibi (Rani) Rajbai Tomb of Mohammed Begarh Tomb of Shaikh Ahmed Khata Ganj Baksh Jami Masjid Malav Tank Khan Masjid	(Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Dholka Dholka Dholka Dholka Dholka	Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad
75. 76. 77. 78. 79. 80. 81. 82. 83.	Tomb of Bibi (Rani) Rajbai Tomb of Mohammed Begarh Tomb of Shaikh Ahmed Khata Ganj Baksh Jami Masjid Malav Tank Khan Masjid Mosque of Balal (Bahlol) Khan Gazi Ruined Building Ancient site at Lothal	(Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Dholka Dholka Dholka Dholka Dholka Saragwala	Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad
75. 76. 77. 78. 79. 80. 81. 82. 83. 84.	Tomb of Bibi (Rani) Rajbai Tomb of Mohammed Begarh Tomb of Shaikh Ahmed Khata Ganj Baksh Jami Masjid Malav Tank Khan Masjid Mosque of Balal (Bahlol) Khan Gazi Ruined Building Ancient site at Lothal Masjid of Rajusha Pir	(Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Dholka Dholka Dholka Dholka Dholka Saragwala Ranpur	Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad
75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85.	Tomb of Bibi (Rani) Rajbai Tomb of Mohammed Begarh Tomb of Shaikh Ahmed Khata Ganj Baksh Jami Masjid Malav Tank Khan Masjid Mosque of Balal (Bahlol) Khan Gazi Ruined Building Ancient site at Lothal Masjid of Rajusha Pir Jami Masjid	(Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Dholka Dholka Dholka Dholka Dholka Saragwala Ranpur Mandal	Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad
75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86.	Tomb of Bibi (Rani) Rajbai Tomb of Mohammed Begarh Tomb of Shaikh Ahmed Khata Ganj Baksh Jami Masjid Malav Tank Khan Masjid Mosque of Balal (Bahlol) Khan Gazi Ruined Building Ancient site at Lothal Masjid of Rajusha Pir Jami Masjid Kazi Masjid	(Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Dholka Dholka Dholka Dholka Dholka Saragwala Ranpur Mandal	Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad
75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87.	Tomb of Bibi (Rani) Rajbai Tomb of Mohammed Begarh Tomb of Shaikh Ahmed Khata Ganj Baksh Jami Masjid Malav Tank Khan Masjid Mosque of Balal (Bahlol) Khan Gazi Ruined Building Ancient site at Lothal Masjid of Rajusha Pir Jami Masjid Kazi Masjid Saiyad Masjid	(Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Dholka Dholka Dholka Dholka Dholka Dholka Saragwala Ranpur Mandal Mandal	Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad
75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88.	Tomb of Bibi (Rani) Rajbai Tomb of Mohammed Begarh Tomb of Shaikh Ahmed Khata Ganj Baksh Jami Masjid Malav Tank Khan Masjid Mosque of Balal (Bahlol) Khan Gazi Ruined Building Ancient site at Lothal Masjid of Rajusha Pir Jami Masjid Kazi Masjid Saiyad Masjid Mansar Talav & shrines	(Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Dholka Dholka Dholka Dholka Dholka Dholka Saragwala Ranpur Mandal Mandal Viramgam	Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad
75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89.	Tomb of Bibi (Rani) Rajbai Tomb of Mohammed Begarh Tomb of Mohammed Begarh Jami Masjid Malav Tank Khan Masjid Mosque of Balal (Bahlol) Khan Gazi Ruined Building Ancient site at Lothal Masjid of Rajusha Pir Jami Masjid Kazi Masjid Saiyad Masjid Mansar Talav & shrines Vithalbhai Haveli	(Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Dholka Dholka Dholka Dholka Dholka Saragwala Ranpur Mandal Mandal Viramgam	Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad
75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90.	Tomb of Bibi (Rani) Rajbai Tomb of Mohammed Begarh Tomb of Mohammed Begarh Jami Masjid Malav Tank Khan Masjid Mosque of Balal (Bahlol) Khan Gazi Ruined Building Ancient site at Lothal Masjid of Rajusha Pir Jami Masjid Kazi Masjid Saiyad Masjid Mansar Talav & shrines Vithalbhai Haveli Bhamaria Well	(Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Dholka Dholka Dholka Dholka Dholka Saragwala Ranpur Mandal Mandal Viramgam Vasco Mahamadabad	Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Kheda
75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91.	Tomb of Bibi (Rani) Rajbai Tomb of Mohammed Begarh Tomb of Mohammed Begarh Jami Masjid Malav Tank Khan Masjid Mosque of Balal (Bahlol) Khan Gazi Ruined Building Ancient site at Lothal Masjid of Rajusha Pir Jami Masjid Kazi Masjid Saiyad Masjid Mansar Talav & shrines Vithalbhai Haveli Bhamaria Well Temple of Galteshwar	(Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Dholka Dholka Dholka Dholka Dholka Dholka Saragwala Ranpur Mandal Mandal Mandal Viramgam Vasco Mahamadabad Sarnal	Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Kheda Kheda
75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92.	Tomb of Bibi (Rani) Rajbai Tomb of Mohammed Begarh Tomb of Shaikh Ahmed Khata Ganj Baksh Jami Masjid Malav Tank Khan Masjid Mosque of Balal (Bahlol) Khan Gazi Ruined Building Ancient site at Lothal Masjid of Rajusha Pir Jami Masjid Kazi Masjid Saiyad Masjid Saiyad Masjid Mansar Talav & shrines Vithalbhai Haveli Bhamaria Well Temple of Galteshwar Tombs of Saif-ud-din & Nizam-ud-din	(Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Dholka Dholka Dholka Dholka Dholka Dholka Saragwala Ranpur Mandal Mandal Mandal Viramgam Vasco Mahamadabad Sarnal Sojali	Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Kheda Kheda Kheda
75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93.	Tomb of Bibi (Rani) Rajbai Tomb of Mohammed Begarh Tomb of Shaikh Ahmed Khata Ganj Baksh Jami Masjid Malav Tank Khan Masjid Mosque of Balal (Bahlol) Khan Gazi Ruined Building Ancient site at Lothal Masjid of Rajusha Pir Jami Masjid Kazi Masjid Saiyad Masjid Mansar Talav & shrines Vithalbhai Haveli Bhamaria Well Temple of Galteshwar Tombs of Saif-ud-din & Nizam-ud-din Tomb of Mubarak Saiyyad	(Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Dholka Dholka Dholka Dholka Dholka Dholka Saragwala Ranpur Mandal Mandal Mandal Viramgam Vasco Mahamadabad Sarnal Sojali	Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Kheda Kheda Kheda
75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92.	Tomb of Bibi (Rani) Rajbai Tomb of Mohammed Begarh Tomb of Shaikh Ahmed Khata Ganj Baksh Jami Masjid Malav Tank Khan Masjid Mosque of Balal (Bahlol) Khan Gazi Ruined Building Ancient site at Lothal Masjid of Rajusha Pir Jami Masjid Kazi Masjid Saiyad Masjid Saiyad Masjid Mansar Talav & shrines Vithalbhai Haveli Bhamaria Well Temple of Galteshwar Tombs of Saif-ud-din & Nizam-ud-din	(Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Makarba (Sarkhej Roza) Dholka Dholka Dholka Dholka Dholka Dholka Saragwala Ranpur Mandal Mandal Mandal Viramgam Vasco Mahamadabad Sarnal Sojali	Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Ahmedabad Kheda Kheda Kheda

Sl. No.	Name of Monument / Sites	Location	District
97.	Ancient site (Excavated)	Karvan	Vadodara
		(Kayavarohan)	
98.	Gateway of Torana	Karvan	Vadodara
		(Kayavarohan)	
99.	Ancient site of Goraj	Goraj	Vadodara
100.	Baroda Bhagol & its adjacent construction	Dabhoi	Vadodara
101.	Hira Bhagol with S.No38, 41, 45, 47 & Ticca No102&103	Dabhoi	Vadodara
102.	Mahudi (Champaneri) Bhagol & adjacent construction	Dabhoi	Vadodara
103.	Nandodi Gate with adjacent construction	Dabhoi	Vadodara
104.	Saptamukhi Vav in Dabhoi tank	Dabhoi	Vadodara
105.	Microlithic site S.No311,12,13 & 298	Amarpura	Vadodara

Source: Archaeological Survey of India

CHAPTER 5 POTENTIAL ENVIRONMENT IMPACT EVALUATION AND MITIGATIUON MEASURES

5.1 INTRODUCTION

The proposed project may have impacts on the environment in two distinct phases. During the construction phase which may be regarded as temporary or short-term; the other during the operation stage which will have long term effects. The environmental impacts in this study have, as such, been discussed separately for the construction phase and the operation stage.

Identification of impacts is followed by recommendations of appropriate cost effective mitigation measures. These impacts along with the preventive, mitigatory, compensatory and enhancement measures to be taken up during design, construction & operation stages have been discussed in this chapter.

5.2 IMPACT EVALUATION METHODOLOGY

The project is likely to have some potential impact during pre-construction, construction and operation phases. Appropriate mitigation measures are suggested to mitigate/ reduce/ eliminate the adverse impacts. An impacts matrix is prepared depicting nature of impact by various activities on the environmental parameters.

Within the framework of DFC Project study, a simple method that determines potential existence of impact has been employed. Thereby the judgment about the magnitude and importance of the impacts caused by the project is presented. Matrix system is considered as a tool for organizing and presenting information on the environmental impacts caused to the natural and social environment by the DFC Project. Thus the following parameter and scale is used for matrix impacts.

Parameter	Scale		Remarks	
Significance	No impact	E	Positive : + Negative : -	
	Neglectable impact	D	Positive : + Negative : -	
	Insignificant impact	С	Positive : + Negative : -	
	Relatively significant impact	В	Positive : + Negative : -	
	Significant impact	А	Positive : + Negative : -	

 Table 5-1
 Parameter and Scale of Impact Matrix

5.3 NATURAL ENVIRONMENT

5.3.1 Impacts and Mitigation Measures during Pre-Construction Phase

During pre-construction phase, main impact will be due to leveling and site clearing.

(1) Flora

Impacts:

- Loss of flora due to felling of private trees within the ROW of DFC alignment in parallel and detour section.

Felling of Trees along parallel section:

Due to construction of new track along parallel section, 6,265 no. of trees have to be felled in Banaskantha and Patan Districts. There are similar no. of trees to be felled in other districts.

The predominant tree species to be felled include Babul, Neem and Palas. No endangered or rare plant species is reported within the proposed ROW.

District	Station/ Place	Length (m)	No. of Trees	Species	Remarks
Banaskantha	Amirgarh	1,200	600	Ardua, Khakra, Babul	Natural
Banaskantha	Sarotra	500	230	Babul, Neem, Khakra, Bordi	Natural
Banaskantha	Kalimati	600	590	Babul, Neem, Khakra, Bordi	Natural
Banaskantha	Laxmipura-West	500	650	Babul, Neem, Khakra, Bordi	Natural
Banaskantha	Juni Sarotri Gate No-151	1,000	800	Babul, Neem, Khakra, Bordi	Natural & Private
Banaskantha	Iqbalgarh	1,000	525	Babul, Neem, Palas	Natural & Private
Banaskantha	Chekhata	1,200	400	Small Babul, Neem, Palas	Natural
Banaskantha	Gangasar	500	150	Babul, Neem, Palas	Natural
Banaskantha	Chitrasani	500	200	Small Babul, Neem, Palas	Natural
Banaskantha	Jaspuriya	700	150	Neem, Mango, Babul	Natural
Banaskantha	Hebatpur	900	475	Neem, Babul, Palas, Bordi	Natural
Banaskantha	Palanpur (checkpost)	500	80	Neem, Babul	Natural
Banaskantha	Kanodar	600	15	Israili Babul	Natural
Banaskantha	Chhapi	750	100	Babul, Neem, Israili Babul	Natural
Patan	Dharevada	500	110	Babul, Neem, Israili Babul	Natural
Patan	Siddhapur	300	80	Babul, Neem, Israili Babul	Natural
Patan	Kamli	1,000	310	Babul, Neem, Israili Babul	Govt. Plantation
Patan	Bhandu	600	190	Babul, Neem, Israili Babul	Govt. Plantation
Patan	Aaithor	1,200	380	Babul, Neem, Israili Babul	Govt. Plantation
Patan	Jetalvasana	800	230	Babul, Neem, Israili Babul	Govt. Plantation
		Total	6,265		

Table 5-2 Number of Trees to be felled in Banaskantha and Patan Districts	Table 5-2	Number of	f Trees to	be felled in	Banaskantha and	Patan Districts
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Source: State Forest Department, Palanpur Division

Mitigation Measures:

- Action plan for tree felling will be prepared to avoid uncontrolled & indiscriminate tree felling.
- Appropriate compensatory plantation will be initiated to compensate the vegetation loss due to felling of trees for site clearing. For trees to be cut, sufficient compensatory plantation, about 2 times the number of trees felled, will be done. If adequate space for compensatory plantation is not available along DFC corridor, plantation may be carried out along State Highway (SH), Major District Road (MDR), and Other District Road (ODR) or in degraded forest land.
- For trees to be felled in private land, compensation for land & trees will be given to the owners.

Rate of trees will be decided by the State Forest Department.

- Preferential mixed plantation consisting of flowering shrubs and evergreen ornamental trees with less timber & fruit value will be carried out.
- Under the plantation programme, more valuable tree species will be planted in place of existing non-valuable mono crops of the project area, if any.

Diversion of Forest Land:

In Banaskantha District, there exist three patches of Reserved Forest through which the detour alignment is passing. It is estimated that, **13.311 hectares of forest land is to be diverted** for the use as ROW for construction of new track in detour section. The details breakup of the forest land to be acquired is given below:

Name of the Forest	Land to be acquired (ha)
Jethi Reserved Forest	6.873
Bantwada Reserved Forest	4.742
Malana Reserved Forest	1.696
Total	13.311

Source: Field survey

Mitigation Measures:

- 100% monetary compensation will be provided to Forest Dept. towards the cost of forest land to be diverted and cost of compensatory afforestation.
- Before start any activity within the Reserved Forest area, Forest Clearance must be obtained as per Forest Conservation Act, 1980 and it's amendments from the State Forest Department.

(2) Fauna

Impacts:

Except Mahesana District, other districts do not have national parks and sanctuaries along the DFC alignment except the small stretches of Reserved Forest and practically no animal except some common birds, lizards & snakes are reported. Due to the acquisition of Reserved Forest land, there will be no loss in wildlife habitat in these districts. There might be minor temporary loss of habitat of avian fauna due to felling of trees in these districts.

In Mahesana District, Thol Bird Sanctuary is located in the east of DFC alignment (detour section) and the distance between DFC alignment & Thol Sanctuary is varying between 80m to 245m. Large number of waterfowls gets attracted to this site due to the agricultural fields surrounding the lake, which provide sufficient food to them. The lake is also surrounded by good tree covers. The tallest flying bird of the world Sarus crane inhabits this area and is found in good number. **The proposed project may have same impacts on the avifauna of the sanctuary**.

Further, the Nilgai (*Boselaphus tragocamelus*) is found in good number in the surrounding agricultural field. Due to acquisition of agricultural land for construction of detour section, they will loose their habitat and food.



Mitigation Measures:

- Any construction activity should not be carried out within in 3 km radius of the Sanctuary.
- New DFC alignment may be considered to avoid the sanctuary. Please refer Section-3.7 of Chapter-3 (Project Description) for new DFC alignment in Mehsana District.
- Appropriate compensatory plantation will be initiated to compensate the habitat loss due to felling of trees for site clearing.

(3) Wildlife Corridors & Migratory Routes

In Banaskantha District, Corridor of wildlife movement will be disturbed due to acquisition of Reserved Forest land. However in other districts no well defined corridor of wildlife movement or routes of wildlife migration has been reported by the forest department along the alignment.

5.3.2 Impacts & Mitigation Measures during Construction Phase

(1) **Topography and Geology**

The impacts on existing topographical setting originate primarily from embankment preparation and opening up borrow pits to fulfill the requirement of huge quantity of earth material. Disfiguration of land may result from unplanned opening up of borrow pits/quarry sites. In Banaskantha District, the alignment passes through plain, rolling and hilly terrain, there would be significant impact on the overall relief of the region.

No significant impact on geology is anticipated from DFC construction activities except requirement of construction materials, which would be supplied from approved quarry sites located nearby.

Impacts:

- Disfiguration & change in existing profile of the land due to detour section
- Disfiguration of topography due to indiscriminate digging of borrow pits
- Uncontrolled digging of borrow pits resulting in water accumulation & breeding of vector

disease.

Disturbance on geological setting due to quarrying

Mitigation Measures:

- Only identified borrow pits & quarry sites will be used to avoid any disfiguration of topography.
- Opening up new borrow pits will be in accordance with the IRC: 10-1961 specifications. Opening up of new borrow pits will be restricted to 1 m depth followed by resurfacing of pits with top soil (15 cm).
- Uncontrolled digging of borrow pits will be avoided to prevent water accumulation in abandoned pits which results in breeding ground of vector disease.
- Construction materials will be procured from **existing approved and licensed quarries** only where crusher is already operating. Therefore, mitigative measure for the environmental impacts due to quarrying and rehabilitation plan of the quarries is the responsibility and scope of the license holder of the quarry.
- Suitable seismic design of the CD structures will be adopted to mitigate the earthquake impacts in future.
- On owner's choice, borrow pits will be converted to water bodies (pond) with proper landscaping (i.e. rectangular in shape, proper sloping and plantation on the bank) which will add scenic beauty in those localities.

(2) Soil

Placing of loose soil for embankment preparation would cause significant soil erosion in case appropriate compaction & stabilization measures are not adopted promptly. The erosion at construction stretches will result in increased sediment load in recipient streams. Loss of productive soil may result from uncontrolled opening up of borrow pits. Any leakage of lubricants in equipment yard and spills at batch mix plant sites will cause soil contamination.

Impacts:

- Disruption & loss of productive top soil from agricultural fields due to creation of borrow pits and development of detour section, which may reduce crop yield.
- Loosening of top soil & loss of vegetative cover along detour and parallel section due to excavation & back filling which will lead to enhanced soil erosion.

Mitigation Measures:

- Fly ash, if available within 100 km distance of the DFC alignment will be utilized for construction of embankment to save soil resource.
- Adequate measures like adequate drainage, embankment consolidation & slope stabilization will be taken along the track to avoid soil erosion.
- Top soils (15 cm) of the borrow pit sites will be conserved and restored after excavation is over.
- Accidental spills of lubricants/oil will be avoided by adherence to good practices.

(3) Land Use

Widening of parallel section and development of detour section will lead to change in land use pattern of areas that comes under the proposed ROW. As the DFC alignment in most of the district passes through the agricultural land, it will change the land use pattern of the corridor.

Preparatory activities like clearing of ROW, construction of temporary construction camps and godowns, storage of construction materials etc. will be confined within the camp & ROW. This will not hamper the land use aspects outside ROW. However, indirectly there may be some change in the land use pattern of the proximate area due to influx of construction workforce and supplier who are likely to construct temporary tents in the vicinity. The on-site land use will more or less have a temporary impact in terms of fugitive emission from handling of construction material.

Impacts:

- Loss of agricultural land resources due to land acquisition for the detour
- Generation of solid waste in the form of construction spoils from construction sites
- Changes in existing land use pattern of the ROW for construction of DFC in detour & parallel sections

Mitigation Measures:

- Earth material generated from excavation will be reused to the maximum possible extent as filling material during site development.
- The small amount of construction debris and surplus excavated material will be disposed of by mechanical transport in suitable pre-identified (jointly by project proponent & local administration) dumping areas in tune with the local condition to avoid land degradation & water logging due to indiscriminate dumping.
- Dumping areas will be reclaimed through top soil cover & plantation.
- Construction camp will be provided for construction personnel to avoid indiscriminate settlement of construction workers and labourers.
- Regular inspection of haul roads and construction site will be carried out to ensure regular and timely removal of construction debris to the designated dumping sites.

(4) Drainage

Impacts:

- Change in drainage pattern of the land around detour
- Increased incidence and duration of floods due to obstruction of natural drainage courses by the embankment
- Chances of filling of existing drainage courses during earth filling.

Mitigation Measures:

- Adequate drains (longitudinal & median drains) will be provided along the track to facilitate its better maintenance. This will also help in avoiding soil erosion and land degradation due to water stagnation on the either side of the track.
- Capacity of existing drainage works and cross drainage (CD) structures in the parallel section will be duly augmented, wherever necessary, to accommodate high discharges to avoid flooding & formation of water pool.

- Adequate new drainage works & cross drainage (CD) structures will be provided for smooth passage of runoff to avoid flooding & formation of water pool.
- Suitable drainage at construction site & camp will be provided to eliminate the chances of formation of stagnant water pools that lead to soil erosion & breeding of mosquitoes.

(5) Water Bodies

Impacts:

No loss of water resources as no filling up of ponds/water bodies is involved along the parallel and detour section.

(6) Water Use

During construction period water is required for compaction of embankment, dust suppression, concrete making and domestic use in construction camp. The water demand for construction will be met from the existing sources like rivers close to the alignment and water for domestic use & drinking purpose will be purchased by the contractor from local municipality. However the quantity being very small it is not likely to have significant impacts on other users.

Impacts:

- Impact on the local water sources due to use of construction water.

Mitigation Measures:

- Minimum use of water from existing sources for construction purpose will be ensured to minimize likely impacts on other users.

(7) Flora

Impacts:

- Deposition of fugitive dust on pubescent leaves of nearby vegetation may lead to temporary reduction of photosynthesis. Such impacts will, however, be confined mostly to the initial periods of the construction phase and in the immediate vicinity of the construction area.
- In long term the proposed plantation will have positive impacts on the ecological resources.

Mitigation Measures:

- Strip plantation in available open spaces on both sides of the railway track will not only enhance the floral cover, land use features and scenic beauty but also act as air pollutants sink dust and noise barrier.
- Cooking fuel will be provided to construction workers to avoid cutting/felling of trees for fuel wood.

(8) Fauna

Impacts:

- In Vadodara District, Soft shelled Terrapin is found along the bank of the Mahi River in village Kotna. Temporary loss of habitat of Terrapin during construction of bridge over Mahi River could happen.

Mitigation Measures:

- New DFC alignment may be considered to avoid the sanctuary in Mahesana District.
- Bridge will be constructed during dry season to minimize the temporary loss of habitat of Terrapin.

5.3.3 Impacts & Mitigation Measures during Operation Phase

(1) Topography, Geology and Soil

No impact is envisaged on Topography, Geology & soil in the operation phase.

(2) Land Use & Encroachment

Impacts:

- Likely change of land use due to squatter/encroachment within ROW at junction station, cross station
- Likely change of land use due to induced railway side development outside the ROW

Mitigation Measures:

- Squatter development along the project shall be strictly avoided by proper regulation and vigilance.
- Land use control measures will be prepared & administered to avoid occurrence of induced development as far as possible.
- Planning agencies and Collector/Revenue Officer/Railway Officer will be made involved for controlled development and prohibiting squatter/ encroachment within ROW.

(3) Drainage & Water Quality

Impacts:

- Filthy environment due to improper maintenance of drainage
- Local drainage is likely to be affected due to formation of Railway Embankment

Mitigation Measures:

- Longitudinal drains of sufficient capacity will be provided on both sides of the track to accommodate increased run-off. The out fall for these drains is generally the nearby culverts/bridges on nallas/rivers/drains.
- Contingent actions will be taken for speedy cleaning up of oil spills, fuel and toxic chemicals in the event of accidents

(4) Flora & Fauna

Impacts:

- Illegal felling of railway side plantation
- Effect on aquatic fauna in case of accidental oil spill & toxic chemical release find its way

into the water bodies.

Mitigation Measures:

- Plantation along the ROW will be maintained properly
- Plantation along the ROW will be protected from illegal felling
- Contingent actions will be taken for speedy cleaning up of oil spills, fuel and toxic chemicals in the event of accidents.

5.3.4 Impact Matrix of Natural Environment

Based of the potential impacts on natural environment in pre-construction, construction and operation phase an impact matrix has been framed. The scale of impact is discussed above under individual parameter with mitigation measures. Most the impacts are insignificant and temporary in nature with localized impact.

(1) Banaskantha District

	Project Activities		PRE-C	ONSTRUCTION ST	ГАСЕ
Sl. No.	Environmental & Social Issues	Overall Evaluation on the Project	Surveying of Planned Areas and Sites	Selection of the Project Location & Sites	Land Acquisition and Resettlement
1.	Topography and Geology	D-	Ε	Ε	E
2.	Soil Erosion	D-	Ε	Ε	Ε
3.	Groundwater	D-	Ε	Ε	E
4.	Hydrological Conditions	D-	Ε	Ε	E
5.	Fauna, Flora and Biodiversity	C-	Ε	Ε	C-
6.	Protected Areas, Reserved Forest and Sanctuaries	А-	Е	Ε	В-
7.	Landscape	D-	Ε	Ε	D-
8.	Local Meteorological Conditions	Ε	Е	Ε	Е
9.	Global Warming	Е	Е	Ε	E

A: Significant impact,B: Relatively Significant impact,C: Insignificant impact,D: Neglectable impact,E: No impact ,: Negative impact,+ : Positive impactD: Neglectable impact,

	Project					CONST	FRUC	TION ST	AGE				
	Activities	reas	ng of orks	ants, , etc.	Plants, ruction Works	Construction Works for Railway line and related structures						es of orks	iities orks
Sl. No.	Environmental & Social Issues	Quarry & Borrow Areas	Earth Moving: Cutting and Filling of the Construction Works	Preparation of Construction Plants, and Warehouses, Work Camps, etc.	Operation of Construction Plants, Machines & Vehicles for Construction Works	(A) Construction of Railway Lines & 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 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
1.	Topography and Geology	B-	D-	D-	Ε	D-	Е	D-	D	D	Е	Ε	Е
2.	Soil Erosion	C-	C-	D-	D	D-	D	D	D-	D-	Е	Е	Е
3.	Groundwater	D-	Е	D	D-	D-	D-	D-	D-	D-	Е	Е	Е
4.	Hydrological Conditions	D-	D-	D-	D-	C-	D-	D-	D-	C-	Е	Ε	Е
5.	Fauna, Flora and Biodiversity	C-	C-	C-	C-	В-	D	В-	D-	D	Е	Ε	Е
6.	Protected Areas, Reserved Forest and Sanctuaries	E	Е	D	C-	А-	D-	C-	C-	D-	E	Е	Е
7.	Landscape	C-	C-	D-	D-	D-	D-	D-	D-	D-	Е	D+	Е
8.	Local Meteorological Conditions	L	Е	Е	Ε	Е	Е	Е	Е	E	Е	Ε	Е
9.	Global Warming	Е	Е	Е	Е	Е	E	Е	Ε	Е	Е	Е	E

A: Significant impact,B: Relatively Significant impact,C: Insignificant impact,D: Neglectable impact,E: No impact,: Negative impact,+ : Positive impact

				PO	ST - CON	NSTRUC	TION ST	AGE		
SI. No.	Project Activitie Environmental & Social Issues	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
1.	Topography and Geology	Е	Ε	Е	Е	Е	Ε	Е	Е	Е
2.	Soil Erosion	Е	Ε	E	Е	Е	Е	Е	Е	Е
3.	Groundwater	Е	Е	E	Е	Е	Е	Е	Е	Ε
4.	Hydrological Conditions	Е	Ε	Е	Е	Е	Ε	Е	Е	Е
5.	Fauna, Flora and Biodiversity	Ε	Ε	Е	C-	Е	Е	Ε	Е	Ε
6.	Protected Areas, Reserved Forest and Sanctuaries	Е	Е	Е	D-	Е	Е	Ε	Е	Е
7.	Landscape	Е	Е	Е	Е	Е	Ε	Е	Е	D-
8.	Local Meteorological Conditions	Е	Е	Е	Е	Е	Е	Е	Е	Е
9.	Global Warming	Е	Е	Е	Е	Е	Ε	Е	Е	Е
	A: Significant impact, B: Relatively	Significa	nt impact,	(C: Insignit	ficant imp	oact,	D: Negle	ctable imp	oact,

E: No impact, : Negative impact, + : Positive impact

(2) Patan District

	Project Activities		PRE-CONSTRUCTION STAGE						
Sl. No.	Environmental & Social Issues	Overall Evaluation on the Project	Surveying of Planned Areas and Sites	Selection of the Project Location & Sites	Land Acquisition and Resettlement				
1.	Topography and Geology	D-	E	Ε	Ε				
2.	Soil Erosion	D-	Ε	Ε	Ε				
3.	Groundwater	D-	E	Ε	Ε				
4.	Hydrological Conditions	D-	Ε	Ε	Е				
5.	Fauna, Flora and Biodiversity	D-	Ε	Е	C-				
6.	Protected Areas, Reserved Forest and Sanctuaries	Ε	Ε	Ε	Е				
7.	Landscape	D-	Ε	Е	D-				
8.	Local Meteorological Conditions	Ε	Ε	Ε	Ε				
9.	Global Warming	Ε	Ε	Е	Е				

A: Significant impact, B: Relatively Significant impact, C: Insignificant impact, D: Neglectable impact,

E: No impact, -: Negative impact, +: Positive impact

	Project					CONST	RUCI	TON ST	AGE				
	Activities	reas	ıg of orks	unts, etc.	Plants, cuction Works	Constru	iction V rel	ne and	es of orks	ities orks			
SI. No.	Environmental & Social Issues	Quarry & Borrow Areas	Earth Moving: Cutting and Filling of the Construction Works	Preparation of Construction Plants, and Warehouses, Work Camps, etc.	Operation of Construction Plants, Machines & Vehicles for Construction Works	(A) Construction of Railway Lines& 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 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
1.	Topography and Geology	B-	D-	D-	Е	D-	Е	D-	D	D	Е	Е	Е
2.	Soil Erosion	C-	C-	D-	D	D-	D	D	D-	D-	Е	Е	Е
3.	Groundwater	D-	Е	D	D-	D-	D-	D-	D-	D-	Е	Е	Е
4.	Hydrological Conditions	D-	D-	D-	D-	C-	D-	D-	D-	C-	Е	Е	Е
5.	Fauna, Flora and Biodiversity	C-	C-	C-	C-	C-	D	D-	D-	D	Е	Е	Е
6.	Protected Areas, Reserved Forest and Sanctuaries	E	E	E	Ε	Е	Е	E	E	E	Е	Е	Е
7.	Landscape	C-	C-	D-	D-	D-	D-	D-	D-	D-	Е	D+	Е
8.	Local Meteorological Conditions	E	Е	Е	Ε	Е	Е	Е	Е	Е	Е	Ε	Е
9.	Global Warming A : Significant impact B	E	Ε	E	Ε	Ε	Ε	Ε	E	E	E able imp	Е	E

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

Sl.				PO	ST - CON	NSTRUC	TION ST	AGE		
No.	Project Activitie Environmental & Social Issues	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
1.	Topography and Geology	Е	Е	Е	Е	Е	Е	Е	Е	Е
2.	Soil Erosion	Е	Ε	Ε	Ε	Е	Е	Ε	Е	Е
3.	Groundwater	Е	Ε	Ε	Ε	Е	Е	Е	Е	Е
4.	Hydrological Conditions	Е	E	Е	Ε	Ε	Ε	Ε	Е	Ε
5.	Fauna, Flora and Biodiversity	Е	E	Е	D-	Е	Ε	Ε	E	E
6.	Protected Areas, Reserved Forest and Sanctuaries	Ε	Е	Е	Е	Ε	Ε	Ε	Е	Е
7.	Landscape	Е	Ε	E	Ε	Е	Е	Ε	E	D-
8.	Local Meteorological Conditions	Е	E	E	E	Е	E	Е	E	Ε
9.	Global Warming	Ε	Ε	E	Ε	Ε	Ε	Ε	Ε	Ε

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

(3) Mahesana District

	Project Activities		PRE-	CONSTRUCTION ST	AGE
Sl. No.	Environmental & Social Issues	Overall Evaluation on the Project	Surveying of Planned Areas and Sites	Selection of the Project Location & Sites	Land Acquisition and Resettlement
1.	Topography and Geology	D-	Ε	Ε	Ε
2.	Soil Erosion	D-	Ε	Ε	Е
3.	Groundwater	D-	Ε	Ε	Ε
4.	Hydrological Conditions	D-	Ε	Ε	Е
5.	Fauna, Flora and Biodiversity	А-	Е	Ε	D
6.	Protected Areas, Reserved Forest and Sanctuaries	A-	Ε	E	Е
7.	Landscape	D-	Ε	Ε	D-
8.	Local Meteorological Conditions	Ε	Ε	Ε	Е
9.	Global Warming	Ε	Ε	Ε	Е

A: Significant impact, B: Relatively Significant impact, C: Insignificant impact, D: Neglectable impact,

E: No impact, -: Negative impact, +: Positive impact

	Project					CONST	RUCTI	ON STAGE					
	Activities	reas	ng of orks	ants, etc.	Plants, cuction Works	Constru		Vorks for R ated structu		line a	und	es of orks	uities orks
SI. No.	Environmental & Social Issues	Quarry & Borrow Areas	Earth Moving: Cutting and Filling of the Construction Works	Preparation of Construction Plants, and Warehouses, Work Camps, etc.	Operation of Construction Plants, Machines & Vehicles for Construction Works	(A) Construction of Railway Lines& 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 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
1.	Topography and Geology	B-	D-	D-	Е	D-	Е	D-	D	Е	E	Е	Е
2.	Soil Erosion	C-	C-	D-	D	D-	D	D	D-	Е	Е	Е	Е
3.	Groundwater	D-	Е	D	D-	D-	D-	D-	D-	Е	Е	Е	Е
4.	Hydrological Conditions	D-	D-	D-	D-	C-	D-	D-	D-	Ε	Ε	Ε	Е
5.	Fauna, Flora and Biodiversity	C-	C-	C-	C-	А-	D	D-	D-	Е	Ε	Е	Е
6.	Protected Areas, Reserved Forest and Sanctuaries	E	Е	Е	Е	A-	Е	Е	Е	Е	Е	Е	Е
7.	Landscape	C-	C-	D-	D-	D-	D-	D-	D-	Ε	E	D +	Е
8.	Local Meteorological Conditions	E	Е	E	Е	Е	Е	Е	E	E	E	Е	Е
9.	Global Warming	Е	E	Е	Е	Ε	Е	Ε	Е	Ε	Е	Ε	Ε

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

Sl.				PO	ST - COI	NSTRUC	TION ST	AGE		
No.	Project Activitie Environmental & Social Issues	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
1.	Topography and Geology	Ε	Е	Ε	E	Ε	Ε	E	Ε	Ε
2.	Soil Erosion	Е	Ε	Ε	Ε	Ε	Е	Е	Е	Е
3.	Groundwater	Ε	Ε	Ε	Ε	Ε	Ε	E	Ε	Ε
4.	Hydrological Conditions	Ε	Ε	Ε	E	Ε	Ε	E	Ε	Ε
5.	Fauna, Flora and Biodiversity	Ε	E	Ε	A-	Ε	Ε	E	Ε	Ε
6.	Protected Areas, Reserved Forest and Sanctuaries	Ε	Е	Е	В-	Е	Е	Ε	Е	Е
7.	Landscape	Ε	Ε	Ε	Ε	Ε	Ε	Ε	Ε	D-
8.	Local Meteorological Conditions	Е	Ε	Ε	Е	Е	Ε	Е	Е	Ε
9.	Global Warming	Е	Ε	Ε	Е	Е	Е	Е	Е	Е

A: Significant impact, B: Relatively Significant impact, C: Insignificant impact, D: Neglectable impact,

E: No impact, -: Negative impact, +: Positive impact

	Project Activities		PRE-	CONSTRUCTION ST	AGE
Sl. No.	Environmental & Social Issues	Overall Evaluation on the Project	Surveying of Planned Areas and Sites	Selection of the Project Location & Sites	Land Acquisition and Resettlement
1.	Topography and Geology	D-	Ε	Ε	E
2.	Soil Erosion	D-	Ε	Ε	Е
3.	Groundwater	D-	Ε	Ε	E
4.	Hydrological Conditions	D-	Ε	Ε	Е
5.	Fauna, Flora and Biodiversity	C-	Ε	Ε	D
6.	Protected Areas, Reserved Forest and Sanctuaries	Ε	Ε	Е	Е
7.	Landscape	D-	Е	Ε	D-
8.	Local Meteorological Conditions	Ε	Е	Ε	E
9.	Global Warming	Ε	Е	Ε	Е

(4) Gandhinagar, Ahmedabad, Kheda, Anand, Vadodara

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

	Project					CONSTI	RUCTIO	N STAGE					
	Activities	reas	ıg of orks	ints, etc.	Plants, cuction Works	Constru		rks for R d structu		line a	ind	es of orks	ities orks
SI. No.	Environmental & Social Issues	Quarry & Borrow Areas	Earth Moving: Cutting and Filling of the Construction Works	Preparation of Construction Plants, and Warehouses, Work Camps, etc.	Operation of Construction Plants, Machines & Vehicles for Construction Works	(A) Construction of Railway Lines& 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 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
1.	Topography and Geology	B-	D-	D-	Е	D-	Ε	D-	D	D	Е	Е	Е
2.	Soil Erosion	C-	C-	D-	D	D-	D	D	D-	D-	Ε	Е	Е
3.	Groundwater	D-	Е	D	D-	D-	D-	D-	D-	D-	Ε	Ε	Е
4.	Hydrological Conditions	D-	D-	D-	D-	C-	D-	D-	D-	C-	Е	Ε	Е
5.	Fauna, Flora and Biodiversity	C-	C-	C-	C-	D-	D	D-	D-	D	Ε	E	Е
6.	Protected Areas, Reserved Forest and Sanctuaries	E	Е	Е	E	Е	Е	Е	Е	E	Е	E	Е
7.	Landscape	C-	C-	D-	D-	D-	D-	D-	D-	D-	Ε	D+	Е
8.	Local Meteorological Conditions	E	Е	Е	Е	Е	Е	Е	Е	Е	Ε	Е	Е
9.	Global Warming	Е	Е	Е	E ficant impa	Е	Е	E	Е	E	Е	Ε	E

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

				PO	ST - COI	NSTRUC	TION ST	AGE		
SI. No.	Project Activitie Environmental & Social Issues	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
1.	Topography and Geology	Е	Е	Е	Е	Е	Е	Е	Е	Е
2.	Soil Erosion	Е	Е	Е	Е	Е	Е	Е	Е	Е
3.	Groundwater	Е	Е	Е	Е	Е	Е	Е	Е	Е
4.	Hydrological Conditions	Ε	Е	Е	Е	Е	Е	Е	Е	Е
5.	Fauna, Flora and Biodiversity	Е	Е	Е	D-	Е	Е	Е	Е	Е
6.	Protected Areas, Reserved Forest and Sanctuaries	Е	Е	Е	Е	Е	Е	Е	Е	Е
7.	Landscape	Е	Ε	Е	Ε	Е	Е	Ε	Ε	D-
8.	Local Meteorological Conditions	Ε	Ε	E	Ε	Е	Е	Ε	Е	Е
9.	Global Warming	<u>Е</u>	Ε	E	E	Ε	E	E	Ε	Ε

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

5.4 SOCIAL IMPACT ASSESSMENT

5.4.1 Introduction

Social Impact Assessment is an important component of project preparation and is carried out to avoid, mitigate or reduce potential negative social impacts and to make the project environmentally viable socially acceptable and user friendly. The objective of social impact assessment is to assess the social impacts likely to occur with project implementation and such social concerns are addressed into the project at the design stage itself so as to avoid or minimize the adverse social impacts. This is possible with the best possible engineering solutions at the most optimal cost.

Within the framework of DFC Project, socio-economic survey was conducted to assess overall social impact. Socio-economic issues have been discussed such as:

- Demographic profile
- Occupational structure
- Income level
- Educational level
- Assets in possession and certain project specific questions like
 - Direct or indirect impact
 - Resettlement
 - In favour or against of DFC etc.

All the results indicate present socio-economic status at a glance. It is important to know this to assess the social impact post project.

5.4.2 Methodology

Following methodology has been adopted to conduct social impact assessment study.

Step 1: Identified affected districts, sub districts and villages where DFC would affect in parallel and detour route. (**Table5-3**)

S. N	District	Taluka	Village/Town
1	Banaskantha	Amirgadh	Amirgadh
2	Banaskantha	-	Dungarpura
3	Banaskantha	-	Kirotar
4	Banaskantha		Jorapura
5	Banaskantha		Dhanpura
6	Banaskantha		Dholia
7	Banaskantha		Juni Roh Sarothi
8	Banaskantha	-	Zanzarvav
9	Banaskantha	-	Iqbalgarh
10	Banaskantha		Jethi
11	Banaskantha		Bantawada
12	Banaskantha	Palanpur	Pirojpura
13	Banaskantha		Antroli
14	Banaskantha	-	Malana
15	Banaskantha	-	Rajpur
16	Banaskantha	-	Pakhanava
17	Banaskantha		Moriya
18	Banaskantha		Parpada
19	Banaskantha		Palanpur
20	Banaskantha		Chadotar
21	Banaskantha		Akesan
22	Banaskantha		Gathaman
23	Banaskantha		Jagana
24	Banaskantha		Sedrasana
25	Banaskantha		Jasleni
26	Banaskantha	Vadgan	Malosana
27	Banaskantha		Majadar
28	Banaskantha		Kotadi
29	Banaskantha	_	Teniwada
30	Banaskantha	_	Manpura
31	Banaskantha		Dharewada
32	Patan	Sidhpur	Maloj
33	Patan		Ganeshpura
34	Patan		Ankvi
35	Patan		Sidhpur
36	Patan		Lalpur
37	Mahesana	Unjha	Kamli
38	Mahesana	-	Maktupur
39	Mahesana	-	Aithor
40	Mahesana		Unjha (M)
41	Mahesana	Visnagar	Jetalvasana

Table 5-3 Administrative Units/Village likely to be Affected
by the DFC Project in Banaskantha District

S. N	District	Taluka	Village/Town
42	Mahesana		Bhandu
43	Mahesana	Mahesana	Motidau
44	Mahesana		Palodar*
45	Mahesana	_	Panchot
46	Mahesana	-	Dediyasan (Part)
47	Mahesana	-	Nugar
48	Mahesana	-	Sametra
49	Mahesana	-	Heduva-Rajgar
50	Mahesana	-	Vadosan
51	Mahesana	-	Boriavi
52	Mahesana	-	Linch
53	Mahesana	-	Ambasan
54	Mahesana	-	Baliyasan
55	Mahesana	-	Bhasariya
56	Mahesana	-	Tundali
57	Mahesana	Kadi	Dhanali
58	Mahesana	-	Ganeshpura
59	Mahesana		Nandasan
60	Mahesana		Mathasur
61	Mahesana		Kherpur
62	Mahesana		Lakshmipura (Nandasan)
63	Mahesana		Rajpur
64	Mahesana	1	Irana
65	Mahesana	7	Indrad
66	Mahesana	7	Ankhol
67	Mahesana	7	Achrasan
68	Mahesana	7	Vamaj
69	Mahesana		Fuletra
70	Mahesana		Vadavi
71	Mahesana		Thol
72	Gandhinagar		Dhanot
73	Gandhinagar		Chhatral
74	Gandhinagar		Hajipur
75	Gandhinagar	- Kalol	Bhaimasan
76	Gandhinagar		Adhana
77	Gandhinagar	_	Nasmed
78	Gandhinagar	_	Rancharada
79	Gandhinagar		Unali
80	Ahmedabad	_	Garodiya
81	Ahmedabad	_	Godhavi
82	Ahmedabad	4	Manipur
83	Ahmedabad		Kaneti
84	Ahmedabad	Sanand	Sanand (Rural) (Gibpura)
85	Ahmedabad	4	Kolat
86	Ahmedabad	4	Moraiya
87	Ahmedabad	4	Moti Devti
88	Ahmedabad		Vasna Chacharavadi
89	Ahmedabad	Dholka	Badarkha
90	Ahmedabad	4	Saroda
91	Ahmedabad		Chandisar

S. N	District	Taluka	Village/Town
92	Ahmedabad		Vasna Keliya
93	Ahmedabad		Chaloda
94	Ahmedabad		Ambaliyara
95	Ahmedabad		Sathal
96	Ahmedabad		Kavitha
97	Ahmedabad	— Bavla	Bavla (M)
98	Kheda		Kaloli
99	Kheda		Naika
100	Kheda		Radhu
101	Kheda	— Kheda	Govindpura
102	Kheda		Shetra
103	Kheda		Vasna Bujarg
104	Kheda		Palla
105	Kheda		Matar
106	Kheda		Traj
107	Kheda	Matar	Garmala
108	Kheda		Machhiel
109	Kheda		Kathoda
110	Kheda		Khandhli
111	Anand		Bhadkad
112	Anand		Bantwa
113	Anand	Sojitra	Virsadpura
114	Anand		Malataj
115	Anand		Kasor
116	Anand		Mahelav
117	Anand		Sunav
118	Anand		Bandhni
119	Anand	Petlad	Porda
120	Anand		Vishnoli
121	Anand		Ardi
122	Anand		Morad
123	Anand	A	Sandesar
124	Anand	— Anand	Karamsad
125	Anand	Petlad	Boriya
126	Anand		Gana
127	Anand	Anand	Vanas Khilya
128	Anand		Khandhali
129	Anand		Napa Vanto
130	Anand	Boread	Dahemi
131	Anand	Borsad	Kasumbad
132	Anand		Harkhapura
133	Anand		Haldari
134	Anand		Asodar
135	Anand	Anklav	Bhedi (Talpad)
136	Anand		Anklav
137	Anand		Ambali
138	Anand		Amrol
139	Vadodara	Vadodara	Kotna
140	Vadodara		Anagarh
141	Vadodara		Sindhrat

S. N	District	Taluka	Village/Town
142	Vadodara		Hinglot
143	Vadodara		Ampad
144	Vadodara		Raypura
145	Vadodara		Bhayli
146	Vadodara		Bill
147	Vadodara		Vadodara
148	Vadodara		Talsat
149	Vadodara		Chapad
150	Vadodara		Maretha
151	Vadodara		Alamgir
152	Vadodara		Varnama
153	Vadodara		Vadsala
154	Vadodara		Itola
155	Vadodara		Kashipura
156	Vadodara		Sarar
157	Vadodara		Kherda
158	Vadodara		Kandari
159	Vadodara		Karjan
160	Vadodara		Miyagam
161	Vadodara		Vavava
162	Vadodara	Karjan	Lakodara
163	Vadodara		Dethan
164	Vadodara		Valan
165	Vadodara		Mankhan
166	Vadodara		Sansrod
167	Vadodara		Haldarva

Source: Census of India Map & Field study

Step 2: Pre - testing of structured / open ended questionnaire

Step 3: Finalization of questionnaire after pre-testing and incorporating changes.

Step 4: Socio-economic survey was conducted at 10% of the total affected structures both in parallel and detour sections.

Step 5: Compilation, Tubulation, computerisation and analyses of the collected primary and secondary information.

Step 6: Analysis of the results.

Step 7: Preparation of Resettlement and Rehabilitation Plan.

5.4.3 District Demographic Profile

(1) Banaskantha

Demographic profile of Banaskantha District, according to Census data is presented in **Table5-4**. There are 30 villages and 1 town that are likely to be affected by DFC spread over 3 Talukas of Amirgadh, Palanpur and Vadgaon. While 17 villages are in the parallel section, 14 villages are in the detour section. Of the six affected villages (highlighted), SC and ST population is marginal and in Antroli, there is no ST population. Literacy level is quite

remarkable (over 50%) in all of the 4 affected villages, excepting Antroli where it is only 41%. Work participation rate is only 25% to 30% average in all the villages.

District/		Total	Tot	al Populati	on	SC	ST		Work
Taluka/ Village	Name	No.of Househ olds	Person	Male	Female	Population (%)	Populat ion (%)	Literacy Rate (%)	Participation Rate (%)
District	Banaskantha	426,781	2,504,244	1,297,404	1,206,840	10.84	8.22	50.97	43.61
Taluka	Amirgad	17,026	101,133	52,148	48,985	3.19	53.21	34.87	39.73
Village	Juni Roh Sarotri	175	986	521	465	0.00	62.78	40.34	46.15
	Kidotar	514	2,875	1,487	1,388	8.31	12.90	36.34	39.44
	Amirgadh	1,145	6,109	3,261	2,848	7.19	8.79	68.32	27.86
	Dungarpura	119	634	325	309	0.00	23.34	54.89	54.57
	Jorapura (Amirgadh)	57	348	182	166	0.00	1.15	59.64	52.87
	Dholia	431	3,041	1,538	1,503	0.20	92.34	19.01	46.37
	Zanzarvav	103	567	295	272	3.53	10.41	60.61	30.34
	Iqbalgadh	983	5,211	2,751	2,460	3.57	4.47	66.21	38.71
	Jethi	714	3,669	1,935	1,734	8.94	33.77	50.31	52.33
	Bantawada	130	562	308	254	6.76	5.52	60.29	45.37
	Dhanpura	596	3,957	2,001	1,956	0.00	81.20	13.81	42.25
Taluka	Vadgam	40735	205992	104967	101025	16.62	2.39	68.78	39.63
Village	Malosana	417	2,140	1,093	1,047	21.96	0.00	71.61	43.50
	Majadar	1,396	7,585	3,847	3,738	14.41	0.09	77.58	27.13
	Teniwada	811	4,241	2,137	2,104	10.35	2.90	71.88	35.91
	Kotadi	301	1,443	716	727	21.55	3.47	70.83	43.24
	Manpura	332	1,534	778	756	18.64	0.00	68.22	34.29
	Dharewada	209	1,066	542	524	14.17	0.00	65.83	34.33
Taluka	Palanpur	72,765	380,707	196,956	183,751	11.22	3.81	70.45	37.22
Village	Rajpur (Pakhanva)	184	998	518	480	17.43	28.66	49.07	45.39
	Antroli	495	2,607	1,341	1,266	2.42	0.00	40.92	28.85
	Pirojpura(Tank ani)	176	904	488	416	4.87	7.19	57.94	42.37
	Malana	738	3,775	1,931	1,844	15.68	8.90	57.38	40.69
	Pakhanwa	90	526	277	249	0.00	37.83	34.62	52.28
	Moriya	289	1,396	695	701	14.61	0.93	63.75	45.99
	Parpada	273	1,357	719	638	1.84	0.00	69.36	43.70
	Akesan	254	1,350	711	639	19.78	0.00	67.91	37.26
	Chadotar	1,212	6,326	3,238	3,088	5.69	0.40	68.35	36.56
	Gathaman	731	4,162	2,127	2,035	6.78	0.00	70.10	26.74
	Sedrasana	243	1,336	695	641	21.93	3.29	71.81	34.13
	Jagana	1,417	6,802	3,517	3,285	14.10	0.37	79.79	36.80
	Jasleni	491	2,507	1,280	1,227	16.67	2.63	75.32	44.12
	Palanpur (OG)	2,358	11,881	6,310	5,571	1.24	0.99	80.31	32.34

Table 5-4 Demographic Profile of District Banaskantha

Source: Census of India, 2001

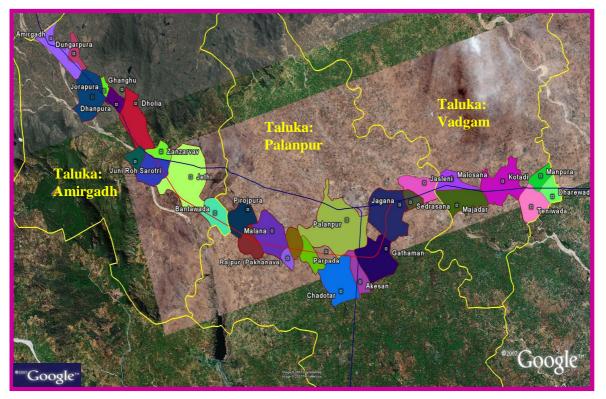


Figure 5-1 Talukas & Villages along DFC alignment in Banaskantha District

(2) Patan

Demographic profile of Patan District, according to Census data is presented in **Table5-5**. There are 4 villages and 1 town that are likely to be affected by DFC spread over 1 Taluka of Siddhpur. All villages and the town are in the parallel section. Meloj has the highest number of households of all DFC affected villages. Literacy rate is quite high in all the villages and 1 town (Sidhapur Municipality) and so is work participation rate. There is marginal SC population, but no ST population at all.

District/	/ Name	Total No.of Households	Total Population			SC	ST	Literacy	Work
Taluka/ Village			Person	Male	Female	Populatio n (%)	Populati on (%)	Rate (%)	Participation Rate (%)
District	Patan	222,630	1,182,709	612,100	570,609	9.88	1.07	50.65	45.07
Taluka	Sidhpur	35,640	190,937	98,063	92,874	11.71	0.86	61.08	39.56
Village	Meloj	664	3,416	1,740	1,676	19.09	0.00	47.07	47.63
	Ankvi	325	1,646	830	816	6.14	0.06	69.68	53.10
	Ganeshpura	374	1,943	957	986	0.00	0.00	66.44	37.06
	Lalpur	446	2,294	1,191	1,103	6.89	7.89	56.23	38.71
	Sidhpur MC	10,309	53,858	27,875	25,983	11.60	1.65	69.77	28.57

 Table 5-5
 Demographic Profile of District Patan

Source: Census of India, 2001

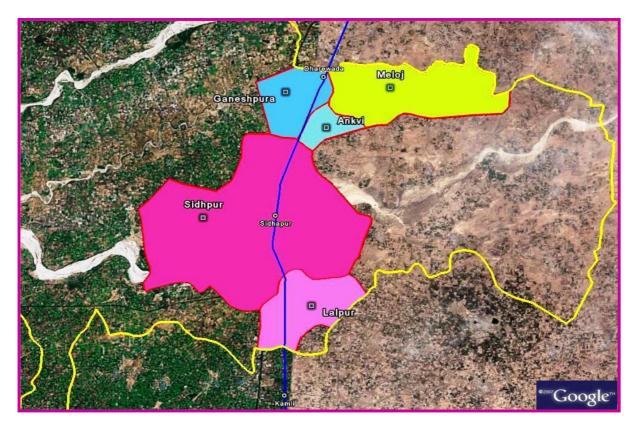


Figure 5-2 Villages along DFC Alignment in Patan District

(3) Mahesana

Demographic profile of Mahesana District, according to Census data is presented in **Table5-6**. There are 34 villages and 1 town that are likely to be affected by DFC spread over 4 Talukas of Unjha, Visnagar, Mehsana and Kadi. While Unjha and Visnagar talukas are in the parallel section, Mehsana and Kadi are in the detour areas. Linch, Nandasan, Panchot, Rajpur and Thol are villages in decreasing order households but all with over 1000 households. SC population is moderate while ST is marginal. Literacy rate is quite high in all the villages (between 60%-80%) and 1 town (Unjha municipality with 85% literacy rate); work participation rate is moderate in all villages, around 50%.

District/		Total No.of Total Population					ST	Literacy	Work
Taluka/ Village	Name	Households	Person	Male	Female	Populat ion (%)	Populat ion (%)	Rate (%)	Participation Rate (%)
District	Mehsana	364,447	1,837,892	953,842	884,050	8.09	0.49	75.22	45.08
Taluka	Unjha	35,064	174,303	90,235	84,068	7.63	0.24	80.81	44.57
Village	Kamli	1,365	6,508	3,347	3,161	3.69	0.06	83.46	49.32
	Maktupur	1,037	5,138	2,662	2,476	9.40	0.16	76.90	48.73
	Aithor	1,769	8,509	4,372	4,137	7.25	0.00	77.56	40.52
	Unjha (M)	10,734	53,876	28,396	25,480	7.75	0.68	84.96	36.11
Taluka	Visnagar	49,906	253,179	131,809	121,370	7.40	0.38	79.74	43.79
Village	Jetalvasana	723	3,417	1,739	1,678	15.86	0.00	84.84	51.95
	Bhandu	1,432	7,186	3,733	3,453	5.46	0.22	77.83	44.22
Taluka	Mehsana	90,920	461,320	241,115	220,205	8.15	0.85	78.02	41.58
Village	Motidau	948	4,901	2,492	2,409	10.55	0.00	77.40	52.81
	Palodar*	831	4,225	2,217	2,008	7.36	0.00	77.07	56.50
	Panchot	1554	7,945	4,138	3,807	7.67	0.00	84.60	43.26
	Dediyasan (Part)	733	3,857	2,019	1,838	8.58	0.00	79.93	31.81
	Nugar	597	2,938	1,553	1,385	5.14	0.00	69.69	54.32
	Sametra	554	2,729	1,438	1,291	11.29	0.00	78.27	55.73
	Heduva-Rajgar	232	1,260	660	600	2.30	0.48	77.87	46.19
	Vadosan	518	2,813	1,425	1,388	4.83	0.00	62.40	44.47
	Boriavi	987	5,496	2,844	2,652	7.26	0.02	75.60	40.96
	Linch	1,889	9,444	4,900	4,544	4.92	0.21	66.98	41.18
	Ambasan	1,001	4,807	2,452	2,355	11.17	0.00	78.97	46.87
	Baliyasan	897	4,410	2,647	1,763	17.21	7.51	69.02	51.02
	Bhasariya	499	2,586	1,361	1,225	5.34	0.00	77.33	50.81
	Tundali	444	2,375	1,228	1,147	3.96	0.00	70.87	48.34
Taluka	Kadi	59,882	296,921	154,947	141,974	9.20	0.42	73.72	45.11
Village	Dhanali	493	2,436	1,245	1,191	7.55	0.00	70.61	33.54
	Ganeshpura	297	1,494	753	741	9.97	0.00	71.20	29.32
	Nandasan	1,884	10,222	5,344	4,878	11.42	0.17	80.24	42.23
	Mathasur	493	2,490	1,253	1,237	16.71	0.16	77.62	39.36
	Kherpur	312	1,546	778	768	15.27	0.00	77.62	37.90
	Lakshmipura (Nandasan)	315	1,542	788	754	0.00	0.00	89.61	44.23
	Rajpur	1,707	8,253	4,390	3,863	7.43	0.13	66.28	43.90
	Irana	535	2,970	1,514	1,456	13.30	0.03	53.75	45.22
	Indrad	878	4,289	2,282	2,007	6.39	0.00	67.61	42.99
	Ankhol	331	1,584	855	729	1.26	0.32	57.05	44.63
	Achrasan	342	1,662	842	820	12.76	0.00	60.07	47.59
	Vamaj	846	4,357	2,448	1,909	8.22	0.09	83.33	56.23
	Fuletra	554	2,884	1,496	1,388	5.37	0.00	56.45	37.62
	Vadavi	537	2,745	1,410	1,335	5.54	0.00	63.79	48.60
	Thol	1,188	6,121	3,186	2,935	11.11	0.08	73.10	50.17

Table 5-6 Demographic Profile of Mehsana District

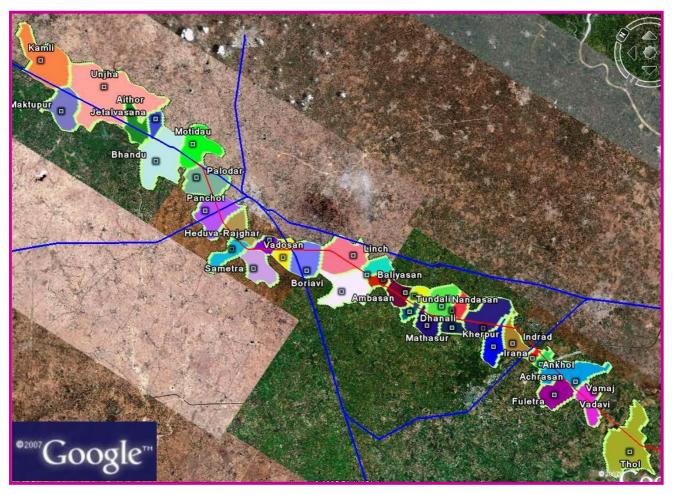


Figure 5-3 Villages along DFC Alignment in Mahesana District

(4) Gandhinagar

There are 8 villages under Kalol Taluka that might get affected by DFC. Chhatral is the biggest village with over 2000 households. Adhana is the smallest village with only 88 households. Literacy rate is medium, between 55%-75% while work participation rate is quite poor, between 30%-40%. ST population is nominal here while SC population is slightly higher. Demographic profile (according to Census data) of the villages through which the DFC alignment is passing in Gandhinagar District, is presented in **Table5-7**.

District/	Name	Total	Total Population			SC	ST		Work
Taluka/ Village		No.of House holds	Person	Male	Female	Populat ion (%)	Populatio n (%)	Literacy Rate (%)	Participat ion Rate (%)
District	Gandhinagar	269,440	1,334,455	697999	636456	8.69	1.32	76.59	41.54
Taluka	Kalol	62,381	310,081	162845	147236	10.47	0.41	75.96	41.052
Village	Dhanot	239	1,224	677	547	8.33	0.00	63.74	34.64
	Chhatral	2,111	9,744	5,451	4,293	7.73	1.64	74.48	41.61
	Hajipur	623	3,447	1,739	1,708	8.50	0.44	63.37	53.96
	Bhimasan	202	1,170	603	567	9.49	0.00	51.79	55.21
	Nasmed	486	2,355	1,207	1,148	10.15	1.70	54.99	40.09
	Adhana	88	455	234	221	0.00	0.00	68.23	36.70
	Unali	235	1,259	617	642	4.77	0.00	60.00	30.34
	Rancharada	571	2,770	1,432	1,338	8.16	0.90	66.55	30.61

Table 5-7	Demographic	Profile of	District	Gandhinagar
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Figure 5-4 District Boundary and Villages along DFC Alignment in Gandhinagar District

(5) Ahmedabad

Demographic profile of Ahmedabad District, according to Census data is presented in **Table5-8**. 17 villages and 1 town in all would get affected in Ahmedabad District – all in detour section, of which 9 villages are in Sanand, 7 in Dholka and 1 in Bavla Talukas.Bavla is the only municipal town which would get affected having over 6,000 structures and the third stage of public consultation was held here only. Other big villages with over 1,000 households are Badarkha, Vasna Keliya, Kavitha and Chaloda. 10% to 20% proportion of population belongs to SC and marginal ST population. Literacy rate is between 60%-80% and work participation rate is medium, around 40% to 50%.

District/		Total	Total Population			SC	ST		Work
Taluka/ Village	Name	No.of Househol ds	Person	Male	Female	Populat ion (%)	Popula tion (%)	Literacy Rate (%)	Participation Rate (%)
District	Ahmadab ad	1,150,588	5,816,519	3,074,556	2,741,963	10.67	1.00	79.50	34.55
Taluka	Sanand	37,616	193,335	101,285	92,050	12.25	0.31	62.05	43.13
Village									
	Garodiya	339	1,628	849	779	0.31	0.00	66.39	28.50
	Godhavi	717	3,632	1,936	1,696	13.05	0.00	79.55	30.18
	Manipur	316	1,651	847	804	9.02	0.00	73.18	41.01
	Kaneti	336	1,759	930	829	10.52	0.00	75.59	38.60
	Sanand (Rural)	226	1.050	62.1	60.6	0.02	0.00	60.4 7	50.00
	(Gibpura)	236	1,270	634	636	8.82	0.00	69.47	58.03
	Kolat	654	3,356	1,748	1,608	8.08	0.00	54.26	
	Moraiya	768	3,694	1,977	1,717	17.62	1.62	69.02	
	Moti Devti	425	2,316	1,185	1,131	7.12	0.00	65.10	45.51
	Vasna Chacharav adi	485	2,238	1,177	1,061	32.48	1.21	74.02	43.16
Taluka	Dholka	485 41,404		,	,	14.15	0.89		
Village		· · · ·	214,836	112,456	102,380			68.37	
v mage	Badarkha	1,699	8,998	4,828	4,170	19.49	0.19	69.83	
	Saroda	849	4,124	2,201	1,923	14.79	0.00	69.24	54.10
	Chandisar Vasna	847	4,039	2,123	1,916	15.33	0.10	60.37	40.11
	Keliya	1,124	5,814	2,998	2,816	21.43	0.62	75.35	52.80
	Chaloda	1,422	7,128	3,771	3,357	21.72	0.00	70.53	45.97
	Ambaliyar	1,.22	.,120	2,771	2,207		5.00	. 0.00	
	a	696	3,550	1,868	1,682	22.37	0.23	74.12	43.75
	Sathal	785	3,940	2,081	1,859	16.24	0.53	65.93	56.04
Taluka	Bavla	26,616	135,097	70,990	64,107	10.94	5.72	61.04	43.44
Village	Kavitha	1,300	6,539	3,452	3,087	21.67	0.00	66.64	44.85
Source: Can	Bavla (M)	6,265	30,871	16,368	14,503	9.48	0.77	78.49	32.84

Source: Census of India, 2001

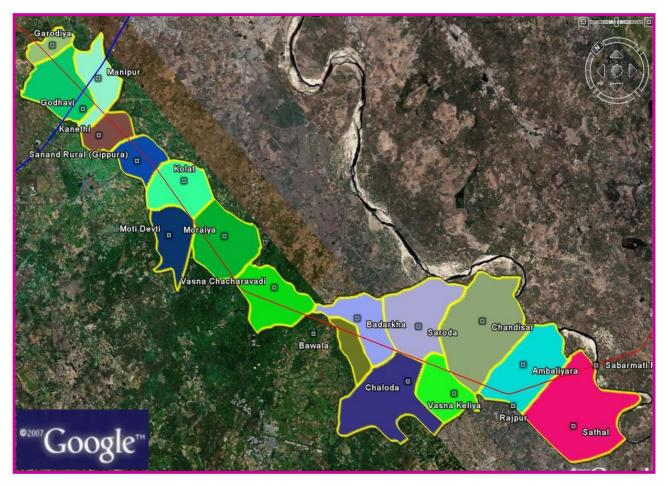


Figure 5-5 Villages along DFC Alignment in Ahmedabad District

(6) Kheda

Table5-9 shows the socio-economic demographic profile of the DFC corridor in Kheda District. Literacy rate is moderate in all the villages and so is work participation rate. There is marginal SC population, and still less is ST population. Matar is the largest village with over 2500 households, followed by Radhu, nearly 2000. Naika is the third largest village with over 1000 households.

District/		Total No.of	Т	otal Population	n	SC	ST	Literacy	Work
Taluka/ Village	Name	Households	Person	Male	Female	Populatio n (%)	Populatio n (%)	Rate (%)	Participation Rate (%)
District	Kheda	395,493	2,024,216	1,052,823	971,393	5.24	1.60	71.96	44.87
Taluka	Kheda	23388	118,420	61,823	56,597	10.43	5.42	71.59	42.44
Village	Kaloli	632	3,213	1,712	1,501	8.84	0.12	64.41	44.91
	Naika	1293	6,257	3,252	3,005	6.44	8.28	71.39	38.93
	Govindpura	181	893	474	419	15.79	1.46	65.01	55.99
	Shetra	236	1,133	575	558	6.88	1.24	55.10	52.43
	Radhu	1,861	9,464	4,860	4,604	12.64	2.97	75.92	39.91
	Vasna Bujarg	619	3,170	1,651	1,519	7.82	6.15	67.94	54.51
Taluka	Matar	28,573	147,201	76,912	70,289	5.56	1.13	69.74	44.28
Village	Matar	2,542	13,421	6,953	6,468	5.84	1.92	72.02	36.77
	Garmala	328	1,841	972	869	7.22	0.49	65.67	37.10
	Traj	792	4,206	2,176	2,030	9.27	0.12	74.25	43.75
	Machhiel	553	2,858	1,490	1,368	1.36	0.00	61.77	49.76
	Khandhli	625	3,029	1,620	1,409	8.91	0.26	80.50	38.56
	Kathoda	196	1,002	535	467	11.58	0.00	57.45	39.02
	Palla	314	1,782	932	850	6.45	0.84	62.53	51.57

Table 5-9 Demographic Profile of Kheda District

Source: Census of India, 2001

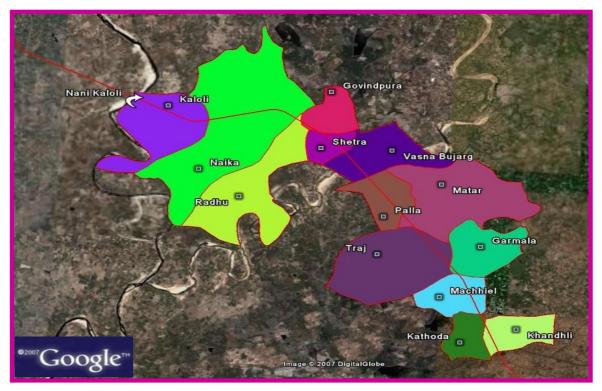


Figure 5-6 Villages along DFC Alignment in Kheda District

(7) Anand

DFC Specific Demographic Profile

The proposed DFC traverses through the administrative boundaries of 28 villages under 5 Talukas as seen in table below. Total population, percentage of SC population to total population, percentage of ST population to total population, literacy rate and work

participation rate is provided in the table. Kasor, Sunav and Mahelav are villages with over 1,000 households. Anklav and Karamsad are the only towns with the later having over 6,000 household population. Anklav is a comparatively smaller town. Proportion of SC population is marginal whereas ST population is still lower. Literacy rate is quite high while work participation rate is moderate. The Table5-10 below shows the socio-economic demographic profile of the DFC corridor in Anand District.

District/			Р	opulation	1	SC	ST		Work
Taluka/ Village	Name	Total No. of Households	Persons	Male	Female	Population (%)	Population (%)	Literacy Rate (%)	Participation Rate (%)
District	Anand	360,808	1,856,872	972,000	884,872	5.30	1.23	74.51	42.26
Taluk	Sojitra	19,359	96,138	50,475	45,663	6.00	0.45	69.75	44.42
Village/	Bhadkad	597	2,862	1,499	1,363	7.34	0.49	75.92	59.29
Town	Bantwa	255	1,177	627	550	1.27	0.00	54.13	55.56
	Dabhou (Virsadpura)	1,135	5,576	2,958	2,618	8.32	1.49	76.53	38.36
	Malataj	929	4,666	2,435	2,231	8.72	1.03	71.57	34.87
	Kasor	2,438	12,031	6,286	5,745	3.63	0.03	61.54	48.15
Taluk	Anand	100,298	513,900	269,971	243,929	4.04	2.48	80.73	36.62
Village/	Sandesar	1,015	5,091	2,698	2,393	4.62	1.61	76.37	40.09
Town	Gana	764	3,569	1,900	1,669	14.49	2.30	84.46	33.62
	Vans Khiliya	520	2,589	1,375	1,214	1.20	0.00	67.09	35.26
	Khandhali	361	1,664	862	802	5.47	2.34	80.10	52.46
	Karamsad (M)	6,179	28,955	15,352	13,603	2.86	1.46	86.37	33.23
Taluk	Petlad	52,894	265,455	138,924	126,531	6.62	0.97	74.74	42.30
Village/	Mahelav	2,338	11,398	6,021	5,377	5.59	0.40	69.55	46.64
Town	Bandhni	1,667	8,221	4,274	3,947	4.61	0.47	69.59	42.62
	Morad	792	3,936	2,108	1,828	3.71	1.42	65.35	49.87
	Porda	844	3,915	2,036	1,879	4.88	1.56	70.63	43.83
	Sunav	1,156	5,399	2,694	2,705	9.21	0.33	86.13	41.90
	Vishnoli	551	2,913	1,540	1,373	3.30	0.00	70.40	41.61
	Ardi	654	3,190	1,652	1,538	5.36	0.34	67.05	52.04
	Boriya	758	3,852	2,010	1,842	15.91	0.00	77.61	37.90
Taluk	Borsad	67,252	347,409	181,961	165,448	4.54	0.67	72.19	45.32
Village/	Napa Vanto	971	5,436	2,838	2,598	0.92	0.00	71.92	48.73
Town	Dahemi	907	4,258	2,223	2,035	4.79	0.00	70.01	43.78
	Kasumbad	557	2,488	1,265	1,223	4.46	0.00	70.77	59.81
	Harkhapura	374	1,779	955	824	4.38	0.00	67.44	59.08
Taluk	Anklav	26,801	134,680	70,758	63,922	3.98	0.65	69.47	49.50
Village/	Haldari	508	2,249	1,155	1,094	1.69	0.00	62.58	53.80
Town	Asodar	1,697	8,811	4,580	4,231	5.57	1.77	74.19	46.39
	Bhetasi (Talpad)	257	1,218	656	562	17.49	0.00	76.71	44.17
	Ambali	839	4,027	2,086	1,941	3.18	0.05	68.69	54.08
	Amrol	969	5,006	2,655	2,351	1.36	0.00	68.59	56.11
	Anklav (M)	3,877	19,803	10,420	9,383	4.56	1.81	71.50	48.23
Courses C	ensus of India 20	01							

Table 5-10 Demographic Profile of Anand District

Source: Census of India, 2001

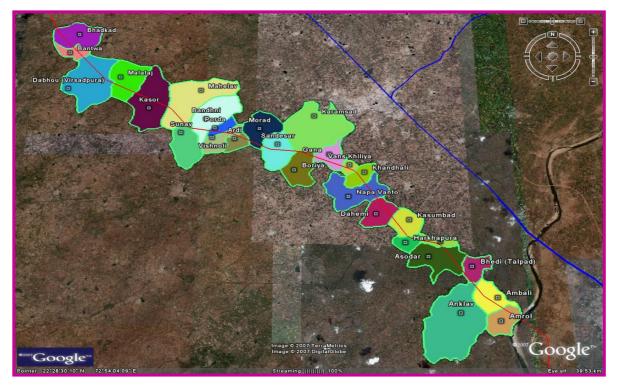


Figure 5-7 Map Showing Villages along DFC Alignment in Vadodara District

(8) Vadodara

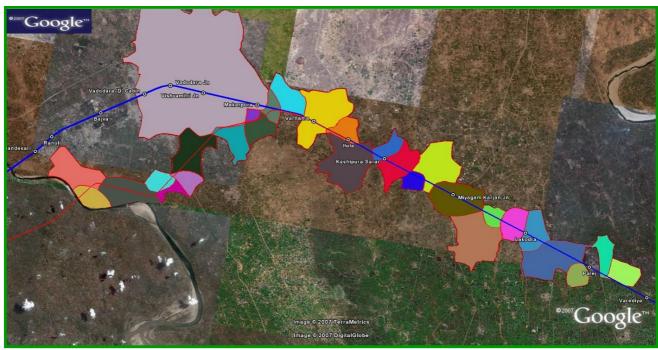
Demographic profile of Vadodara District, according to Census data is presented in **Table5-11**. There are 27 villages and 2 cities/towns that are likely to be affected by DFC spread over 2 Talukas of Vadodara and Karjan. All villages and the towns are both in the parallel and detour sections. Valan in Karjan taluka has the highest number of households of all DFC affected villages. Literacy rate is quite high in all the villages and higher still in Karjan town and Vadodara city- a seat of learning. Work participation rate is moderate. There is marginal SC population, but quite high ST population.

District/		Total No.of	Tot	al Populatio	n	SC	ST	Literacy	Work
Taluka/ Village	Name	Households	Person	Male	Female	Populat ion (%)	Populat ion (%)	Rate (%)	Participation Rate (%)
District	Vadodara	739,276	3,641,802	1,897,368	1,744,434	5.61	26.56	70.76	41.71
Taluka	Vadodara	363,886	1,705,989	894,780	811,209	6.87	4.71	85.06	33.19
Village	Anagadh	2,560	13,531	6931	6,600	3.30	0.35	69.44	35.65
	Kotna	379	2,051	1,062	989	0.88	0.00	69.08	39.69
	Sindhrot	1,262	6,174	3,220	2,954	1.44	3.58	59.63	35.76
	Hinglot	182	988	494	494	1.52	0.20	68.69	49.39
	Ampad	251	1,328	706	622	2.33	0.00	76.82	50.00
	Bhayli	1,553	7,096	3,682	3,414	14.35	9.75	79.81	42.08
	Raypura	870	4,594	2,393	2,201	0.26	0.00	76.55	41.47
	Bil	966	4,471	2,339	2,132	9.06	17.54	76.85	45.47
	Talsat	177	856	438	418	1.64	0.00	51.95	48.48
	Chapad	496	2,280	1,200	1,080	10.66	16.62	69.77	49.56
	Maretha	370	1,852	969	883	7.07	13.55	76.86	39.31
	Alamgir	146	763	418	345	11.14	20.84	71.62	30.93
	Varnama	899	4,177	2,219	1,958	13.48	20.25	73.94	37.51
	Itola	861	3,826	1,971	1,855	10.35	27.26	71.69	41.17
	Vadsala	709	3,115	1,640	1,475	12.07	23.43	79.71	31.27
	Sarar	486	2,258	1,158	1,100	12.58	19.18	65.47	40.30

Table 5-11 Demographic Profile of Vadodara District

District/		Total No.of	Tot	al Populatio	n	SC	ST	Literacy	Work
Taluka/ Village	Name	Households	Person	Male	Female	Populat ion (%)	Populat ion (%)	Rate (%)	Participation Rate (%)
	Kashipura	198	942	499	443	14.44	31.74	74.13	32.06
	Vadodara (M	303,130	1,411,228	739,675	671,553	6.69	3.95	86.86	32.14
	Corp+OG)								
	Vadodara (M	280,873	1,306,227	684,013	622,214	6.61	3.58	87.55	32.05
	Corp.)								
Taluka	Karjan	33,349	162,486	85,044	77,442	7.39	25.37	68.82	43.94
Village	Kherda	182	959	496	463	3.13	18.98	56.88	57.04
	Kandari	1,156	5,845	3,326	2,519	7.34	40.00	64.37	43.82
	Miyagam	1,050	5,155	2,658	2,497	4.25	3.82	66.21	42.19
	Lakodara	358	1,912	1,014	898	7.64	17.99	71.48	43.10
	Vadava	14	54	28	26	24.07	46.30	28.89	40.74
	Dethan	462	2,134	1,142	992				
	Valan	1,611	9,250	4,800	4,450				
	Mankan	321	1,766	895	871	7.97	20.06	75.12	39.55
	Sansrod	1,054	5,561	2,786	2,775	3.18	13.73	77.52	33.33
	Haldarva	377	2,191	1,183	1,008	4.64	21.63	75.72	36.69
	Karjan (M)	5,487	26,358	13,764	12,594	6.53	25.46	73.53	32.19

Source: Census of India, 2001



Source: Google Earth

Figure 5-8 Villages along DFC Alignment in Vadodara District

5.4.4 Sample Study

(1) Banaskantha

In all **15 structures** would be affected in parallel section and **15** in detour whose details are provided in the **Table5-12**. The total number of affected structures is **30**.

S. N.	Village	DFC Section	No of Structures
1	Majadar	Parallel	14
2	Gathaman	De-tour	1
3	Pakhanwa	De-tour	1
4	Antroli	De-tour	10
5	Iqbalgarh	De-tour	3
6	Kirotar	Parallel	1
•		Total: 6 Villages	30

(2) Patan

In all **151 structures** would be affected in Patan District whose summary are provided in the **Table5-13**.

Name of Locality	Total Affected Structure	Residential	Commercial
Indira Nagar Slum area, Kakoci Phatak	73	61	12
APMC shops	54	0	54
Juna power house slum	4	4	0
Gujarat housing Board	10	9	1
Bindusar slum Area	10	10	0
Total	151	84	67

Table 5-13 List of Affected Structures

Source: Socio-economic Survey









(3) Mahesana

In all **121 structures** (Unjha 24, Laxmipura 2, Baliyasan 91, Rajpur 4) would be affected in Mahesana District.

In all **121 structures** would be affected in Mahesana District whose details are provided in the **Table5-14**.

Name of Locality	Total Affected Structure
Unjha	24
Laxmipura	2
Baliyasan	91
Rajpur	4
Total	121

Table 5-14 List of Affected Structures

Source: Field Survey

(4) Gandhinagar

In Gandhinagar District, no structures would be affected by the DFC. There are 8 villages in the Kalol taluka through which DFC passes. However one ONGC pipeline (in Unali village) and one road (major road connecting Ahmedabad with the villages of Adhana, Nasmed, Unali) is getting affected which has no social concern as such. Budget pertaining to social aspects (affected structure) is therefore not required.

The road stretch likely to be affected by DFC alignment is about 431 m in **Adhana** village. Here the alignment has been superimposed on the road it seems. This is a serious engineering concern.

Again, in **Unali** village, ONGC has dug wells at several locations and pipeline is crossing underground across this village. It may be suggested that it would be best to avoid this village altogether, meaning re-alignment of the DFC at least in this stretch.

(5) Ahmedabad

In all **117 structures** would be affected in Ahmedabad District whose details are provided in the **Table5-15**.

Name of Locality	Total Affected Structure
Vasna Chancharwadi	5
Kavitha	112
Total	117

Table 5-15 List of Affected Structures

Source: Field Survey

(6) Kheda

In Kheda District, which lies in detour section DFC crosses mostly agricultural land with only two structures being affected. There are 6 villages in the Kheda Taluka and seven villages in Matar Taluka respectively through which the proposed DFC passes.

(7) Anand

In Anand District which lies in detour section, twelve structures would be affected by the DFC alignment 11 structures in Airdi and one structure each in Sunav and Sandesar all under Anand Taluka. In total, in Anand District, 11 out of 12 structures are presently used for residential purposes. One structure in Sandesar is a storehouse. Except this storehouse which is a pucca structure, all other structures are kutchha structures.

(8) Vadodara

In all **96 structures** would get affected in Vadodara District of which majority (93 out of 96) is in Karjan area (parallel section). The structures in Bhayali and Itola are in the detour area.

Name of Locality	Total Affected Structure
Karjan	93
Itola	2
Bhayali	1
Total	96

 Table 5-16 List of Affected Structures

Source: Field Survey

The sample socio-economic survey (10%) was conducted along the existing line within a width of 25 m from the centerline of the existing railway track on the proposed side of widening. In addition, similar survey was conducted in the detours at the crossing of the motorable road using the GPS for identification of cross points (43.5 m total width either side). The socio-economic survey was conducted in 15 households in parallel section; no survey was carried out in detour areas as there were hardly any settlements (not more than 10 structures).

Detour Section - Near Junctions with Motorable Roads within 43.5 m (total width)



Parallel Section: Within approx. 25 m (on the side of widening) from the middle of the last existing

track



5.4.5 DFC Specific Socio-Economic Survey Analysis, Conclusion and Mitigation Measures

The socio-economic survey sheet and socio-economic survey questionnaire format used for this survey has been provided in **Annex-5.1** and **Annex-5.2** respectively.

(1) Banaskantha

Location of Household Interview: Table5-17 indicates that 3 household interviews were conducted parallel to railway line and two in detour in Banaskantha District.

Location of Interview	No. of HH Interviews
Parallel to railway	3
Near ROB	0
Near Diversion	2
Total	5

 Table 5-17 Location of Household Interview

Source: Field Survey

Thus 10% of the total households likely affected by the project were covered in this survey. In all 5 households would be affected in Banaskantha District. The households surveyed are located in Kidotar, Iqbalgarh, Majadar, Sadarpura and Antroli. The exact locations of household interviews are Iqbalgarh, Kidotar railway level crossing, near Malana Patia, Majadar and near Roshan Dhaba on NH-14. The analysis of survey data is provided in the following sections.

Land Holding Size: Three families own land in varying quantities (the households are settled within their own land (within ROW) and is given in **Table 5-18**. Two households own more than 10 bighas of land which is more than 2.5 acres.

Size of Agriculture Land	No. of Families
Upto 3 bigha	1
3-5 bigha	0
6-10 bigha	0
more than 10 bigha	2
Total	3

Note: N.B. 4 bighas is equal to 1 acre. Source: Field Survey

Profile of Head of Household: All households are headed by male member. Religious distribution of households indicates that 4 households are followers of Hinduism and one follower of Islam (see **Table 5-19**). **The average size of the household/family works out to be 11 which are very high** as compared to national figure. The reason for large family is probably because of joint family system.

Item		Unit	No.	Remarks
Head of Household		Family	5	Male
Head of HH		Married	5	
Family members		Members	56	
Family size		Average	11	
Legal status of Project Affected Families (PAFs)		Family	5	All Legal (Within RoW)
Religion of PAFs	Hindu	Family	4	
	Muslim	-do-	1	
Occupation	Agriculture	Head of HH	2	
	Business		2	
	Others		1	
Literacy	Illiterate	Head of HH	1	
	Upto class XII	-do-	4	
Age group	22 - 59	Head of HH	3	
	60 & above	-do-	2	
Income of Head of	3001-6000	Monthly	1	
HH (in Rs.)	6001-10000	-do-	2	
	> 10000	-do-	2	

Table 5-19	Profile of Head of Household
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Source: Field Survey

Four families have been living at the present place for more than 10 years. The duration of stay at present place for one family is less than 3 years. The structures that are likely to be affected in Banaskantha District are all single detached one storey. The tenure status of both land and structure is *legal* i.e., both belong to the household affected by the project. In response to a question that how long you are likely to stay at present location one household answered not sure whereas all other households did not provide any answer. The name of the head of households interviewed are Bhani Ji Bhil (Majhi Rana), Mahavir Sharama, Manohar Lal, Manjhi Bhai Patel and Matlub Ali Mehta. Three of the head of households belong to the age group of 22-59 which is the prime age of working population. Two head of households are above 60 years of age and may be considered as vulnerable person. As regards marital status of the head of households –all were married. The main occupation of two head of households has been categorized as others (which include household work, maid, handicapped, unemployed, retired, mobile vendor, etc). Major crops produced as reported by respondents include Oil seeds, Cotton, Bazra, Jowar, Sount and cumin seeds.

The Government of India, Ministry of Rural Development conducts Below Poverty Line (BPL) Census at the beginning of each Five Year Plan to identify households living BPL for providing assistance to households under various anti-poverty programmes. As per 9 th Five Year Plan the criteria for identification of BPL households are 1. Up to Rs. 20,000/year 2. Families having >2 hectares of land/pucca houses/annula income exceeding Rs. 20,000/-, TV/Refrigerator/Ceiling Fan/motor cycle/scooter/three wheeler were not considered to be BPL family. In the 10th Plan, the criteria for identification of BPL households changed. No fixed income limit, adoption of normative approach for identification of the Rural poor by introducing a "Score-based ranking" based on relative deprivations revealed by certain socio-economic indicators, in contrast to the Income and Expenditure approach adopted in the BPL Census for the 9th Plan.

Literacy is one of the important indicators of development. None of the head of households have completed graduation which is considered as the basic requirement for any service, be it Government or private. In fact, four out of five head of households have studied upto class twelve and one head of household is illiterate. However, the income range of none of the households affected is less than Rs. 3000/- per month. It may be mentioned a family having an income of less than Rs. 20,000/- per annum is considered as Below Poverty Line (BPL) family as per "Identification of Below Poverty Line (BPL) families for the 9th Five Year Plan"¹. Rs. 20000/- per annum converted into months works out to Rs. 1667/- per month. BPL families are considered vulnerable and are covered in various government sponsored schemes/programmes and are therefore entitled to some extra benefits from the Government. Thus we may conclude that none of the families belong to BPL category.

Possession of Assets and Consumer Durables: Assets and consumer durables possessed by the households are indicative of their socio-economic status. The consumer items in possession of the households indicate that all five households have TVs which at present time may be considered as one of the essential items. Consumer durables and other assets possessed by households are given in Table5-20 Two households have scooter/motor bike and two have jeep/car. Refrigerator is possessed by only two households. Besides, two households possess tractors for agriculture purpose.

Consumer items, other assets and animals owned by family	Number of Families	
TV	5	
Refrigerator	2	
Mixer	1	
Electric fan	4	
Radio	3	
Scooter/Motor Bike	2	
Car/Jeep	2	
Others (Cycle)	1	
Tractor	2	
Thresher	1	
Electric pumpset	2	
Cow	1	
Ox	2	
Buffalo	3	
Source: Field Survey		

 Table 5-20
 Consumer Durables and other Assets of Household

Source: Field Survey

Animal assets among the households indicate possession of one cow, two ox and three buffaloes. Consumer durables and other items/assets possessed by the affected households may be considered as *relevant indicators for monitoring the economic status of the households during and after the implementation of the project*. In addition, *change in occupation of head of households is also one of the important indicators (from primary to secondary and tertiary sectors) which could be monitored to understand the economic condition of affected households after the implementation of the project.*

Basic facilities such as source of drinking water, toilet facilities, availability of electricity connection etc indicate the economic status of the households. Household's access to drinking water facilities does not indicate wide variation as four out of five families get their water supply for various purposes from dug well. One family has access to common tap water supply facility. Household's access to toilet facilities by locality indicates that four families have access to indoor toilet facilities indicative of hygienic awareness probably. Only one family uses the outdoor common toilet facility. As regards the source of lighting, it was revealed that *all households had access to electricity for lighting*.

Debt Status: In Banaskantha District, four out of the five families have taken loan. The sources of loan for three households have been the Bank whereas one household has availed loan from money lender (called Mahajan in local area). Debt status of households, sources of loan and status of loan are provided in **Tables 5-21, 5-22 and 5-23** respectively.

Loan taken	No. of Families
Yes	4
No	1
Don't know	0
Total	5

 Table 5-21
 Debt Status of Household

Source: Field Survey

Source	No. of Families		
Bank	3		
Relative/Friend	0		
Mahajan/ Money lender	1		
Others (Society)	0		
Total	4		

Table 5-22 Sources of Loan

Source: Field Survey

Table 5-23	Status of Loan
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Loan paid	No. of Families		
Full amount paid	1		
Partly amount paid	2		
Not paid any amount so far	1		
Total	4		

Source: Field Survey

One household which has taken loan from money lender has repaid Rs. 100,000/- so far and another 300,000/- needs to be paid back. One household took loan from bank of Rs. 200,000/- and has paid back the entire amount to bank. Another person availed a loan of Rs. 10,000/- out of which he has paid back Rs. 8,000/-. The fourth household which took loan of Rs. 395,000/- from bank has not yet repaid any amount to bank. *Monitoring debt condition of household affected by the project is important to understand the change in socio-economic condition of*

the households in the aftermath of project. As regards saving money, four out of the five households have said that they save some money from their earnings. However, the amount of savings for two households is marginal, less than Rs. 10,000/- per annum. Two households have reported annual saving of Rs. 30,000/- and 50,000/- per annum respectively.

In response to a question with regard to awareness about the Dedicated Freight Corridor (DFC) project, four out of five respondents answered in affirmative. As regards the source of information about DFC, four respondents revealed that they knew about the project through word of mouth. One person did not provide any answer in this regard. Regarding economic benefits of the DFC, three of the respondents opined that there would be economic benefit of the project in the area. Two respondents opined in negative. Further to the economic benefit, respondents felt that there would be increased business opportunity, wage employment and also increased opportunity of establishment of industries.

Resettlement and rehabilitation is an emotive issue and no one likes to be displaced. However, in response to resettlement proposal, two respondents opined that if required they would prefer self or voluntary relocation whereas three respondents revealed the relocation would be conditional. Further, respondents revealed that the acquiring authority should pay prevailing market price as compensation. Besides resettlement and rehabilitation assistance should also be provided so that families affected by the project do not become the victim of development.

Ranking of Anticipated Impact of DFC: As regards anticipated impact of DFC project, respondents were asked to rank various impacts as per their understanding. As indicated in Table 5-24, one respondent ranked each impact on commuting to school, hospital and animal and human movement has been ranked 1. Community severance and commuting to school and hospital has been ranked 2 by two respondents each. Commuting to market, impacts on irrigation system have been ranked 3. However, commuting to school and hospital has been the most common concern.

Anticipated impacts		Rank			
		2	3		
Impacts on irrigation	0	0	1		
Community severance	0	2	0		
Impacts on commuting to school, college	1	2	1		
Hospital	1	0	0		
Market	0	0	2		
Railway station	0	0	0		
Bus Station	0	0	0		
Place of worship (Temple/mosques etc)	0	0	0		
Farming land	0	0	1		
Displacement	2	0	0		
Accidents when crossing railway tracks	1	0	0		
Animal & human movement	0	1	0		
Resettlement	0	0	0		
Livelihood	0	0	0		
Our road comes under DFC proposed alignment, so problem of accessibility/communication will arise	0	0	0		
Environment	0	0	0		
Total	5	5	5		

Table 5-24 Anticipated Impact of proposed DFC Project (Banaskantha District)

Source: Field Survey

<u>Major Findings</u>

1) The average size of the household/family works out to be 11 which is very high as compared

to national figure. The reason for large family is probably because of joint family system.

- 2) The structures that are likely to be affected in Banaskantha District are all single detached one storey. The tenure status of both land and structure is legal i.e., both belong to the household affected by the project.
- 3) Major crops produced as reported by respondents include Oil seeds, Cotton, Bajra, Jowar, ani seeds and cumin seeds.
- 4) The income range of none of the households affected is less than Rs. 3000/- per month. None of the families belong to BPL category. BPL families are considered vulnerable and are covered in various government sponsored schemes/programmes and are therefore entitled to some extra benefits from the Government.
- 5) Assets and consumer durables possessed by the households are indicative of their socioeconomic status. Consumer durables and other items/assets possessed by the affected households may be considered as relevant indicators for monitoring the economic status of the households during and after the implementation of the project. In addition, change in occupation of head of households is also one of the important indicators (from primary to secondary and tertiary sectors) which could be monitored to understand the economic condition of affected households after the implementation of the project. TV has been the most common consumer durable/asset indicating two things: visual entertainment is popular and that information dissemination via visual media may be a tool for DFC implementation.
- 6) As regards the source of lighting, it was revealed that all households had access to electricity for lighting indicating rural electrification here is prevalent.
- 7) Monitoring debt condition of household affected by the project is important to understand the change in socio-economic condition of the households in the aftermath of the project. As regards saving money, respondents do save money depending upon their income level.
- 8) Commuting to school and hospital has been the most common concern of the people with regard to DFC.
- 9) However, in response to resettlement proposal, they would prefer self or voluntary relocation whereas three respondents revealed the relocation would be conditional. Further, respondents revealed that the acquiring authority should pay prevailing market price as compensation. Besides resettlement and rehabilitation assistance should also be provided so that families affected by the project do not become the victim of development.
- 10) In response to a question with regard to awareness about the Dedicated Freight Corridor (DFC) project, respondents answered in affirmative. As regards the source of information about DFC, respondents revealed that they knew about the project through word of mouth. Regarding economic benefits of the DFC, respondents were divided; some opined that there would be overall economic benefit of the area due to the project. Other respondents opined in negative. Further to the economic benefit, respondents felt that there would be increased business opportunity, wage employment and also increased opportunity of establishment of industries-indicating positive impact of DFC project though indirect and time consuming.

Mitigation Measures

- Provide appropriate/enough compensation
- Replacement cost of structures affected
- Provide some job opportunity for PAPs according to capability
- Retention of farmers' title/status even after losing all land in DFC project so that in future can buy land at any other place
- Provision of basic infrastructure at resettlement site
- Impart some training to PAPs by which they can earn their livelihood.
- To take care of sensitive CPRs(common property resources) like places of worships,

graveyards, schools and hospitals etc.

- Adequate measures to maintain proper drainage in adjoining farmland
- To make PAPs "real" stakeholders by offering them a share in DFC project so that they feel obligated in its post construction maintenance.

(2) Patan

Location of Household Interview: Table5-25 indicates that 17 household interviews were conducted of which 16 were parallel to railway line and one near ROB (also within 25 mtrs. of track)

Location of Interview	No. of HH Interviews
Parallel to railway	16
Near ROB	1
Near Diversion	0
Total	17
Source: Field Survey	

 Table 5-25
 Location of Household Interview

Source: Field Survey

In all socio-economic survey was conducted at 17 households in Patan District. The locations of household interviews are at Bindusarovar Jhoparpatti, Gujarat Housing Board, Indira Colony, Kakoci Phatak, Juna Power House and Sardar Patel Complex APMC Building. The analysis of survey data is provided in the following sections

Land Holding Size: Three families own land in varying quantities (the households are settled within their own land (within ROW) and is given in **Table5-26**. All three families own less than 5 bighas of land which when converted into acre is less than one acre (less than 2.5 hectares which is one of the criteria for identification of Below Poverty Line families).

Size of Agriculture Land	No. of Families
Upto 3 bigha	2
3-5 bigha	1
6-10 bigha	0
more than 10 bigha	0
Total	4

 Table 5-26 Size of agricultural land (in Bigha)

Note: N.B. 4 bighas is equal to 1 acre. Source: Field Survey

Profile of Head of Household: All households are headed by male member. Religious distribution of households indicates that 15 households are followers of Islam (see Table 5-27). The average size of the household/family works out to be 7 which is higher than the national figure. The reason for large family is probably because of joint family system.

Item		Unit	No.	Remarks
Head of Household		Family	17	Male
Head of HH		Married	16	
Ē		Unmarried	1	
Family members		Members	115	
Family size		Average	7	
Legal status of Proj	ect Affected Families	Family	4	In private land
(PAFs)			13	In public land
Religion of PAFs	Hindu	Family	15	
	Muslim	-do-	2	
Occupation	Service	Head of HH	1	
	Wage employee	-do-	1	
	Daily wage labour	-do-	2	
	Business	-do-	8	
	Others	-do-	5	
Literacy	Illiterate	Head of HH	7	
	Upto class V	-do-	1	
	Upto class XII	-do-	5	
	Graduate & above	-do-	4	
Age group	22 - 59	Head of HH	14	
	60 & above	-do-	3	
Income of Head of	Upto 1700	Monthly	3	
HH (in Rs.)	1700 - 3000	-do-	4	
	3001-6000	-do-	3	
	6001-10000	-do-	4	

Table 5-27	Profile of Head of H	ousehold
		Juscholu

Ten families have been living at the present place for more than 25 years followed by sic families whose duration of stay at present place varies between 10-25 years. The duration of stay at present place for one family is between 3-10 years. The structures that are likely to be affected in Patan District comprises two single detached one storey, one Apartment/Duplex, 8 simple huts, 5 structures of a market complex and 1 single detached shop. The tenure status of both land and structure is *legal* for two households i.e., both belong to the household affected by the project. Besides, there are 9 households whose tenure status of land and structure are illegal followed by 6 households whose tenure status are rented land and house. In response to a question that how long you are likely to stay at present location, eight households said that their stay at present place depends upon government. Only one household answered that they would stay here for ever.

Fourteen of the head of households belong to the age group of 22-59 which is the prime age of working population and the balance three head of households are above 60 years of age and may be considered as vulnerable person. As regards marital status of the head of households – all but one were married. The main occupation of about 50% (8 households) of head of households is business followed by others (which include household work, maid, handicapped, unemployed, retired, mobile vendor, etc). Two head of the households earn their livelihood by working as daily wage labour. One head of household work as wage employee and one work with a private company as full time employee see Table 3. Major crops produced as reported by respondents include oil seeds, cotton, bajra, ani seeds, wheat and cumin seeds.

Literacy is one of the important indicators of development. A little more than 40% (7 head of households) are illiterate followed by those who have completed education up to class XII. Four head of households have completed graduation and above which is considered as the basic requirement for any service, be it Government or private. One head of the household has

completed his education up to class V. The income range of about 42% of the households (7 households) likely to be affected is less than Rs. 3000/- per month of which the monthly income of 3 households is less than Rs. 1700/- per month and therefore eligible to be identified as BPL families based on income criteria. *It may be mentioned a family having an income of less than Rs. 20,000/- per annum is considered as Below Poverty Line (BPL) family as per "Identification of Below Poverty Line (BPL) families for the 9 the Five Year Plan"². Rs. 20000/- per annum converted into months works out to Rs. 1667/- per month. BPL families are considered vulnerable and are covered in various government sponsored schemes/programmes and are therefore entitled to some extra benefits from the Government. <i>Thus we may conclude that none of the families belong to BPL category.*

Possession of Assets and Consumer Durables

Assets and consumer durables possessed by the households are indicative of their socioeconomic status. The consumer items in possession of the households indicate that all seven households have TVs which at present time may be considered as one of the essential items. Consumer durables and other assets possessed by households are given in **Table5-28**. Five households have scooter/motor bike and none of the households have four wheelers. Refrigerator is possessed by five households. Tractors and other agricultural implements are not possessed by any of the families having agricultural land because of small land holding size of affected families. In other words, land holding size of affected families is very small which is not economical for possessing agricultural implements such as tractor, thresher, etc.

Consumer items, other assets and animals owned by family	Number of Families
TV	7
Refrigerator	5
Mixer	5
Electric fan	8
Radio	0
Scooter/Motor Bike	5
Car/Jeep	0
Others (Cycle)	2
Tractor	0
Thresher	0
Electric pumpset	0
Cow	0
Ox	0
Buffalo	0
Sheep/Goat	2
Source: Field Survey	· ·

 Table 5-28 Consumer Durables and other Assets of Household

Source: Field Survey

Animal assets among the households are negligible. Consumer durables and other items/assets possessed by the affected households may be considered as *relevant indicators for monitoring the economic status of the households during and after the implementation of the project*. In addition, *change in occupation of head of households is also one of the important indicators (from primary to secondary and tertiary sectors) which could be monitored to understand the economic condition of affected households after the implementation of the project.*

Basic facilities such as source of drinking water, toilet facilities, availability of electricity connection etc indicate the economic status of the households. Household's access to drinking water facilities does not indicate wide variation as four out of five families get their water supply for various purposes from dug well. One family has access to common tap water supply facility. Household's access to toilet facilities by locality indicates that four families have access to indoor toilet facilities indicative of hygienic awareness probably. Only one family uses the outdoor common toilet facility. As regards the source of lighting, it was revealed that *all households had access to electricity for lighting*.

Debt Status: Only one household has taken loan of Rs. 45,000/- from bank and so has not paid back any money to bank. *Monitoring debt condition of household affected by the project is important to understand the change in socio-economic condition of the households in the aftermath of project.* Debt status of households, sources of loan and status of loan are provided in **Tables 5-29, 5-30 and 5-31** respectively.

Loan taken	No. of Families
Yes	1
No	16
Don't know	0
Total	17
Source: Field Survey	

Table 5-29 Debt status of Household

Source: Field Survey

Source	No. of Families
Bank	1
Relative/Friend	0
Mahajan/ Money lender	0
Others (Society)	0
Total	1

Table 5-30 Sources of Loan

Source: Field Survey

Table 5- 51 Status of Loan			
Loan paid	No. of Families		
Full amount paid	0		
Partly amount paid	0		
Not paid any amount so far	1		
Total	1		

Table 5-31 Status of Loan

Source: Field Survey

As regards saving money, 10 out of the seventeen households have said that they save some money from their earnings. However, the amount of savings for six households is marginal, less than Rs. 10,000/- per annum. Three households have reported annual saving of in the range of Rs. 30,000/- to 50,000/- per annum.

In response to a question with regard to awareness about the Dedicated Freight Corridor (DFC) project, four out of five respondents answered in affirmative. As regards the source of information about DFC, four respondents revealed that they knew about the project through word of mouth. One person did not provide any answer in this regard. Regarding economic benefits of the DFC, three of the respondents opined that there would be economic benefit of the project in the area. Two respondents opined in negative. Further to the economic benefit, respondents felt that there would be increased business opportunity, wage employment and also increased opportunity of establishment of industries.

Resettlement and rehabilitation is an emotive issue and no one likes to be displaced. However, in response to resettlement proposal, two respondents opined that if required they *would prefer self or voluntary relocation whereas three respondents revealed the relocation would be conditional.* Further, respondents revealed that the acquiring authority should pay *prevailing market price as compensation*. Besides resettlement and rehabilitation assistance should also be provided so that families affected by the project do not become the victim of development.

Ranking of Anticipated Impact of DFC: As regards anticipated impact of DFC project, respondents were asked to rank various impacts as per their understanding. As indicated in **Table 5-32**, five respondents ranked resettlement as the most important anticipated impact followed by community severance and commuting to market places (3 each). Impacts on commuting to schools and college and livelihood have been ranked one by two respondent each. Impacts on commuting to hospital and railway have been ranked one respondent each. Community severance has been has been ranked 2 by more than 50% of the respondents followed by impacts on commuting to market and farm land. However, impacts on commuting to school and colleges have been ranked 3 by 50% of the respondents. This is followed by the impacts on commuting to place of worship. Impacts on irrigation system have been not been mentioned may be because of parallel section. *Overall community severance, resettlement and commuting to school/college have been the most common concern.*

Anticipated impacts		Rank			
		2	3		
Impacts on irrigation	0	0	0		
Community severance	3	8	0		
Impacts on commuting to school, college	2	1	8		
Hospital	1	0	3		
Market	3	3	0		
Railway station	1	1	1		
Bus Station	0	0	0		
Place of worship (Temple/mosques etc)	0	0	4		
Farming land	0	3	0		
Displacement	0	0	0		
Accidents when crossing railway tracks	0	0	0		
Animal & human movement	0	0	0		
Resettlement	5	1	0		
Livelihood	2	0	1		
Our road comes under DFC proposed alignment, so	0	0	0		
problem of accessibility/communication will arise					
Environment	0	0	0		
Total	17	17	17		

<u>Major Findings</u>

- 1) 17 household interviews were conducted of which 16 were parallel to railway line and one near ROB (also within 25 m. of track).
- 2) Three families own land in varying quantities (the households are settled within their own land (within ROW). All three families own less than 5 bighas of land which when converted into acre is less than one acre (less than 2.5 hectares which is one of the criteria for identification of Below Poverty Line families).

- 3) The average size of the household/family works out to be 7 which is very high as compared to national figure. The reason for large family is probably because of joint family system.
- 4) The structures that are likely to be affected in Patan District comprises two single detached one storey, one Apartment/Duplex, 8 simple huts, 5 structures of a market complex and 1 single detached shop. The tenure status of both land and structure is *legal* for two households i.e., both belong to the household affected by the project. Besides, there are 9 households whose tenure status of land and structure are illegal followed by 6 households whose tenure status are rented land and house.
- 5) Major crops produced as reported by respondents include Oil seeds, Cotton, Bajra, Jowar, ani seeds and cumin seeds.
- 6) The income range of about 42% of the households (7 households) likely to be affected is less than Rs.3,000/- per month of which the monthly income of 3 households is less than Rs.1,700/- per month and therefore eligible to be identified as BPL families based on income criteria.
- 7) Assets and consumer durables possessed by the households are indicative of their socioeconomic status. Consumer durables and other items/assets possessed by the affected households may be considered as relevant indicators for monitoring the economic status of the households during and after the implementation of the project. In addition, change in occupation of head of households is also one of the important indicators (from primary to secondary and tertiary sectors) which could be monitored to understand the economic condition of affected households after the implementation of the project. TV has been the most common consumer durable/asset indicating two things: visual entertainment is popular and that information dissemination via visual media may be a tool for DFC implementation. Five households have scooter/motor bike and none of the households have four wheelers. Refrigerator is possessed by five households. Tractors and other agricultural implements are not possessed by any of the families having agricultural land because of small land holding size of affected families. In other words, land holding size of affected families is very small which is not economical for possessing agricultural implements such as tractor, thresher, etc.
- 8) Animal assets among the households are negligible. Consumer durables and other items/assets possessed by the affected households may be considered as *relevant indicators* for monitoring the economic status of the households during and after the implementation of the project. In addition, change in occupation of head of households is also one of the important indicators (from primary to secondary and tertiary sectors) which could be monitored to understand the economic condition of affected households after the implementation of the project.
- 9) As regards the source of lighting, it was revealed that all households had access to electricity for lighting.
- 10) Monitoring debt condition of household affected by the project is important to understand the change in socio-economic condition of the households in the aftermath of the project. Only one household has taken loan of Rs.45,000/- from bank and so has not paid back any money to bank. As regards saving money, respondents do save money depending upon their income level. As regards saving money, 10 out of the seventeen households have said that they save some money from their earnings. However, the amount of savings for six households is marginal, less than Rs.10,000/- per annum.
- 11) Overall community severance, resettlement and commuting to school/college have been the most common concern.
- 12) Resettlement and rehabilitation is an emotive issue and no one likes to be displaced. However, in response to resettlement proposal, two respondents opined that if required they *would prefer self or voluntary relocation whereas three respondents revealed the relocation would be conditional.* Further, respondents revealed that the acquiring authority should pay *prevailing market price as compensation*. Besides resettlement and rehabilitation assistance should also be provided so that families affected by the project do

not become the victim of development.

13) As regards the source of information about DFC, four respondents revealed that they knew about the project through word of mouth. One person did not provide any answer in this regard. Regarding economic benefits of the DFC, three of the respondents opined that there would be economic benefit of the project in the area. Two respondents opined in negative. Further to the economic benefit, respondents felt that there would be increased business opportunity, wage employment and also increased opportunity of establishment of industries.

Mitigation Measures

- Provide appropriate/enough compensation
- Replacement cost of structures affected
- Provide some job opportunity for PAPs according to capability
- Retention of farmers' title/status even after losing all land in DFC project so that in future can buy land at any other place
- Provision of basic infrastructure at resettlement site
- Impart some training to PAPs by which they can earn their livelihood.
- To take care of sensitive CPRs (common property resources) like places of worships, graveyards, schools and hospitals etc.
- Adequate measures to maintain proper drainage in adjoining farmland
- To make PAPs "real" stakeholders by offering them a share in DFC project so that they feel obligated in its post construction maintenance.

(3) Mahesana

Location of Household Interview: Table 5-33 indicates that 11 household interviews were conducted of which nine were in detour and two in parallel section to railway line in Mahesana District.

Location of Interview	No. of HH Interviews
Parallel to railway	2
Near ROB	0
Near Diversion	9
Total	11
Source: Field Survey	

Table 5-33 Location of Household Interview

Source: Field Survey

Locations of household interviews conducted in parallel section are backside of Unja Bus Stand and Shaktinagar Jhuggi. As indicated above, nine interviews were conducted in Baliyasan(detour) by using hand held Global Positioning System (GPS).Latitude and Longitude of each location where socio-economic survey was conducted in detour section is available with the consultant. The analysis of survey data is provided in the following sections.

Land Holding Size: Five households have reported having agricultural land, Table 5-34. The size of land holding is marginal to small. Two households own 14 bighas of land which is equal to 3.5 acres and one household owns 6 bighas followed by two households having less agricultural land up to 3 bighas. Thus all the households are having less than 6.2 acres (2.5 ha) which is one of the criteria for identification of Below Poverty Line families.

Size of Agriculture Land	No. of Families
Upto 3 bigha	2
3-5 bigha	0
6-10 bigha	1
more than 10 bigha	2
Total	5

Table 5-34	Size of Agricultural Land	(in Bigha)
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Note: N.B. 4 bighas is equal to 1 acre. Source: Field Survey

Profile of Head of Household: The profile of head of household and relevant social and economic information is provided in Table5-35. All eleven households interviewed are headed by male member and ten are Hindu and one is Muslim. Out of the total households interviewed, one household belong to Schedule Caste, two of general category and eight belong to other backward castes. None of the households interviewed belong to ST category. It is important to mention here that SC and ST are considered vulnerable on the basis social considerations and are eligible for various kinds of assistances under government sponsored programmes/schemes. The average size of the households interviewed works out to be 4 which is less than the average household size of 5 for Mahesana District.

Ite	em	Unit	No.	Remarks
Head of Household	Male	Family	11	
	Female	-do-	0	
Head of HH		Married	11	
		Unmarried	0	
Family members		Members	47	
Family size		Average	4	
Legal status of Project A	ffected Families (PAFs)	Family	9	In private land
		-do-	2	In public land
Religion of PAFs	Hindu	Family	10	
	Muslim	-do-	1	
Social category of PAFs	General	-do-	2	
	SC	-do-	1	
	ST	-do-	0	
	OBC	-do-	8	
Occupation	Service	Head of HH	1	
	Wage employee	-do-	7	
	Daily wage labour	-do-	2	
	Business	-do-	1	
	Others	-do-	0	
Literacy	Illiterate	Head of HH	3	
	Can read & write	-do-	0	
	Upto class V	-do-	4	
	Upto class XII	-do-	4	
	Graduate & above	-do-	0	
Age group	22 - 59	Head of HH	7	
	60 & above	-do-	4	
Income of Head of HH	Upto 1700	Monthly	9	
(in Rs.)	1700 - 3000	-do-	1	
	3001-6000	-do-	0	
	6001-10000	-do-	0	
	> 10000	-do-	1	

Table 5-35 Profile of Head of Household

Source: Field Survey

Nine out of eleven families have been living at the present place for more than 25 years. Duration of stay of one family at present place is ten years and one family has recently shifted to the present place of stay. Structures that are likely to be affected by the project include seven single detached one storey, two single detached two storeys, one simple hut and one commercial structure (shop). The tenure status of both land and structure is *legal* for seven households i.e., both belong to the household affected by the project. Besides, there are three households whose tenure status of land are illegal but have constructed own house and six shops connected to each other are commercial squatter i.e., tenure status of land is illegal but have constructed own structure. In response to a question that how long you are likely to stay at present location, all the respondents said that they would be staying here for ever.

Majority of the head of households (7) belongs to the age group of 22-59 which is the prime age of working population and others are above 60 years of age and all head of households are married. The main occupation of seven head of households is agriculture as almost the entire alignment in the district traverses through the agricultural land. Two head of households earn their livelihood by working as daily wage labour. One head of household is employed in service and one is engaged in business. Crops grown by households having agricultural land include wheat, rice and sugar cane.

Literacy is one of the important indicators of development. Three head of the households are illiterate and four each head of households have completed education up to class V and class XII respectively. None of the head of household is graduate and above. The income range of majority of households (seven) is less than Rs.1,700/- per month which is the criteria for identification of BPL families. Only one household has reported income of Rs.10,000/- or more. *It may be mentioned a family having an income of less than Rs.20,000/- per annum is considered as Below Poverty Line (BPL) family as per "Identification of Below Poverty Line (BPL) families for the 9 th Five Year Plan"³. Rs.20,000/- per annum converted into months works out to Rs.1,667/- per month. BPL families are considered vulnerable and are covered in various government sponsored schemes/programmes and are therefore entitled to some extra benefits from the Government. <i>Overall the socio-economic condition of majority of households interviewed may be categorized as low socio-economic group*.

Possession of Assets and Consumer Durables: Assets and consumer durables possessed by the households are indicators of the socio-economic status. Consumer durables and other assets possessed by households are given in **Table 5-36**. The consumer items in possession of the households indicate that six households have TVs which at present time is considered as one of the essential items. None of the households have scooter/motor bike or four wheelers. Refrigerator and mixer is possessed by only one household. Tractors and other agricultural implements are not possessed by any of the households though seven households possess agricultural land but all are marginal to small land holders. In other words, land holding size of affected families is very small which may not be economical for possessing agricultural implements such as tractor, thresher, etc.

³ The Government of India, Ministry of Rural Development conducts Below Poverty Line Census at the beginning of each Five Year Plan to identify households living Below Poverty Line for providing assistance to households under various anti-poverty programmes implemented by the Ministry of Rural Development, Govt. of India. As per 9th Five Year Plan the criteria for identification of BPL households are 1. Up to Rs. 20,000/- per annum 2. Families having >2 hectares of land/pucca houses/annula income exceeding Rs. 20,000/-, TV/Refrigerator/Ceiling Fan/motor cycle/scooter/three wheeler were not considered to be BPL family. In the 10th Plan, the criteria for identification of BPL households changed. No fixed income limit, adoption of normative approach for identification of the Rural poor by introducing a "Score-based ranking" based on relative deprivations revealed by certain socio-economic indicators, in contrast to the Income and Expenditure approach adopted in the BPL Census for the 9th Plan.

Consumer items, other assets and animals owned by family	Number of families
TV	6
Refrigerator	1
Mixer	1
Electric fan	0
Radio	5
Scooter/Motor Bike	0
Car/Jeep	0
Others (Cycle)	0
Tractor	0
Thresher	0
Electric pumpset	0
Cow	4
Ox	0
Buffalo	6
Sheep/Goat	1
Source: Field Survey	

 Table 5-36 Consumer Durables and other Assets of Household

Mahesana is a major centre of milk production and the economy of the district is very dependent on milk and milk products. Keeping that in view, animal assets possessed by the households are very small even though majority of households are engaged in agriculture and also in close proximity to milk centre. Consumer durables and other items/assets possessed by the affected households may be considered as *relevant indicators for monitoring the economic status of the households during and after the implementation of the project.* In addition, *change in occupation of head of households is also one of the important indicators (from primary to secondary and tertiary sectors) which could be monitored to understand the economic condition of affected households after the implementation of the project.*

Basic facilities such as source of drinking water, toilet facilities, availability of electricity connection etc indicate the economic status of the households. Household's access to drinking water facilities indicate that majority (8) households have access to common pump well and one household fulfill their water supply from common dug well. Remaining two households have access to tap water supply (public stand post). Household's access to toilet facilities by locality indicates that eight out of eleven households have access to indoor toilet facilities. The remaining three households do not have access to toilet facilities at all. As regards the source of lighting, it was revealed that two *households use car battery for lighting and the remaining nine households had access to electricity*.

Resettlement and rehabilitation is an emotive issue and no one likes to be displaced voluntarily. Opinion of respondents with respect to resettlement proposal is presented in **Table 5-37**. As indicated five respondents opined that resettlement *would be conditional whereas majority* (*six*) respondents felt that it was not possible to say anything at this stage.

Opinion of Respondents	No. of Respondents
Self or voluntary relocation	0
Protest displacement	0
Conditional resettlement	5
Can't say now	6
Don't want to be displaced	0
Total	11

 Table 5-37 Opinion of Respondents on Resettlement Proposal

Source: Field Survey

On the issue of compensation and resettlement and rehabilitation, respondents revealed that the acquiring authority should pay prevailing market price as compensation, this has been the general demand of everyone during PCM, village level meeting as well as socio-economic survey. Opinions provided by the respondents are presented in Table5-38. It may be seen in the table that seven respondents opined that both compensation and resettlement and rehabilitation assistance should be provided to affected households. Four households felt that resettlement and rehabilitation is important. These respondents did not mention about compensation may be because they knew that compensation is inbuilt in acquisition process.

Opinion of Respondents	No. of Respondents
Resettlement & Rehabilitation	4
Compensation and R&R both	7
Pay market price of affected property	0
Job given in railway to each affected family	0
Resettlement site must be close to railway station	0
Compensation and R&R both and pay market price of	0
affected property	
Total	11

 Table 5-38 Opinion of Respondents on Compensation and R & R

Source: Field Survey

In response to a question with regard to awareness about the Dedicated Freight Corridor (DFC) project, seven (7) out of eleven (11) respondents said that they were aware of DFC project. As regards the sources of information about DFC, main source of information was TV news, see **Table 5-39**. One respondent he knew about the project through word of mouth.

No. of Respondents
0
1
6
0
0
0
7

 Table 5-39
 Sources of Information about DFC

Source: Field Survey

Regarding economic benefits of the DFC project, two (2) respondents opined that there would be no economic benefit in the area whereas a large majority of respondents (9) preferred no comments. One of the main reasons for negative reaction or no comments on the project benefit could be the apprehension of land being acquired by the project. Further during survey, respondents expressed that they would in no way benefit from the project and the actual beneficiary of the project would be someone else for example, industrialists, businessmen, etc and not the one who would be losing land and property. As may be seen none of the respondents provided any comments with regard to economic benefit and therefore no response about the types of economic benefit. This indicates how people likely to be affected by the project are apathetic to project.

Debt Status: None of the households interviewed is under debt at present. Debt status of households is provided in **Table 5-40**. However, *monitoring debt condition of household affected by the project is important to understand the change in socio-economic condition of the households in the aftermath of project*.

Loan taken	No. of Families
Yes	0
No	11
Don't know	0
Total	11
Source: Field Survey	

Table 5-40	Debt status of Household	

As regards saving money, only two households aid that they saved some money from their earnings. However, the amount of savings for both the households is less than Rs. 5000/- per annum

Ranking of Anticipated Impact of DFC:

As regards anticipated impacts of DFC project, respondents were asked to rank various impacts as per their understanding. As indicated in **Table 5-41** five respondents ranked impacts on irrigation as the most important impact followed by impacts on commuting to school and college. Community severance and resettlement have been ranked 1 by one respondent each. Community severance has been ranked 2 by as many as seven respondents. One respondent has ranked impact on commuting to hospital as rank 2. Impacts on commuting to school and college have been ranked 3 by five respondents. Impacts on irrigation and community severance have been ranked 3 by two respondents each. Concerns due to DFC project on irrigation system, commuting to school/college, farm land, community severance etc were raised by participants in the public consultation meeting at Mehsana which have been again substantiated through the socio-economic survey. *Overall impacts on irrigation, community severance and commuting to school/college have been the major concerns of respondents*.

Anticipated impacts		Rank				
Anticipated impacts	1	2	3			
Impacts on irrigation	5	2	2			
Community severance	1	7	2			
Impacts on commuting to school, college	4	1	5			
Hospital	0	1	0			
Market	0	0	1			
Railway station	0	0	0			
Bus Station	0	0	0			
Place of worship (Temple/mosques etc)	0	0	1			
Farming land	0	0	0			
Displacement	0	0	0			
Accidents when crossing railway tracks	0	0	0			
Animal & human movement	0	0	0			
Resettlement	1	0	0			
Livelihood	0	0	0			
Our road comes under DFC proposed alignment, so problem of						
accessibility/communication will arise	0	0	0			
Environment	0	0	0			
Total	11	11	11			

Table 5-41 Anticipated Impact of proposed DFC Project (Mahesana District)

Source: Field Survey

<u>Major Findings</u>

1) In all **121 structures** would be affected in Mahesana District. In Unjha, 24 structures would

get affected and so 2 HH survey was conducted. And in Baliyasan, 9 HH survey conducted as a total of 91 Structures would be affected by DFC. Rajpur and Laxmipura were left out for obvious reasons.

- Locations of household interviews conducted in parallel section are backside of Unjha Bus Stand and Shaktinagar Jhuggi. As indicated above, nine interviews were conducted in Baliyasan (detour) by using hand held Global Positioning System (GPS).
- 3) Five households have reported having agricultural land. The size of land holding is marginal to small. All the households are having less than 6.17 acres (2.5 hectare) which is one of the criteria for identification of Below Poverty Line families.
- 4) All eleven households interviewed are headed by male member and ten are Hindu and one is Muslim. Out of the total households interviewed, one household belong to Schedule Caste, two of general category and eight belong to other backward castes. None of the households interviewed belong to ST category.
- 5) The average size of the households interviewed works out to be 4 which is less than the average household size of 5 for Mahesana District.
- 6) **Nine out of eleven** families have been living at the present place for more than 25 years. Duration of stay of one family at present place is ten years and one family has recently shifted to the present place of stay. Structures that are likely to be affected by the project include seven single detached one storey, two single detached two storeys, one simple hut and one commercial structure (shop). The tenure status of both land and structure is *legal* for seven households i.e., both belong to the household affected by the project.

The main occupation of seven head of households is agriculture as almost the entire alignment in the district traverses through the agricultural land. Two head of households earn their livelihood by working as daily wage labour. One head of household is employed in service and one is engaged in business. Crops grown by households having agricultural land include wheat, rice and sugar cane.

Literacy is one of the important indicators of development. Three head of the households are illiterate and four each head of households have completed education up to class V and class XII respectively. None of the head of household is graduate and above. The income range of majority of households (seven) is less than Rs. 1700/- per month which is the criteria for identification of BPL families. Only one household has reported income of Rs. 10000/- or more. *Overall the socio-economic condition of majority of households interviewed may be categorized as low socio-economic group.*

None of the households have scooter/motor bike or four wheelers. Refrigerator and mixer is possessed by only one household. Tractors and other agricultural implements are not possessed by any of the households though seven households possess agricultural land but all are marginal to small land holders. In other words, land holding size of affected families is very small which may not be economical for possessing agricultural implements such as tractor, thresher, etc.

Mahesana is a major centre of milk production and the economy of the district is very dependent on milk and milk products. Keeping that in view, animal assets possessed by the households are very small even though majority of households are engaged in agriculture and also in close proximity to milk centre.

As indicated five respondents opined that resettlement would be conditional whereas majority (six) respondents felt that it was not possible to say anything at this stage.

On the issue of compensation and resettlement and rehabilitation, respondents revealed that the acquiring authority should pay *prevailing market price as compensation, this has been the general demand of everyone during PCM, village level meeting as well as socioeconomic survey.*

Respondents expressed that they would in no way benefit from the project and the actual beneficiary of the project would be someone else for example, industrialists, businessmen,

etc and not the one who would be losing land and property.

None of the households interviewed is under debt at present. As regards saving money, only two households aid that they saved some money from their earnings. However, the amount of savings for both the households is less than Rs. 5000/- per annum.

Overall impacts on irrigation, community severance and commuting to school/college have been the major concerns of respondents

Mitigation Measures

- Provide appropriate/enough compensation
- Replacement cost of structures affected
- Provide some job opportunity for PAPs according to capability
- Retention of farmers' title/status even after losing all land in DFC project so that in future can buy land at any other place
- Provision of basic infrastructure at resettlement site
- Impart some training to PAPs by which they can earn their livelihood.
- To take care of sensitive CPRs (common property resources) like places of worships, graveyards, schools and hospitals etc.
- Adequate measures to maintain proper drainage in adjoining farmland
- To make PAPs "real" stakeholders by offering them a share in DFC project so that they feel obligated in its post construction maintenance.

(4) Gandhinagar

In Gandhinagar District, no structures would be affected by the DFC. There are 8 villages in the Kalol taluka through which DFC passes. However one ONGC pipeline (in Unali village) and one road (major road connecting Ahmedabad with the villages of Adhana, Nasmed, Unali) is getting affected which has no social concern as such. **Budget pertaining to social aspects (affected structure) is therefore not required.**

The road stretch likely to be affected by DFC alignment is about 431 mtrs in **Adhana** village. Here the alignment has been superimposed on the road it seems. This is a serious engineering concern.

Again, in **Unali** village, ONGC has dug wells at several locations and pipeline is crossing underground across this village. It may be suggested that it would be best to avoid this village altogether, meaning re-alignment of the DFC at least in this.

(5) Ahmedabad

The sample socio-economic survey (10%) was conducted along the detour section. In all **117 structures** would be affected in Ahmedabad District whose details are provided in the **Table5-42**.

Name of Locality	Total Affected Structure
Vasna Chancharwadi	5
Kavitha	112
Total	117

Table 5-42	List of	Affected	Structures
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Location of Household Interview: 10% of the total households likely affected by the project were covered for the socio-economic survey. **Table 5-43** indicates that in all, twelve (12) household were interviewed and all of them are in detour.

No. of HH Interviews
0
0
0
12
12

Table 5-43 Location of Household Interview

Source: Field Survey

Locations in the detour section for conducting the socio-economic survey was identified using hand held Global Positioning System (GPS). Latitude and Longitude of each location where socio-economic survey was conducted in detour section is available with the consultant. The analysis of survey data is provided in the following sections.

Land Holding Size: Only one family is having agricultural land, **Table 5-44**. The size of land holding is very small i.e., less than an acre. As per the criteria for identification of Below Poverty Line families, a family is eligible for identification as BPL family if the land holding of the family is less than 2.5 hectare.

Size of Agriculture Land	No. of Families
Upto 3 bigha	1
3-5 bigha	0
6-10 bigha	0
more than 10 bigha	0
Total	1

Table 5-44 Size of Agricultural Land (in Bigha)

Note: N.B. 4 bighas is equal to 1 acre. Source: Field Survey

Profile of Head of Household: The profile of head of household and relevant social and economic information is provided in **Table 5-45**. All twelve households interviewed are headed by male member and all belong to Hindu religion. Out of the households interviewed, two households belong to Schedule Caste, one of general category and nine comes under other backward castes. None of the households interviewed belong to ST category. It is important to mention here that SC and ST are considered vulnerable on the basis social considerations and are eligible for various kinds of assistances under government sponsored programmes/schemes. The average size of the household interviewed works out to be 7 which is very high compared to average household size of 5 for Ahmedabad District.

Item		Unit	No.	Remarks
Head of Household	Male	Family	12	
	Female	-do-	0	
Head of HH		Married	12	
		Unmarried	0	
Family members		Members	82	
Family size		Average	7	
Legal status of Project A	ffected Families (PAFs)	Family	12	In private land
		-do-	0	In public land
Religion of PAFs	Hindu	Family	12	
	Muslim	-do-	0	
Social category of PAFs	General	-do-	1	
	SC	-do-	2	
	ST	-do-	0	
	OBC	-do-	9	
Occupation	Service	Head of HH	5	
	Wage employee	-do-	1	
	Daily wage labour	-do-	3	
	Business	-do-	3	
	Others	-do-	0	
Literacy	Illiterate	Head of HH	1	
	Can read & write	-do-	0	
	Up to class V	-do-	5	
	Up to class XII	-do-	5	
	Graduate & above	-do-	1	
Age group	22 - 59	Head of HH	10	
	60 & above	-do-	2	
Income of Head of HH	Up to 1700	Monthly	8	
(in Rs.)	1700 - 3000	-do-	4	
	3001-6000	-do-	0	
	6001-10000	-do-	0	
	> 10000	-do-	0	

Table 5-45	Profile	of Head	of F	lousehold
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One family out of twelve families has been living at the present place for more than 20 years. Duration of stay of all other families at present place is more than 50 years. Structures that are likely to be affected by the project include eleven single detached one storey and one single detached two stories. The tenure status of both land and structure is *legal* for ten households i.e., both belong to the household affected by the project. Besides, there are two households whose tenure status of land is illegal but have constructed own structure. In response to a question that how long you are likely to stay at present location, all the respondents said that they would be staying here for ever.

Ten out of twelve head of households belongs to the age group of 22-59 which is the prime age of working population and the remaining two are above 60 years of age. All twelve head of households are married. The main occupation of five head of households is service followed by daily wage labour and others (three each). Only one household is engaged in agriculture.

Literacy is one of the important indicators of development. One head of the household is illiterate and five each head of households have completed education up to class V and class XII respectively. One head of household is graduate and above. The income range of majority of households (eight) is less than Rs.1,700/- per month which is the criteria for identification of BPL families. Four households have revealed that their income from all sources lies in the

range of Rs. 1700/- to 3000/- per month. Thus all households interviewed belong to lower income group. It may be mentioned a family having an income of less than Rs.20,000/- per annum is considered as Below Poverty Line (BPL) family as per "Identification of Below Poverty Line (BPL) families for the 9th Five Year Plan"⁴. Rs.20,000/- per annum converted into months works out to Rs.1,667/- per month. BPL families are considered vulnerable and are covered in various government sponsored schemes/programmes and are therefore entitled to some extra benefits from the Government. Overall the socio-economic condition of majority of households interviewed may be categorized as low socio-economic group.

Possession of Assets and Consumer Durables:

Assets & consumer durables possessed by the households are indicators of the socio-economic status. Consumer durables and other assets possessed by households are given in **Table 5-46**. The consumer items in possession of the households indicate that four households have TVs which at present time is considered as one of the essential items. Only one household has scooter/motor bike. Refrigerator, mixer and other consumer durables are absent indicating the poor economic condition of households. Tractors and other agricultural implements are not possessed by any of the households.

Consumer items, other assets and animals owned by family	Number of Families
TV	4
Refrigerator	0
Mixer	0
Electric fan	0
Radio	7
Scooter/Motor Bike	1
Car/Jeep	0
Others (Cycle)	0
Tractor	0
Thresher	0
Electric pumpset	0
Cow	8
Ox	0
Buffalo	8
Sheep/Goat	1
Source: Field Survey	

 Table 5-46 Consumer Durables and other Assets of Household

Source: Field Survey

Animal assets (milk- producing animals) possessed by the household is not much whereas these areas are famous for milk production. Consumer durables and other assets possessed by the affected households may be considered *relevant indicators for monitoring the economic status of the households during and after the implementation of the project*. In addition, *change in occupation of head of households is also one of the important indicators (from primary to secondary and tertiary sectors) which could be monitored to understand the economic condition of affected households after the implementation of the project*.

Basic facilities such as source of drinking water, toilet facilities, availability of electricity connection etc indicate the economic status of the households. Household's access to drinking water facilities indicate that eight households have access to common pump well and four households have access to common dug well. Household's access to toilet facilities by locality indicates that only two households have access to outdoor toilet facilities and the remaining

ten households do not have access to toilet facilities at all indicating the economic condition of the people likely to be affected by the project. As regards the source of lighting, it was revealed that three *households have electricity connection and all others are without any source of lighting.*

Resettlement and rehabilitation is an emotive issue and no one likes to be displaced voluntarily. Opinion of respondents with respect to resettlement proposal is presented in **Table 5-47**. As indicated six respondents opined that resettlement *would be conditional whereas other six respondents felt that it was not possible to say anything at this stage.*

Opinion of Respondents	No. of Respondents
Self or voluntary relocation	0
Protest displacement	0
Conditional resettlement	6
Can't say now	6
Don't want to be displaced	0
Total	12

 Table 5-47 Opinion of Respondents on Resettlement Proposal

Source: Field Survey

On the issue of compensation and resettlement and rehabilitation, respondents revealed that the acquiring authority should pay prevailing market price as compensation, this has been the general demand of everyone during PCM, village level meeting as well as socio-economic survey. Opinions provided by the respondents are presented in Table5-48. It may be seen that ten respondents opined that both compensation and resettlement and rehabilitation assistance should be provided to affected households. Two respondents opined that resettlement and rehabilitation is important. These two respondents did not mention about compensation may be because they knew that compensation is inbuilt in acquisition process.

Table 5-48	Opinion of	Respondents on	Compensation and R & R
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Opinion of Respondents	No. of Respondents
Resettlement & Rehabilitation	2
Compensation and R&R both	10
Pay market price of affected property	0
Job given in railway to each affected family	0
Resettlement site must be close to railway station	0
Compensation and R&R both and pay market price of affected property	0
Total	12

Source: Field Survey

In response to a question with regard to awareness about the Dedicated Freight Corridor (DFC) project, five (5) out of twelve (12) respondents revealed that they were aware of DFC project. As regards the sources of information about DFC, main source of information was TV news, see **Table 5-49**.

Opinion of Respondents	No. of Respondents
Newspaper	0
Word of mouth	0
TV news	5
Newspaper & word of mouth	0
Newspaper, word of mouth & friends/relatives	0
Word of mouth, friends/relative & public consultation meeting	0
Total	5

	Table 5-49	Sources	of information	about DFC
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Regarding economic benefits of the DFC project, none of the respondents opined that there would be any economic benefit in the area. One of the main reasons for negative or no comments on the project benefit could be the apprehension of land being acquired by the project. Further during survey, respondents expressed that the actual beneficiary of the project would be someone else for example, industrialists, businessmen, etc and not the one who would be losing land and property. Opinion of respondents with respect to the type of economic benefits of DFC project is given in **Table 5-50**. As may be seen none of the respondents provided any comments with regard to economic benefit and therefore no response was recorded about the types of economic benefit. This indicates probably their indirect protest against the project.

Opinion of Respondents	No. of Respondents
Business opportunity	0
Industry establishment	0
Wage employment and business opportunity	0
Business opportunity and industry establishment	0
Business opportunity, industry establishment and time saving	0
Business opportunity and time saving	0
Industry establishment and time saving	0
Total	Nil

 Table 5-50 Economic Benefits of the DFC Project

Source: Field Survey

Debt Status: None of the households interviewed is under debt at present. Debt status of households, sources of loan and status of loan are provided in **Tables 5-51**, **5-52** and **5-53** respectively. However, monitoring debt condition of household affected by the project is important to understand the change in socio-economic condition of the households in the aftermath of project.

Table 5-51 Debt stat	tus of Household
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Loan taken	No. of Families
Yes	0
No	12
Don't know	0
Total	12

Source: Field Survey

Source	No. of Families
Bank	0
Relative/Friend	0
Mahajan/ Money lender	0
Others (Society)	0
Total	Not applicable

Table 5-52 Sources of Loan	Table	5-52	Sources	of	Loan
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Loan paid	No. of Families
Full amount paid	0
Partly amount paid	0
Not paid any amount so far	0
Total	Not Applicable

Table 5-53 Status of Loan

Source: Field Survey

As regards saving money, none of families revealed that they save any money. This is possible as income of all the families surveyed is less than Rs.3,000/- per month and the average size of family is quite high.

Ranking of Anticipated Impact of DFC:

As regards anticipated impacts of DFC project, respondents were asked to rank various impacts as per their understanding. As indicated in **Table 5-54**, seven respondents ranked impacts on commuting to school and college as the most important impacts followed by impacts on irrigation as the most important impact followed by impacts on community severance has been perceived as second and third important impacts by six respondents each. *Overall community severance, impacts on community to school/college and impacts on irrigation are the major concerns of respondents. Some of the perceived impacts may be addressed by integrating social and engineering components. For example, provision of underpass based on ground realities and in built provision for laying irrigation pipeline across the railway line would address some of the concerns of the people in the area.*

Anticipated impacts	Rank		
	1	2	3
Impacts on irrigation	5	4	3
Community severance	0	6	6
Impacts on commuting to school, college	7	2	3
Hospital	0	0	0
Market	0	0	0
Railway station	0	0	0
Bus Station	0	0	0
Place of worship (Temple/mosques etc)	0	0	0
Farming land	0	0	0
Displacement	0	0	0
Accidents when crossing railway tracks	0	0	0
Animal & human movement	0	0	0
Resettlement	0	0	0
Livelihood	0	0	0
Our road comes under DFC proposed alignment, so problem of			
accessibility/communication will arise	0	0	0
Environment	0	0	0
Total	12	12	12

Table 5-54 Anticipated Impact of proposed DFC Project (Ahmedabad District)

Source: Field Survey

Summary of the survey results

- In all, twelve (12) household were interviewed and all of them are in detour.
- Only one family is having agricultural land. The size of land holding is very small i.e., less than an acre.
- All twelve households interviewed are headed by male member and all belong to Hindu religion. Out of the total households interviewed, two households belong to Schedule Caste, one of general category and nine comes under other backward castes. None of the households interviewed belong to ST category. The average size of the household interviewed works out to be 7 which is very high compared to average household size of 5 for Ahmedabad District.
- Structures that are likely to be affected by the project include eleven single detached one storey and one single detached two stories. The tenure status of both land and structure is *legal* for ten households i.e., both belong to the household affected by the project. Besides, there are two households whose tenure status of land is illegal but have constructed own structure.
- One head of the household is illiterate and five each head of households have completed education up to class V and class XII respectively. One head of household is graduate and above. The income range of majority of households (eight) is less than Rs. 1700/- per month which is the criteria for identification of BPL families. Four households have revealed that their income from all sources lies in the range of Rs. 1700/- to 3000/- per month. Thus all households interviewed belong to lower income group. *Overall the socio-economic condition of majority of households interviewed may be categorized as low socio-economic group.*
- Only one household has scooter/motor bike. Refrigerator, mixer and other consumer durables are absent indicating the poor economic condition of households. Tractors and other agricultural implements are not possessed by any of the households.
- Household's access to drinking water facilities indicate that eight households have access to common pump well and four households have access to common dug well. Household's access to toilet facilities by locality indicates that only two households have access to outdoor toilet facilities and the remaining ten households do not have access to toilet facilities at all indicating the economic condition of the people likely to be affected by the project.
- As indicated six respondents opined that resettlement would be conditional whereas other six respondents felt that it was not possible to say anything at this stage.
- On the issue of compensation and resettlement and rehabilitation, respondents revealed that the acquiring authority should pay *prevailing market price as compensation, this has been the general demand of everyone during PCM, village level meeting as well as socio-economic survey.*
- Regarding economic benefits of the DFC project, none of the respondents opined that there would be any economic benefit in the area. One of the main reasons for negative or no comments on the project benefit could be the apprehension of land being acquired by the project. Further during survey, respondents expressed that the actual beneficiary of the project would be someone else for example, industrialists, businessmen, etc and not the one who would be losing land and property.
- None of the households interviewed is under debt at present.
- Overall community severance, impacts on community to school/college and impacts on irrigation are the major concerns of respondents. Some of the perceived impacts may be addressed by integrating social and engineering components. For example, provision of underpass based on ground realities and in built provision for laying irrigation pipeline

across the railway line would address some of the concerns of the people in the area.

Mitigation Measures

- Provide appropriate/enough compensation
- Replacement cost of structures affected
- Provide some job opportunity for PAPs according to capability
- Retention of farmers' title/status even after losing all land in DFC project so that in future can buy land at any other place
- Provision of basic infrastructure at resettlement site
- Impart some training to PAPs by which they can earn their livelihood.
- To take care of sensitive CPRs (common property resources) like places of worships, graveyards, schools and hospitals etc.
- Adequate measures to maintain proper drainage in adjoining farmland
- To make PAPs "real" stakeholders by offering them a share in DFC project so that they feel obligated in its post construction maintenance.

(6) Kheda

In Kheda District, which lies in detour section DFC crosses mostly agricultural land with only two structures being affected. There are 6 villages in the Kheda Taluka and seven villages in Matar Taluka respectively through which the proposed DFC passes. The socio-economic household survey was not conducted because of lack of requisite number of structures (less than ten) likely to be affected. Both the structures affected are in Shetra village which comes under Kheda Taluka. The residential structure is made of kutcha material and the storehouse is a pucca structure. The name of head of household of residential structure is Parmar Ramtu Atmarambhai. The owner of the godown is Pathan Gulamghose Usmanbhai. One of the owners is Muslim whereas another one is a Hindu and both come under the social category of other backward castes. The occupation of storehouse owner is business whereas that of other person is agriculture. The tenure status of both land and structures is legal. Therefore, on social environment, no significant impact is involved

(7) Anand

In Anand District which lies in detour section, twelve structures would be affected by the DFC alignment- 11 structures in Airdi and one structure each in Sunav and Sandesar -- all under Anand Taluka. In total, in Anand District, 11 out of 12 structures are presently used for residential purposes. One structure in Sandesar is a storehouse. Except this storehouse which is a pucca structure, all other structures are kutchha structures. The owner of the storehouse is a businessman and all others are farmers.

All affected persons belong to Hindu religion and their social category is OBC (other backward castes). The tenure status of both land and structure is legal for all except one residential structure owner. The proposed DFC traverses through the administrative boundaries of 28 villages under 5 Talukas.

The socio-economic household survey was conducted at only 1 structure at Airdi village as total of ten structures would be affected in the village (as per 10% socio-economic survey).

(7) Vadodara

In all **96 structures** would get affected in Vadodara District of which majority (93 out of 96) is in Karjan area (parallel section). The structures in Bhayali and Itola are in the detour area. The sample socio-economic survey (10%) was conducted along the existing line within a width of 25 m from the centerline of the existing railway track on the proposed side of widening. In addition, similar survey was conducted in the detours at the crossing of the motorable road using the GPS for identification of cross points (43.5 m total width either side). The socio-economic survey was conducted in 15 households in parallel section; no survey was carried out in detour areas as there were hardly any settlements (not more than 10 structures).

Name of Locality	Total Affected Structure
Karjan	93
Itola	2
Bhayali	1
Total	96

List of Affected Structures

Source: Field Survey

Location of Household Interview: Table 5-55 indicates that 15 household interviews were conducted in parallel section in Vadodara District.

Location of Interview	No. of HH Interviews
Parallel to railway	15
Near ROB	0
Near Diversion	0
Total	15

 Table 5-55
 Location of Household Interview

Source: Field Survey

Thus 10% of the total households likely affected by the project were covered in this survey. The locations of household interviews are Karjan (Ward No.2) and Itola. The analysis of survey data is provided in the following sections.

Land Holding Size: None of the family has reported having agricultural land.

Profile of Head of Household: All the households likely to be affected by the project are headed by male member. Religious distribution of affected households indicates that almost equal number of households would be affected from each religion i.e., Hindu as well as Muslim (see **Table 5-56**). Out of the total households interviewed, one household belong to Schedule Caste, six of general category and nine of other backward castes. None of the households interviewed belong to ST category. It is important to mention here that SC and ST are considered vulnerable on the basis social considerations and are eligible for various kinds of assistances under government sponsored programmes/schemes. **The average size of the household/family works out to be 7** which is high as compared to average household size of Vadodara District as per Census 2001.

It	em	Unit	No.	Remarks
Head of Household	Male	Family	15	
	Female	-do-	0	
Head of HH		Married	14	
		Unmarried	1	
Family members		Members	86	
Family size		Average	6	
Legal status of Project A	ffected Families (PAFs)	Family	3	In private land
		-do-	12	In public land
Religion of PAFs	Hindu	Family	8	
	Muslim	-do-	7	
Social category of PAFs	General	-do-	6	
	SC	-do-	1	
	ST	-do-	0	
	OBC	-do-	8	
Occupation	Service	Head of HH	3	
	Wage employee	-do-	0	
	Daily wage labour	-do-	0	
	Business	-do-	10	
	Others	-do-	2	
Literacy	Illiterate	Head of HH	1	
	Can read & write	-do-	0	
	Up to class V	-do-	7	
	Up to class XII	-do-	7	
	Graduate & above	-do-	0	
Age group	22 - 59	Head of HH	15	
	60 & above	-do-	0	
Income of Head of HH	1	Monthly	0	
(in Rs.)	1700 - 3000	-do-	1	
	3001-6000	-do-	9	
	6001-10000	-do-	3	
	> 10000	-do-	3	

Table 5-56 Profile of Head of Household	Table 5-56	Profile	of Head	of Household	b
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Source: Field Survey

Three families have been living at the present place for more than 25 years and the duration of stay at present place for the seven families varies between 10-25 years. One family has been staying at the present place for less than 2 years whereas duration of stay for four families varies between 5 to 10 years. The structures that are likely to be affected in Vadodara District comprises fourteen (14) single detached one storey and the remaining one is a simple hut. The tenure status of both land and structure is *legal* for three households i.e., both belong to the household affected by the project. For the remaining twelve households the tenure status of land is illegal that means structures have been constructed by occupants in public land. In response to a question as to how long do they plan to live at present location, no response was provided by any of the respondents presently occupying the public land.

All the head households belong to the age group of 22-59 which is the prime age of working population. As regards marital status of the head of households – all but one are at present married. The occupation of three head of households is service. Two head of households is under the category "others" which include household work, maid, handicapped, unemployed, retired, mobile vendor, etc. Business including petty business is the main occupation for the majority (10) of head households. None of the households have reported producing any crops as none of them own any agricultural land.

Literacy is one of the important indicators of development. Almost 50% of the head of households have completed education up to class V and an equal number of head of households have completed education up to class XII. Strangely, none of the head of households have completed graduation which is considered as the basic requirement for any service, be it Government or private. One head of household is illiterate. Though this person can read but can't write so he has been put under the category as illiterate as definition of literate is "A person who can read and write with understanding is considered literate irrespective of his/her formal degree". The income range of nine households is between Rs. 3001-6000/- of which occupation of five head of households is business. There are three families each whose income range per month are Rs. 6001 to 1000/- and more than Rs. 10000/- per month respectively. There is only one family whose monthly income is less than Rs. 1700/- per month and therefore eligible to be identified as BPL families based on income criteria. It may be mentioned a family having an income of less than Rs.20,000/- per annum is considered as Below Poverty Line (BPL) family as per "Identification of Below Poverty Line (BPL) families for the 9th Five Year Plan³⁵. Rs.20,000/- per annum converted into months works out to Rs.1,667/- per month. BPL families are considered vulnerable and are covered in various government sponsored schemes/programmes and are therefore entitled to some extra benefits from the Government. Thus we may conclude that none of the families belong to BPL category.

Possession of Assets and Consumer Durables: Assets and consumer durables possessed by the households are indicative of their socio-economic status. The consumer items in possession of the households indicate that all seven households have TVs which at present time may be considered as one of the essential items. Consumer durables and other assets possessed by households are given in **Table 5-57**. Two households have scooter/motor bike and none of the households have four wheelers. Refrigerator is possessed by four households. Tractors and other agricultural implements are not possessed by any of the families as households likely to be affected are staying parallel to the existing railway line and are engaged in secondary/tertiary activities.

Consumer items, other assets and animals owned by family	Number of families
TV	6
Refrigerator	4
Mixer	9
Electric cooker	10
Geyser	4
Electric fan	15
Toaster	0
Radio	10
Scooter/Motor Bike	2
Car/Jeep	0
Others (Cycle)	5
Tractor	0
Thresher	0
Electric pump set	0
Cow	0
Ox	0
Buffalo	0
Sheep/Goat	0
Birds	0
Source: Field Survey	·

Table 5-57 Consumer Durables and Other Assets of	Household
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Animal assets among the households are nil. Consumer durables and other items/assets possessed by the affected households may be considered as relevant indicators for monitoring the economic status of the households during and after the implementation of the project. In addition, change in occupation of head of households is also one of the important indicators (from primary to secondary and tertiary sectors) which could be monitored to understand the economic condition of affected households after the implementation of the project.

Basic facilities such as source of drinking water, toilet facilities, availability of electricity connection etc indicate the economic status of the households. Household's access to drinking water facilities does not indicate wide variation as four out of five families get their water supply for various purposes from dug well. One family has access to common tap water supply facility. Household's access to toilet facilities by locality indicates that four families have access to indoor toilet facilities indicative of hygienic awareness probably. Only one family uses the outdoor common toilet facility. As regards the source of lighting, it was revealed that all households had access to electricity for lighting.

Resettlement and rehabilitation is an emotive issue and no one likes to be displaced voluntarily. Opinion of respondents with respect to resettlement proposal is presented in Table 5-58. As indicated, ten respondents revealed that relocation would be conditional whereas five respondents said it would not possible to say anything on the resettlement proposal at present.

Opinion of Respondents	No. of Respondents
Self or voluntary relocation	0
Protest displacement	0
Conditional resettlement	10
Can't say now	5
Don't want to be displaced	0
Total	15

 Table 5-58 Opinion of Respondents on Resettlement Proposal

Source: Field Survey

On the issue of compensation and resettlement and rehabilitation, respondents in general everywhere revealed that the acquiring authority should pay *prevailing market price as compensation*. Opinions provided by the respondents are provided in **Table 5-59**. As may be seen in the table majority of respondents opined that compensation as well as resettlement and rehabilitation assistance should be provided followed by those who only opined for resettlement and rehabilitation assistance.

Table 5-59	Opinion of	Respondents on	Compensation and R & R
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Opinion of Respondents	No. of Respondents
Resettlement & Rehabilitation	6
Compensation and R&R both	9
Pay market price of affected property	0
Job given in railway to each affected family	0
Resettlement site must be close to railway station	0
Compensation and R&R both and pay market price of affected property	0
Total	15

Source: Field Survey

In response to a question with regard to awareness about the Dedicated Freight Corridor (DFC) project, twelve out of 15 respondents answered in affirmative. As regards the source of information about DFC, the main source of information was word of mouth, see **Table 5-60**.

Four respondents revealed that they knew about the project through word of mouth. It may be understood that respondents received information about DFC project through various sources and in some cases through a combination of sources.

Opinion of Respondents	No. of Respondents
Newspaper	2
Word of mouth	4
TV & newspaper	1
Newspaper & word of mouth	1
Newspaper, word of mouth & friends/relatives	2
Newspaper, word of mouth & Public consultation meeting	2
Total	12

 Table 5-60 Sources of Information about DFC

Source: Field Survey

Regarding economic benefits of the DFC project, eight respondents opined that there would be economic benefit of the project in the area whereas other respondents did not provide any comments. Opinion of respondents with respect to type of economic benefits of DFC project is given in **Table 5-61**. It may be concluded that respondents believed that there would be increased opportunity for business.

 Table 5-61 Economic Benefits of the DFC project

Opinion of Respondents	No. of Respondents
Business opportunity	0
Industry establishment	6
Wage employment and business opportunity	0
Business opportunity and industry establishment	2
Business opportunity, industry establishment and	0
time saving	0
Business opportunity and time saving	0
Industry establishment and time saving	0
Total	8
No Comments	7

Source: Field Survey

Debt Status: Debt status of households is provided in **Table 5-62**. Two households are at present under debt. One of the households has borrowed money from bank whereas other one borrowed from relative/friend. Gaffar Shah Malong Shah has taken loan of Rs.200 000/- from bank and has repaid Rs.70,000/- so far. The other person has taken a loan of Rs.4,000/- from and has repaid Rs.1,000/-.

Loan taken	No. of Families
Yes	2
No	13
Don't know	0
Total	15

Table 5- 62 Debt status of Household

Source: Field Survey

As regards saving money, 8 out of the fifteen households have said that they save some money from their earnings. However, the amount of savings for **five** households is in the range of

Rs.5,000/- to 10,000/- per annum whereas **three** households have reported annual saving in the range of Rs.10,000/- to Rs.25,000/- per annum.

Ranking of Anticipated Impact of DFC: As regards anticipated impact of DFC project, respondents were asked to rank various impacts as per their understanding. As indicated in **Table-5.63**, eight respondents ranked community severance as the most important anticipated impact followed by impacts on commuting to school/college and impacts and irrigation respectively. Impacts on commuting severance and community severance, commuting to school and college have been ranked 2 six and five respondents. *Overall community severance, commuting to schools/colleges and impacts on irrigation are the important concerns*. Impacts on others such as commuting to hospital, market, railway station, bus station, place of worship etc have not been mentioned by any of the respondents.

Anticipated impacts		Rank	
Anticipated impacts	1	2	3
Impacts on irrigation	3	4	8
Community severance	8	6	1
Impacts on commuting to school, college	4	5	6
Hospital	0	0	0
Market	0	0	0
Railway station	0	0	0
Bus Station	0	0	0
Place of worship (Temple/mosques etc)	0	0	0
Farming land	0	0	0
Displacement	0	0	0
Accidents when crossing railway tracks	0	0	0
Animal & human movement	0	0	0
Resettlement	0	0	0
Livelihood	0	0	0
Our road comes under DFC proposed alignment, so problem of accessibility/communication will arise	0	0	0
Environment	0	0	0
Total	15	15	15

Table 5-63	Anticipated Impac	t of Proposed DF(C Project (Vadodara	District)

Source: Field Survey

Summary of the survey results

- 15 household interviews were conducted parallel to railway line (within 25 m. of track).
- None of the families own land.
- The average size of the household/family works out to be 7 which is very high as compared to national figure. The reason for large family is probably because of joint family system.
- The structures that are likely to be affected in Vadodara District comprises fourteen (14) single detached one storey and the remaining one is a simple hut. The tenure status of both land and structure is *legal* for three households i.e., both belong to the household affected by the project. For the remaining twelve households the tenure status of land is illegal that means structures have been constructed by occupants in public land.
- Literacy is one of the important indicators of development. Almost 50% of the head of households have completed education up to class V and an equal number of head of households have completed education up to class XII. Strangely, none of the head of households have completed graduation which is considered as the basic requirement for any service, be it Government or private. One head of household is illiterate.
- The income range of nine households is between Rs. 3001-6000/- of which occupation of

five head of households is business. There are three families each whose income range per month are Rs. 6001 to 1000/- and more than Rs. 10000/- per month respectively. There is only one family whose monthly income is less than Rs. 1700/- per month and therefore eligible to be identified as BPL families based on income criteria.

Assets and consumer durables possessed by the households are indicative of their socioeconomic status. Consumer durables and other items/assets possessed by the affected households may be considered as relevant indicators for monitoring the economic status of the households during and after the implementation of the project. In addition, change in occupation of head of households is also one of the important indicators (from primary to secondary and tertiary sectors) which could be monitored to understand the economic condition of affected households after the implementation of the project. TV has been the most common consumer durable/asset indicating two things: visual entertainment is popular and that information dissemination via visual media may be a tool for DFC implementation. Two households have scooter/motor bike and none of the households have four wheelers.

Refrigerator is possessed by four households. Tractors and other agricultural implements are not possessed by any of the families as households likely to be affected are staying parallel to the existing railway line and are engaged in secondary/tertiary activities.

- Animal assets among the households are nil. Consumer durables and other items/assets possessed by the affected households may be considered as *relevant indicators for monitoring the economic status of the households during and after the implementation of the project*. In addition, *change in occupation of head of households is also one of the important indicators (from primary to secondary and tertiary sectors) which could be monitored to understand the economic condition of affected households after the implementation of the project.*
- As regards the source of lighting, it was revealed that all households had access to electricity for lighting.
- Monitoring debt condition of household affected by the project is important to understand the change in socio-economic condition of the households in the aftermath of the project. Two households are at present under debt. One of the households has borrowed money from bank whereas other one borrowed from relative/friend
- Overall community severance, commuting to schools/colleges and impacts on irrigation are the important concerns. Impacts on others such as commuting to hospital, market, railway station, bus station, place of worship etc have not been mentioned by any of the respondents.
- Resettlement and rehabilitation is an emotive issue and no one likes to be displaced. However, in response to resettlement proposal, two respondents opined that if required they would prefer self or voluntary relocation whereas three respondents revealed the relocation would be conditional. Further, respondents revealed that the acquiring authority should pay prevailing market price as compensation. Besides resettlement and rehabilitation assistance should also be provided so that families affected by the project do not become the victim of development.
- In response to a question with regard to awareness about the Dedicated Freight Corridor (DFC) project, twelve out of 15 respondents answered in affirmative. As regards the source of information about DFC, the main source of information was word of mouth. Four respondents revealed that they knew about the project through word of mouth. It may be understood that respondents received information about DFC project through various sources and in some cases through a combination of sources

Mitigation Measures

- Provide appropriate/enough compensation
- Replacement cost of structures affected

- Provide some job opportunity for PAPs according to capability
- Retention of farmers' title/status even after losing all land in DFC project so that in future can buy land at any other place
- Provision of basic infrastructure at resettlement site
- Impart some training to PAPs by which they can earn their livelihood.
- To take care of sensitive CPRs (common property resources) like places of worships, graveyards, schools and hospitals etc.
- Adequate measures to maintain proper drainage in adjoining farmland
- To make PAPs "real" stakeholders by offering them a share in DFC project so that they feel obligated in its post construction maintenance.

5.5 IMPACT MATRIX OF SOCIAL ENVIRONMENT

5.5.1 Banaskantha, Patan

	Project Activities	Overall	PRE-	CONSTRUCTION S	ГАGЕ
Sl. No.	Environmental & Social Issues	Evaluation on the Project	Surveying of Planned Areas and Sites	Selection of the Project Location & Sites	Land Acquisition and Resettlement
1	Involuntary Resettlement				
	a. General People	C-	Ε	A-	A-
	b. Socially and Physically Disadvantaged	C-	Ε	D-	D-
	c. Minorities & Scheduled Castes/Tribes	C-	Е	А-	А-
2	Local Economy such as Employment and Livelihood etc.	C+	Ε	Е	Е
3	Land Use and Utilization of Local Resources	В-	Е	Е	А-
4	Social Institutions, Social Infrastructures and Local Decision-making Process	C+	Ε	C+	B +
5	Existing Infrastructures and Services	B +	Ε	Ε	Ε
6	Vulnerable Social Groups such as the Poor and Indigenous People				
	a. Households below the Poverty Line	D-	D-	D-	D-
	b. Scheduled Castes and Tribes	D-	D-	D-	D-
7	Gender	D+	Ε	Ε	Ε
8	Children's Rights	Ε	Ε	Ε	Ε
9	Distribution of Benefits and Losses and Equality in the Development Process	B +	Ε	Е	Ε
10	Local Conflict of Interests	В-	Ε	A-	A-
11	Cultural Property and Heritage	C-	Ε	C-	C-
12	Public Health Conditions				
	a. Infectious Diseases (including HIV/AIDS)	D-	Ε	Ε	Ε
	b. Other Health Problems	D+	Ε	Ε	Ε
13	Water Rights/Rights of Common Land	D-	Ε	E	Ε
14	Hazards and Risk				
	a. Traffic Accidents	D-	Е	E	E
	b. Natural Hazards	D-	Ε	Ε	Ε

A: Significant impact, B: Relatively Significant impact, C: Insignificant impact, D: Neglectable impact,

E: No impact, -: Negative impact, +: Positive impact

	Project Activities		the	and	nes	Construction		s for Railv structures	vay line an	d rela	ated	the	to
Sl. No.	Environmental & Social Issues	Quarry & Borrow Areas	Earth Moving: Cutting and Filling of Construction Works	Preparation of Construction Plants, Warehouses, Work Camps, etc.	Operation of Construction Plants, Machines & Vehicles for Construction Works	(A) Construction of Railway Lines & 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 ROBs and RUBs	(E) Construction Works for Bridges	(F) Construction Works for Tunnels	Localized Employment Opportunities of the Construction Works	Localized Business Opportunities Related the Construction Works
1	Involuntary Resettlement a. General People	C-	Е	C-	Е	A-	D-	B-	C-	Е	Е	A+	A+
	b. Socially and Physically Disadvantaged	с.	E	с- с-	E	A- A-	D-	в- В-	с- С-	E	E	A+	A+
	c. Minorities & Scheduled Castes/Tribes	C-	Е	C-	E	А-	D-	B-	C-	Е	Е	A+	A+
2	Local Economy such as Employment and Livelihood etc.	B+	B+	Е	C+	B +	B+	B+	B+	B +	E	A+	A+
3	Land Use and Utilization of Local Resources	B-	B-	C-	Е	A-	В-	В-	C-	D-	C-	C+	C+
4	Social Institutions, Social Infrastructures and Local Decision-making Process	E	E	B +	Е	B +	B +	B +	B+	B +	E	D+	D+
5	Existing Infrastructures and Services	E	Е	Е	D+	B+	B +	B +	B +	B +	B +	C+	C+
6	Vulnerable Social Groups such as the Poor and Indigenous People												
	a. Households below the Poverty Line	E	Е	C+	Е	C-	C-	C-	C-	C-	Е	C+	D+
	b. Scheduled Castes and Tribes	Е	Е	C+	Е	C-	C-	C-	C-	C-	Е	C+	D+
7	Gender Children's Rights	E	E	E E	E	E E	E E	E	E	E E	E E	D+	D+
9	Distribution of Benefits and Losses and Equality in	E C+	E E	E	E	E	E	E E	E E	E	E	E B+	<u>Е</u> В+
10	the Development Processes	P	C	P	F		P	<u> </u>		Г	Г	C	
10	Local Conflict of Interests Cultural Property and	B- E	C-	B-	D-	D-	B-	A-	A-	E	E	C-	C-
11 12	Heritage Public Health Conditions	Ľ	Е	Е	Ε	C-	E	Е	Е	E	E	Е	E
12	a. Infectious Diseases (including HIV/AIDS)	Е	Е	D-	D-	D-	D-	D-	D-	D-	D-	Е	E
	b. Other Health Problems	D-	D-	D-	D-	D-	D-	D-	D-	D-	D-	D-	D-
13	Water Rights/Rights of Common Land	D-	D-	D-	D-	D-	D-	D-	D-	D-	Е	Е	E
14	Hazards and Risk a. Traffic Accidents	Е	Е	Е	D-	D-	D-	D-	D-	D-	Е	Е	E
	b. Natural Hazards	C-	C-	Е	Е	E	Е	Е	Е	D-	C-	Е	E
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A: Significant impact, B: Relatively Significant impact, C: Insignificant impact, D: Neglectable impact,

E: No impact, -: Negative impact, +: Positive impact

Sl.		POST - CONSTRUCTION STAGE									
No.	Project Activities		, Raw lustrial		ce of tures	unities	Business	Business			
	Environmental & Social Issues	Traffic Conditions of Passenger/ Freight Trains	Logistic Condition of Goods, Raw Materials, Agricultural and Industrial Products	Traffic Condition of Roads	Operation and Maintenance o Railway lines and Related Structures	Employment Opportunities (whole country/local level)	Freight-oriented Opportunities	Passenger Oriented Bu Opportunities	Promoting Development of Surrounding Area	Increase in Settlers and Visitors to the Project Area	
1	Involuntary Resettlement a. General People	C	A .	B+	C+	A .	B+	C+	C.	C-	
	a. General People b. Socially and Physically Disadvantaged	C+ C+	A+ A+	в+ В+	C+ C+	A+ A+	в+ В+	C+	C+ C+	C-	
	c. Minorities & Scheduled Castes/Tribes	C+	A+	B +	C+	A+	B +	C+	C+	C-	
2	Local Economy such as Employment and Livelihood etc.	B +	B +	Е	C+	C+	C+	D+	C+	D-	
3	Land Use and Utilization of Local Resources	Е	Е	Е	Е	D-	D-	Е	Е	C-	
4	Social Institutions, Social Infrastructures and Local Decision- making Process	Е	Е	E	Е	D+	D+	D+	D+	C+	
5	Existing Infrastructures and Services	B +	A+	B +	C+	D+	B +	D+	B +	C+	
6	Vulnerable Social Groups such as the Poor and Indigenous People										
	a. Households below the Poverty Line	Ε	E	Е	Е	C+	C+	B +	C+	Ε	
	b. Scheduled Castes and Tribes	E	E	E	E	C+	C+	B+	C+	E	
7	Gender Children's Rights	<u>Е</u> Е	E E	E E	E E	C+ E	E E	C+ E	E E	E E	
9	Distribution of Benefits and Losses and Equality in the Development Process	E	E	E	E	B+	B+	D+	C+	E	
10	Local Conflict of Interests	Ε	Е	Е	Е	B-	D-	D-	Е	B-	
11	Cultural Property and Heritage	Ε	E	Е	Ε	E	E	Ε	E	C-	
12	Public Health Conditions a. Infectious Diseases (including HIV/AIDS)	Е	Е	D+	Е	D+	D+	D+	Е	C-	
	b. Other Health Problems	Ε	Е	C+	Е	C+	C+	C+	C+	Ε	
13	Water Rights/Rights of Common Land	Е	Е	Е	Е	Е	Е	Е	Е	C-	
14	Hazards and Risk										
	a. Traffic Accidents	E	E	D+	E	E	E	E	E	E	
	b. Natural Hazards	E	E	E	E	E	E Di Nagla	E	Ε	Ε	

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

5.5.2 Mahesana

	Project Activities	Overall	PRE-	CONSTRUCTION S	TAGE
Sl. No.	Environmental & Social Issues	Evaluation on the Project	Surveying of Planned Areas and Sites	Selection of the Project Location & Sites	Land Acquisition and Resettlement
1	Involuntary Resettlement				
	d. General People	C-	Ε	A-	A-
	e. Socially and Physically Disadvantaged	C-	E	D-	D-
	f. Minorities & Scheduled Castes/Tribes	C-	Ε	А-	А-
2	Local Economy such as Employment and Livelihood etc.	C+	Е	Е	Ε
3	Land Use and Utilization of Local Resources	В-	Е	Е	A-
4	Social Institutions, Social Infrastructures and Local Decision-making Process	C+	E	C+	B +
5	Existing Infrastructures and Services	B +	E	E	E
6	Vulnerable Social Groups such as the Poor and Indigenous People				
	c. Households below the Poverty Line	D-	D-	D-	D-
	d. Scheduled Castes and Tribes	D-	D-	D-	D-
7	Gender	D+	E	Ε	Ε
8	Children's Rights	Ε	Е	Ε	Ε
9	Distribution of Benefits and Losses and Equality in the Development Process	B +	Е	Е	Ε
10	Local Conflict of Interests	В-	Е	A-	A-
11	Cultural Property and Heritage	D-	Е	D-	D-
12	Public Health Conditions				
	c. Infectious Diseases (including HIV/AIDS)	D-	Е	Е	Ε
	d. Other Health Problems	D+	Е	Е	Ε
13	Water Rights/Rights of Common Land	D-	E	E	E
14	Hazards and Risk				
	c. Traffic Accidents	D-	E	Ε	E
	d. Natural Hazards	D-	E	E	Ε

A: Significant impact, B: Relatively Significant impact, C: Insignificant impact, D: Neglectable impact,

E: No impact , -: Negative impact, +: Positive impact

	\backslash												
	Project Activities		the	and	nes	Construction		s for Railv structures		d rela	ated	the	to
SI. No.	Environmental & Social Issues	Quarry & Borrow Areas	Earth Moving: Cutting and Filling of Construction Works	Preparation of Construction Plants, a Warehouses, Work Camps, etc.	Operation of Construction Plants, Machines & Vehicles for Construction Works	(A) Construction of Railway Lines & 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 ROBs and RUBs	(E) Construction Works for Bridges	(F) Construction Works for Tunnels	Localized Employment Opportunities of the Construction Works	Localized Business Opportunities Related the Construction Works
1	Involuntary Resettlement d. General People	C-	Е	C-	E	A-	D-	B-	C-	Е	Е	A .	A .
	e. Socially and Physically Disadvantaged	с.	E	с. с.	E	A- A-	D-	В-	с. с.	E	E	<u>A+</u> A+	<u>A+</u> A+
	f. Minorities & Scheduled Castes/Tribes	C-	Е	C-	Е	А-	D-	B-	C-	E	E	A+	A+
2	Local Economy such as Employment and Livelihood etc.	B+	B +	Е	C+	B +	B+	B+	B+	B+	E	A+	A+
3	Land Use and Utilization of Local Resources	B-	В-	C-	Е	A-	В-	В-	C-	D-	C-	C+	C+
4	Social Institutions, Social Infrastructures and Local Decision-making Process	E	Е	B+	Е	B +	B +	B+	B+	B+	E	D+	D+
5	Existing Infrastructures and Services	Е	Е	Е	D+	B +	B +	B +	B +	B+	B +	C+	C+
6	Vulnerable Social Groups such as the Poor and Indigenous People												
	c. Households below the Poverty Line	E	Е	C+	Ε	C-	C-	C-	C-	C-	Е	C+	D+
	d. Scheduled Castes and Tribes	Е	Е	C+	Е	C-	C-	C-	C-	C-	Е	C+	D+
7	Gender Children's Rights	E E	E E	E E	E	E	E E	E E	E E	E E	E E	D+ E	D+ E
9	Distribution of Benefits and Losses and Equality in		E	E	E	E	E	E	E	E	E	B+	E B+
10	the Development Processes Local Conflict of Interests	B-	C-	B-	D-	D-	B-	A-	A-	Е	Е	C-	C-
10 11	Cultural Property and Heritage	Б- Е	E	B- E	E	D-	B- E	A- E	A- E	E	E	E	E
12	Public Health Conditions c. Infectious Diseases												
	(including HIV/AIDS)	Е	Е	D-	D-	D-	D-	D-	D-	D-	D-	Е	E
	d. Other Health Problems	D-	D-	D-	D-	D-	D-	D-	D-	D-	D-	D-	D-
13 14	Water Rights/Rights of Common Land Hazards and Risk	D-	D-	D-	D-	D-	D-	D-	D-	D-	Е	Е	E
	c. Traffic Accidents	Е	Е	Е	D-	D-	D-	D-	D-	D-	Е	Е	E
	d. Natural Hazards	C-	C-	Е	Е	Е	Е	Е	Е	D-	C-	Е	Е
				~		O I		-					

A: Significant impact, B: Relatively Significant impact, C: Insignificant impact, D: Neglectable impact,

E: No impact, -: Negative impact, +: Positive impact

		POST - CONSTRUCTION STAGE								
Sl. No.	Project Activities Environmental & Social Issues	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
1	Involuntary Resettlement d. General People	C+	A+	B+	C+	A+	B+	C+	C+	C-
	e. Socially and Physically Disadvantaged	C+	A+	B+	C+	A+ A+	B+	C+	C+	C-
	f. Minorities & Scheduled Castes/Tribes	C+	A+	B +	C+	A+	B +	C+	C+	C-
2	Local Economy such as Employment and Livelihood etc.	B +	B +	Е	C+	C+	C+	D+	C+	D-
3	Land Use and Utilization of Local Resources	Е	E	Е	Е	D-	D-	Е	Е	C-
4	Social Institutions, Social Infrastructures and Local Decision- making Process	Ε	Е	Е	Е	D+	D+	D+	D+	C+
5	Existing Infrastructures and Services	B+	A+	B +	C+	D+	B +	D+	B +	C+
6	Vulnerable Social Groups such as the Poor and Indigenous People									
	c. Households below the Poverty Line	Ε	E	Е	Ε	C+	C+	B +	C+	Е
	d. Scheduled Castes and Tribes	E	Ε	Е	Ε	C+	C+	B +	C+	E
7	Gender	E	E	E	E	C+	E	C+	E	E
<u>8</u> 9	Children's Rights Distribution of Benefits and Losses and Equality in the Development Process	E E	E E	E E	E E	Е В+	E B+	E D+	E C+	E E
10	Local Conflict of Interests	Ε	E	Е	Е	B-	D-	D-	E	В-
11	Cultural Property and Heritage	Ε	E	Е	Ε	Ε	Е	E	E	D-
12	Public Health Conditions c. Infectious Diseases (including HIV/AIDS)	Е	Е	D+	Е	D+	D+	D+	Е	C-
	d. Other Health Problems	Е	Е	C+	Е	C+	C+	C+	C+	Е
13	Water Rights/Rights of Common Land	E	E	E	E	E	E	E	E	C-
14	Hazards and Risk									
	c. Traffic Accidents	Ε	E	D+	Е	Е	Ε	Е	E	E
	d. Natural Hazards	Е	Ε	Ε	Ε	Ε	Е	Ε	Ε	E

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

5.5.3 Gandhinagar

	Project Activities	Overall	PRE-	CONSTRUCTION S	ГАGE
Sl. No.	Environmental & Social Issues	Evaluation on the Project	Surveying of Planned Areas and Sites	Selection of the Project Location & Sites	Land Acquisition and Resettlement
1	Involuntary Resettlement				
	g. General People	D-	E	D-	D-
	h. Socially and Physically Disadvantaged	D-	E	D-	D-
	i. Minorities & Scheduled Castes/Tribes	D-	Е	D-	D-
2	Local Economy such as Employment and Livelihood etc.	C+	E	E	Ε
3	Land Use and Utilization of Local Resources	В-	E	E	A-
4	Social Institutions, Social Infrastructures and Local Decision-making Process	C+	E	C+	B +
5	Existing Infrastructures and Services	B +	E	Е	Е
6	Vulnerable Social Groups such as the Poor and Indigenous People				
	e. Households below the Poverty Line	D-	D-	D-	D-
	f. Scheduled Castes and Tribes	D-	D-	D-	D-
7	Gender	D+	E	Е	E
8	Children's Rights	Ε	E	Е	Ε
9	Distribution of Benefits and Losses and Equality in the Development Process	B +	E	E	Ε
10	Local Conflict of Interests	C-	E	D-	D-
11	Cultural Property and Heritage	Ε	E	E	Ε
12	Public Health Conditions				
	e. Infectious Diseases (including HIV/AIDS)	D-	E	E	Ε
	f. Other Health Problems	D+	Е	Е	Ε
13	Water Rights/Rights of Common Land	D-	E	E	Ε
14	Hazards and Risk				
	e. Traffic Accidents	D-	E	E	Ε
	f. Natural Hazards	D-	E	E	Е

A: Significant impact, B: Relatively Significant impact, C: Insignificant impact, D: Neglectable impact,

E: No impact, -: Negative impact, +: Positive impact

	Ν	CONSTRUCTION STAGE											
	Project		the	and	es	Construction	on Work	s for Railv	vay line an	d rela	ted	he	to
	Activities		of		Operation of Construction Plants, Machines & Vehicles for Construction Works	s & ials,	and	structures	and			Localized Employment Opportunities of the Construction Works	Localized Business Opportunities Related to the Construction Works
			Filling	n Plants, .c.	eration of Construction Plants, []] Vehicles for Construction Works	Line s (sigr	ICDs) Construction Works for Stations rminal, Junction and Crossing)	ROBs	idges	nnels	ortunit	ities F
SI.			and	ictior ps, et	on P tion	lway Silitie	for	s foi rossi	for F	r Bri	r Tu	oddC	ortun
No.	\backslash	vreas	Cutting orks	nstru Camj	ructi struc	Rai d Fac	orks	Vork nd C	orks	ks fo	ks fo	ient (Oppo orks
		/ MO.	: Cu Vorks	f Co /ork	Con	n of elate	n Wo Park	on V ion a	M U	Wor	Wor	loym Vorks	ness on Wo
		Borı	Moving: uction Wo	on of es, W	of C s for	uction of R	iction istic	ructi Junct	rction	ction	ction	Emp ion V	Busi uctic
	Environmental	ry &	n Mo truct	aratic	ation chicle	onstr ntion tc.)	nstru t Log	Const nal, J	nstru	nstru	ıstru	lized truct	lized onstr
	& Social Issues	Quarry & Borrow Areas	Earth Moving: Cut Construction Works	Preparation of Construction Warehouses, Work Camps, etc.	Oper & V((A) Construction of Railway Lines & Installation of Related Facilities (signals, rails, etc.)	(B) Construction Works for ICDs Freight Logistic Parks	(C) Construction Works for S (Terminal, Junction and Crossing)	(D) Construction Works for ROBs and RUBs	(E) Construction Works for Bridges	(F) Construction Works for Tunnels	Localized Employme Construction Works	Localized Business Opp the Construction Works
1	Involuntary Resettlement g. General People	D-	Е	D-	E	D-	D-	D-	D-	Е	Е	D+	D+
	h. Socially and	D -		D-			<u> </u>						
	Physically Disadvantaged	D-	Е	D-	Е	D-	D-	D-	D-	E	Е	D+	D+
	i. Minorities & Scheduled Castes/Tribes	D-	Е	D-	Е	D-	D-	D-	D-	Е	Е	D+	D+
2	Local Economy such as Employment and	B+	B+	Е	C+	B+	B+	B+	B +	B+	Е	A+	A+
	Livelihood etc. Land Use and Utilization												
3	of Local Resources	B-	В-	C-	E	А-	В-	В-	C-	D-	C-	C+	C+
4	Social Institutions, Social Infrastructures and Local Decision-making Process	Е	Е	B +	Е	B +	B+	B+	B +	B+	Е	D+	D+
5	Existing Infrastructures and Services	Е	Е	Е	D+	B +	B +	B+	B +	B+	B +	C+	C+
6	Vulnerable Social Groups such as the Poor and												
	Indigenous People e. Households below												
	f. Scheduled Castes and	Е	Е	C+	E	C-	C-	C-	C-	C-	Е	C+	D+
	Tribes	Е	Е	C+	E	C-	C-	C-	C-	C-	Е	C+	D+
7	Gender Children's Rights	E E	E E	E E	E E	E E	E E	E E	E E	E E	E	D+ E	D+ E
0	Distribution of Benefits	Ľ	Ľ	Ľ	Ľ	Ľ	Ľ	Ľ	Ľ	Ľ	Ľ	Ľ	Ľ
9	and Losses and Equality in the Development Processes	C+	Е	Е	Е	Ε	Е	Е	Е	Е	Е	B +	B +
10	Local Conflict of Interests	B-	C-	В-	D-	D-	В-	A-	A-	E	Е	C-	C-
11	Cultural Property and Heritage	Е	Е	Е	Е	Е	Е	Е	Ε	Е	Е	Е	Е
12	Public Health Conditions e. Infectious Diseases												
	e. Infectious Diseases (including HIV/AIDS)	Е	Е	D-	D-	D-	D-	D-	D-	D-	D-	Е	Е
	f. Other Health Problems	D-	D-	D-	D-	D-	D-	D-	D-	D-	D-	D-	D-
13	Water Rights/Rights of Common Land	D-	D-	D-	D-	D-	D-	D-	D-	D-	Е	Е	Е
14	Hazards and Risk												
	e. Traffic Accidents	Е	Е	Е	D-	D-	D-	D-	D-	D-	Е	Е	Е
	f. Natural Hazards	C-	C-	E	E	E	E	E	E	D-	C-	Ε	Е
	A: Significant impact. F	P Do	latival	Simifi	cont impost	C: Incian	itioant in	nnoot D	 Maglaata 	hlai	mnoo	+	

A: Significant impact, B: Relatively Significant impact, C: Insignificant impact, D: Neglectable impact,

E: No impact, -: Negative impact, +: Positive impact

		POST - CONSTRUCTION STAGE								
Sl. No.	Project Activities Environmental & Social Issues	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 Opportunities	Passenger Oriented Business Opportunities	Promoting Development of Surrounding Area	Increase in Settlers and Visitors to the Project Area
1	Involuntary Resettlement g. General People	C+	A .	B+	C+	A .	B+	C+	C+	C-
	g. General People h. Socially and Physically Disadvantaged	C+	A+ A+	<u>в</u> +	C+	A+ A+	в+ В+	C+	C+	C-
	i. Minorities & Scheduled Castes/Tribes	C+	A+	B +	C+	A+	B +	C+	C+	C-
2	Local Economy such as Employment and Livelihood etc.	B +	B +	Е	C+	C+	C+	D+	C+	D-
3	Land Use and Utilization of Local Resources	Е	Е	Е	Е	D-	D-	Е	Е	C-
4	Social Institutions, Social Infrastructures and Local Decision- making Process	Е	Е	E	Е	D+	D+	D+	D+	C+
5	Existing Infrastructures and Services	B +	A+	B +	C+	D+	B+	D+	B+	C+
6	Vulnerable Social Groups such as the Poor and Indigenous People									
	e. Households below the Poverty Line	Е	Е	Е	Е	C+	C+	B +	C+	Е
	f. Scheduled Castes and Tribes	Ε	E	Ε	Ε	C+	C+	B +	C+	E
7	Gender	E	E	E	E	C+	E	C+	E	E
8 9	Children's Rights Distribution of Benefits and Losses and Equality in the Development Process	E E	E E	E E	E E	E B+	E B+	E D+	E C+	E E
10	Local Conflict of Interests	Ε	Е	Е	Ε	B-	D-	D-	Е	B-
11	Cultural Property and Heritage	Ε	Е	Е	Е	Ε	Е	E	E	Е
12	Public Health Conditions									
	e. Infectious Diseases (including HIV/AIDS)	Е	Е	D+	Е	D+	D+	D+	Е	C-
	f. Other Health Problems	Ε	E	C+	Ε	C+	C+	C+	C+	Е
13	Water Rights/Rights of Common Land	Е	Е	Е	Е	Е	Е	Ε	Е	C-
14	Hazards and Risk									
	e. Traffic Accidents	E	E	D+	E	E	E	E	E	E
	f. Natural Hazards	E	E	E	E	E	E	Ε	E	Ε

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

5.5.4 Ahmedabad

	Project Activities	Overall	PRE-	CONSTRUCTION S'	ГАGE
Sl. No.	Environmental & Social Issues	Evaluation on the Project	Surveying of Planned Areas and Sites	Selection of the Project Location & Sites	Land Acquisition and Resettlement
1	Involuntary Resettlement				
	j. General People	C-	Ε	А-	A-
	k. Socially and Physically Disadvantaged	C-	Е	D-	D-
	1. Minorities & Scheduled Castes/Tribes	C-	Е	А-	А-
2	Local Economy such as Employment and Livelihood etc.	C+	E	Ε	Ε
3	Land Use and Utilization of Local Resources	B-	Е	Ε	А-
4	Social Institutions, Social Infrastructures and Local Decision-making Process	C+	Е	C+	B +
5	Existing Infrastructures and Services	B +	Е	E	E
6	Vulnerable Social Groups such as the Poor and Indigenous People				
	g. Households below the Poverty Line	D-	D-	D-	D-
	h. Scheduled Castes and Tribes	D-	D-	D-	D-
7	Gender	D+	Е	Ε	Е
8	Children's Rights	Е	Е	E	E
9	Distribution of Benefits and Losses and Equality in the Development Process	B +	E	Ε	Е
10	Local Conflict of Interests	В-	Е	A-	A-
11	Cultural Property and Heritage	Е	Е	E	E
12	Public Health Conditions				
	g. Infectious Diseases (including HIV/AIDS)	D-	Е	Ε	Ε
	h. Other Health Problems	D+	Е	E	E
13	Water Rights/Rights of Common Land	D-	Е	Ε	Ε
14	Hazards and Risk				
	g. Traffic Accidents	D-	Ε	Ε	Ε
	h. Natural Hazards	D-	E	Ε	E

A: Significant impact, B: Relatively Significant impact, C: Insignificant impact, D: Neglectable impact,

E: No impact, -: Negative impact, +: Positive impact

			CONSTRUCTION STAGE										
	Project Activities		the	and	nes	Construction		s for Railv structures	vay line an	d rela	ated	the	to
SI. No.	Environmental & Social Issues	Quarry & Borrow Areas	Earth Moving: Cutting and Filling of Construction Works	Preparation of Construction Plants, a Warehouses, Work Camps, etc.	Operation of Construction Plants, Machines & Vehicles for Construction Works	(A) Construction of Railway Lines & 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 ROBs and RUBs	(E) Construction Works for Bridges	(F) Construction Works for Tunnels	Localized Employment Opportunities of the Construction Works	Localized Business Opportunities Related the Construction Works
1	Involuntary Resettlement j. General People	C-	Е	C-	E	A-	D-	B-	C-	Е	Е	A .	A+
	k. Socially and Physically Disadvantaged	<u>с</u> .	E	с- С-	E	A-	D-	B- B-	с- С-	E	E	A+ A+	A+ A+
	l. Minorities & Scheduled Castes/Tribes	C-	E	C-	Ε	А-	D-	B-	C-	E	E	A+	A+
2	Local Economy such as Employment and Livelihood etc.	B+	B+	Е	C+	B +	B+	B+	B+	B+	E	A+	A+
3	Land Use and Utilization of Local Resources	B-	B-	C-	Е	A-	В-	В-	C-	D-	C-	C+	C+
4	Social Institutions, Social Infrastructures and Local Decision-making Process	E	E	B+	Е	B +	B+	B +	B+	B +	E	D+	D+
5	Existing Infrastructures and Services	E	Е	Е	D+	B+	B +	B +	B +	B +	B +	C+	C+
6	Vulnerable Social Groups such as the Poor and Indigenous People												
	g. Households below the Poverty Line	E	Е	C+	Ε	C-	C-	C-	C-	C-	Е	C+	D+
	h. Scheduled Castes and Tribes	E	Е	C+	Ε	C-	C-	C-	C-	C-	Е	C+	D+
7	Gender Children's Rights	E E	E E	E E	E E	E E	E E	E E	E E	E E	E E	D+ E	D+ E
9	Distribution of Benefits and Losses and Equality in the Development Processes		E	E	E	E	E	E	E	E	E	B+	B+
10	Local Conflict of Interests	B-	C-	B-	D-	D-	B-	A-	A-	Е	Е	C-	C-
11	Cultural Property and Heritage	E	Е	Е	E	Е	Е	Е	Е	Е	Е	Е	Е
12	Public Health Conditions g. Infectious Diseases (including HIV/AIDS)	Е	E	D-	D-	D-	D-	D-	D-	D-	D-	E	Е
	h. Other Health Problems	D-	D-	D-	D-	D-	D-	D-	D-	D-	D-	D-	D-
13	Water Rights/Rights of Common Land	D-	D-	D-	D-	D-	D-	D-	D-	D-	Е	Е	E
14	Hazards and Risk g. Traffic Accidents	Е	E	Е	D-	D-	D-	D-	D-	D-	Е	Е	Е
	h. Natural Hazards	C-	C-	Е	Е	Е	Е	Е	Е	D-	C-	Е	Е

A: Significant impact, B: Relatively Significant impact, C: Insignificant impact, D: Neglectable impact,

E: No impact, -: Negative impact, +: Positive impact

	POST - CONSTRUCTION STAGE											
Sl. No.	Project Activities Environmental & Social Issues	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 Opportunities	Passenger Oriented Business Opportunities	Promoting Development of Surrounding Area	Increase in Settlers and Visitors to the Project Area		
1	Involuntary Resettlement j. General People	C+	A+	B+	C+	A+	B+	C+	C+	C-		
	k. Socially and Physically Disadvantaged	C+	A+	B+	C+	A+ A+	B+	C+	C+	C-		
	1. Minorities & Scheduled Castes/Tribes	C+	A+	B +	C+	A+	B +	C+	C+	C-		
2	Local Economy such as Employment and Livelihood etc.	B +	B +	Е	C+	C+	C+	D+	C+	D-		
3	Land Use and Utilization of Local Resources	Е	Е	Е	Е	D-	D-	Е	Е	C-		
4	Social Institutions, Social Infrastructures and Local Decision- making Process	Ε	Е	E	Е	D+	D+	D+	D+	C+		
5	Existing Infrastructures and Services	B +	A+	B +	C+	D+	B +	D+	B+	C+		
6	Vulnerable Social Groups such as the Poor and Indigenous People											
	g. Households below the Poverty Line	Ε	Ε	Е	Е	C+	C+	B +	C+	Е		
	h. Scheduled Castes and Tribes	Ε	E	Ε	Ε	C+	C+	B +	C+	Ε		
7	Gender	E	E	E	E	C+	E	C+	E	E		
8 9	Children's Rights Distribution of Benefits and Losses and Equality in the Development Process	E E	E E	E E	E E	E B+	E B+	E D+	E C+	E E		
10	Local Conflict of Interests	Ε	Ε	Е	Ε	B-	D-	D-	Е	B-		
11	Cultural Property and Heritage	Ε	E	Е	Е	Ε	Е	Ε	E	Ε		
12	Public Health Conditions											
	g. Infectious Diseases (including HIV/AIDS)	Ε	Е	D+	Е	D+	D+	D+	Е	C-		
	h. Other Health Problems	Ε	E	C+	Е	C+	C+	C+	C+	E		
13	Water Rights/Rights of Common Land	Е	Е	Е	Е	Е	Е	Е	Е	C-		
14	Hazards and Risk											
	g. Traffic Accidents	E	E	D+	E	E	E	E	E	E		
	h. Natural Hazards	E	E	E	E	E	E	E	Ε	Ε		

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

	Project Activities	Overall	PRE-	CONSTRUCTION S	TAGE
Sl. No.	Environmental & Social Issues	Evaluation on the Project	Surveying of Planned Areas and Sites	Selection of the Project Location & Sites	Land Acquisition and Resettlement
1	Involuntary Resettlement				
	m. General People	C-	E	C-	C-
	n. Socially and Physically Disadvantaged	C-	Е	D-	D-
	o. Minorities & Scheduled Castes/Tribes	C-	Е	C-	C-
2	Local Economy such as Employment and Livelihood etc.	C+	Е	E	Е
3	Land Use and Utilization of Local Resources	В-	Е	E	A-
4	Social Institutions, Social Infrastructures and Local Decision-making Process	C+	Е	C+	B +
5	Existing Infrastructures and Services	B +	Ε	E	Ε
6	Vulnerable Social Groups such as the Poor and Indigenous People				
	i. Households below the Poverty Line	D-	D-	D-	D-
	j. Scheduled Castes and Tribes	D-	D-	D-	D-
7	Gender	D +	Ε	Е	Ε
8	Children's Rights	Ε	Ε	Е	Ε
9	Distribution of Benefits and Losses and Equality in the Development Process	B +	Е	E	Е
10	Local Conflict of Interests	В-	Ε	А-	A-
11	Cultural Property and Heritage	Е	Е	Е	Е
12	Public Health Conditions				
	i. Infectious Diseases (including HIV/AIDS)	D-	Е	E	E
	j. Other Health Problems	D +	E	Е	E
13	Water Rights/Rights of Common Land	D-	Е	Е	Е
14	Hazards and Risk				
	i. Traffic Accidents	D-	Ε	Е	Ε
	j. Natural Hazards	D-	Ε	E	E

5.5.5 Kheda

A: Significant impact,
E: No impact ,B: Relatively Significant impact,
- : Negative impact,

C: Insignificant impact, + : Positive impact D: Neglectable impact,

	Ν		CONSTRUCTION STAGE										
	Project Activities		the	and	nes	Construction		s for Railv structures	vay line an	d rela	ated	the	to
Sl. No.	Environmental & Social Issues	Quarry & Borrow Areas	Earth Moving: Cutting and Filling of Construction Works	Preparation of Construction Plants, a Warehouses, Work Camps, etc.	Operation of Construction Plants, Machines & Vehicles for Construction Works	(A) Construction of Railway Lines & 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 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
1	Involuntary Resettlement m. General People	C-	Е	C-	Е	A-	D-	B-	C-	Е	Е	A+	A+
	n. Socially and Physically Disadvantaged	<u>с</u> .	E	с- С-	E	A- A-	D-	<u>В-</u>	с- С-	E	E	A+	A+ A+
	o. Minorities & Scheduled Castes/Tribes	C-	E	C-	Ε	А-	D-	В-	C-	E	E	A+	A+
2	Local Economy such as Employment and Livelihood etc.	B+	B +	Е	C+	B +	B +	B+	B+	B +	Е	A+	A+
3	Land Use and Utilization of Local Resources	B-	B-	C-	Е	A-	В-	B-	C-	D-	C-	C+	C+
4	Social Institutions, Social Infrastructures and Local Decision-making Process	Е	Е	B +	Е	B +	B +	B +	B +	B +	E	D+	D+
5	Existing Infrastructures and Services	E	Е	Е	D+	B +	B +	B +	B +	B+	B+	C+	C+
6	Vulnerable Social Groups such as the Poor and Indigenous People												
	i. Households below the Poverty Line	E	Е	C+	Е	C-	C-	C-	C-	C-	Е	C+	D+
	j. Scheduled Castes and Tribes	Е	Е	C+	Е	C-	C-	C-	C-	C-	Е	C+	D+
7	Gender Children's Diahts	E	E	E	E	E	E	E	E	E	E	D+	D+
8 9	Children's Rights Distribution of Benefits and Losses and Equality in	E C+	E E	E E	E E	E E	E E	E E	E	E E	E E	E B+	<u>Е</u> В+
10	the Development Processes Local Conflict of Interests	B-	C-	B-	D-	D-	B-	A-	A-	Е	Е	C-	C-
11	Cultural Property and Heritage	E	E	E	E	E	E	E	E	E	E	E	E
12	Public Health Conditions												
	i. Infectious Diseases (including HIV/AIDS)	E	Е	D-	D-	D-	D-	D-	D-	D-	D-	Е	Е
	j. Other Health Problems	D-	D-	D-	D-	D-	D-	D-	D-	D-	D-	D-	D-
13 14	Water Rights/Rights of Common Land Hazards and Risk	D-	D-	D-	D-	D-	D-	D-	D-	D-	Е	Е	Е
14	i. Traffic Accidents	Е	Е	Е	D-	D-	D-	D-	D-	D-	E	Е	Е
	j. Natural Hazards	C-	C-	Е	E icant impa	Ε	Е	E	Е	D-	C-	E	Е

A: Significant impact, B: Relatively Significant impact, $E:\operatorname{No}$ impact , -: Negative impact,

C: Insignificant impact, + : Positive impact

D: Neglectable impact,

Sl.	POST - CONSTRUCTION STAGE									
No.	Project Activities Environmental & Social Issues	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
1	Involuntary Resettlement m. General People	C+	A+	B+	C+	A+	B +	C+	C+	C-
	n. Socially and Physically Disadvantaged	C+	A+ A+	B+	C+	A+ A+	B+	C+	C+	C-
	o. Minorities & Scheduled Castes/Tribes	C+	A+	B +	C+	A+	B +	C+	C+	C-
2	Local Economy such as Employment and Livelihood etc.	B +	B +	Е	C+	C+	C+	D+	C+	D-
3	Land Use and Utilization of Local Resources	Е	Е	Е	Е	D-	D-	Е	Е	C-
4	Social Institutions, Social Infrastructures and Local Decision- making Process	Е	Е	E	Е	D+	D+	D+	D+	C+
5	Existing Infrastructures and Services	B +	A+	B +	C+	D+	B +	D+	B +	C+
6	Vulnerable Social Groups such as the Poor and Indigenous People									
	i. Households below the Poverty Line	Ε	Е	Е	Е	C+	C+	B +	C+	Е
7	j. Scheduled Castes and Tribes	E	E	E	E	C+	C+	B +	C+	E
7	Gender Children's Rights	<u>Е</u> Е	E E	E E	E E	C+ E	E E	C+ E	E E	E E
9	Distribution of Benefits and Losses and Equality in the Development Process	E	E	E	E	B+	B+	D+	C+	E
10	Local Conflict of Interests	Ε	Е	Е	Е	В-	D-	D-	Е	В-
11	Cultural Property and Heritage	Ε	Ε	Е	Е	E	Ε	E	Ε	Е
12	Public Health Conditions i. Infectious Diseases (including HIV/AIDS)	Е	Е	D+	Е	D+	D+	D+	Е	C-
	j. Other Health Problems	Ε	E	C+	E	C+	C+	C+	C+	Е
13	Water Rights/Rights of Common Land	Е	Е	E	Е	Е	Е	Е	Е	C-
14	Hazards and Risk									
	i. Traffic Accidents	E	E	D+	E	E	E	E	E	E
	j. Natural Hazards A: Significant impact B: Relatively Signif	E	E	E	E	E	E	E	Ε	Ε

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

5.5.6 Anand, Vadodara

	Project Activities	Overall	PRE-	PRE-CONSTRUCTION STAGE				
Sl. No.	Environmental & Social Issues	Evaluation on the Project	Surveying of Planned Areas and Sites	Selection of the Project Location & Sites	Land Acquisition and Resettlement			
1	Involuntary Resettlement							
	p. General People	C-	E	C-	C-			
	q. Socially and Physically Disadvantaged	C-	Е	D-	D-			
	r. Minorities & Scheduled Castes/Tribes	C-	Е	C-	C-			
2	Local Economy such as Employment and Livelihood etc.	C+	Е	E	Е			
3	Land Use and Utilization of Local Resources	В-	Е	E	А-			
4	Social Institutions, Social Infrastructures and Local Decision-making Process	C+	Е	C+	B +			
5	Existing Infrastructures and Services	B +	Е	Е	Ε			
6	Vulnerable Social Groups such as the Poor and Indigenous People							
	k. Households below the Poverty Line	D-	D-	D-	D-			
	1. Scheduled Castes and Tribes	D-	D-	D-	D-			
7	Gender	D+	Е	Ε	Ε			
8	Children's Rights	Ε	Е	Ε	Ε			
9	Distribution of Benefits and Losses and Equality in the Development Process	B +	E	E	Е			
10	Local Conflict of Interests	В-	E	А-	A-			
11	Cultural Property and Heritage	Е	E	Е	E			
12	Public Health Conditions							
	k. Infectious Diseases (including HIV/AIDS)	D-	E	E	E			
	1. Other Health Problems	D+	Е	Е	E			
13	Water Rights/Rights of Common Land	D-	Е	Е	Е			
14	Hazards and Risk							
	k. Traffic Accidents	D-	E	E	E			
	1. Natural Hazards	D-	Е	Е	Е			

A: Significant impact,B: Relatively Significant impact,E: No impact ,- : Negative impact,

C: Insignificant impact, + : Positive impact D: Neglectable impact,

$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		\backslash		CONSTRUCTION STAGE										
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$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		& Social Issues	Quarry & Borrow Areas	Moving: Cutting and Filling uction Works	of Construction Plants, Work Camps, etc.	Operation of Construction Plants, Machi & Vehicles for Construction Works	 (A) Construction of Railway Lines & Installation of Related Facilities (signals, rails, etc.) 	(B) Construction Works for ICDs and Freight Logistic Parks	- E	(D) Construction Works for ROBs and RUBs	(E) Construction Works for Bridges	(F) Construction Works for Tunnels	Localized Employment Opportunities of Construction Works	Localized Business Opportunities Related the Construction Works
q. Socially Physically DisadvantagedC.EC.EA.D.B.C.EA.A.r. Minorities Castes/Tribes $\&$ C.EC.EC.EA.D.B.C.EA.A.2Local Economy such as trivelod etc.B.B.B.C.EA.A.B.B.C.EA.A.3Local Economy such as of Local ResourcesB.B.C.EA.B.B.C. </td <td>1</td> <td></td> <td>C</td> <td>F</td> <td>C</td> <td>F</td> <td>•</td> <td>D</td> <td>D</td> <td>C</td> <td>F</td> <td>F</td> <td>A .</td> <td>A 1</td>	1		C	F	C	F	•	D	D	C	F	F	A .	A 1
r.Minorities& Scheduled Castes/TribesC-EC-EA-D-B-C-EA+A+1Local Economy such as Employment and B+ of Local ResourcesB+B+B+B+B+B+B+B+B+A+A+3Land Use and Utilization of Local ResourcesB-B-C-EA-B-B-C-D-C-C+C+C+4Infrastructures and Local Ecision-making ProcessEEB+EB+D+ <td< td=""><td></td><td>q. Socially and Physically</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>A+ A+</td></td<>		q. Socially and Physically												A+ A+
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		r. Minorities & Scheduled	C-	E	C-	Е	А-	D-	B-	C-	Е	Е	A +	A+
3of Local ResourcesB-C-EA-B-C-D-C-C+C+C+Social Institutions, SocialInfrastructures and LocalEEB+EB+B+B+B+B+B+B+B+D+5Existing InfrastructuresEEED+B+B+B+B+B+B+B+B+C+C+7Social Groups6such as the Poor and Indigenous PeopleEEC+EC-C-C-C-C-EC+D+1.Scheduled Castes and TribesEEC+EC-C-C-C-C-EC+D+7GenderEEEEEEEEEEEEEE9and Losses and Equality in the Development ProcessesC+EEED+D	2	Employment and Livelihood etc.	B+	B +	Е	C+	B +	B +	B+	B+	B +	Е	A+	A+
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	3	of Local Resources	B-	В-	C-	Е	А-	В-	В-	C-	D-	C-	C+	C+
5and ServicesEEEED+B+B+B+B+B+B+B+C+C+Vulnerable Social Groups 6 such as the Poor and Indigenous People<	4	Infrastructures and Local	Е	Е	B+	Ε	B +	B+	B +	B +	B +	Е	D+	D+
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	5	and Services	Е	Е	Е	D+	B +	B +	B +	B +	B +	B +	C+	C+
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	6	such as the Poor and Indigenous People												
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8Children's RightsEE <td>7</td> <td>Tribes</td> <td></td> <td>D+</td>	7	Tribes												D+
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k.Infectious (including HIV/AIDS)EEED-D-D-D-D-D-D-D-EE1.Other ProblemsHealth ProblemsD-D-D-D-D-D-D-D-D-D-D-D-13Water Common LandRights/Rights of Common LandD-D-D-D-D-D-D-D-D-D-D-14Hazards and Risk1.Natural HazardsC-C-EEEEEEEEEE1.Natural HazardsC-C-EEEEEEEEEEE		Heritage	Е	Е	Е	Е	Е	E	Е	Е	Е	Е	Е	Е
I.Other ProblemsHealth D-D-D-D-D-D-D-D-D-D-13Water Rights/Rights of Common LandD-D-D-D-D-D-D-D-D-D-14Hazards and Risk	12	k. Infectious Diseases (including	Е	Е	D-	D-	D-	D-	D-	D-	D-	D-	Е	Е
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k. Traffic AccidentsEEED-D-D-D-D-EEE1. Natural HazardsC-C-EEEEEED-C-EE		Common Land	D-	D-	D-	D-	D-	D-	D-	D-	D-	Е	Е	Е
I. Natural Hazards C- C- E E E E E D- C- E E	14													
A: Significant impact, B: Relatively Significant impact, C: Insignificant impact, D: Neglectable impact,														

A: Significant impact, B: Relatively Significant impact, $E:\operatorname{No}$ impact , -: Negative impact,

C: Insignificant impact, + : Positive impact

	Project POST - CONSTRUCTION STAGE											
Sl. No.	Project Activities Environmental & Social Issues	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 Opportunities	Passenger Oriented Business Opportunities	Promoting Development of Surrounding Area	Increase in Settlers and Visitors to the Project Area		
1	Involuntary Resettlement p. General People	C+	A+	B+	C+	A+	B+	C+	C+	C-		
	 q. Socially and Physically Disadvantaged 	C+	A+	B+	C+	A+ A+	B+	C+	C+	C-		
	r. Minorities & Scheduled Castes/Tribes	C+	A+	B+	C+	A+	B +	C+	C+	C-		
2	Local Economy such as Employment and Livelihood etc.	B +	B +	Е	C+	C+	C+	D+	C+	D-		
3	Land Use and Utilization of Local Resources	Е	Е	Е	Е	D-	D-	Е	Е	C-		
4	Social Institutions, Social Infrastructures and Local Decision- making Process	Ε	Е	Е	Е	D+	D+	D+	D+	C+		
5	Existing Infrastructures and Services	B+	A+	B+	C+	D+	B +	D+	B+	C+		
6	Vulnerable Social Groups such as the Poor and Indigenous People											
	k. Households below the Poverty Line	Ε	E	Е	Ε	C+	C+	B +	C+	Е		
	1. Scheduled Castes and Tribes	Ε	Ε	E	Ε	C+	C+	B +	C+	E		
7	Gender	E	E	E	E	C+	E	C+	E	E		
<u>8</u> 9	Children's Rights Distribution of Benefits and Losses and Equality in the Development Process	E E	E E	E E	E E	E B+	Е В+	E D+	E C+	E E		
10	Local Conflict of Interests	Ε	Е	Е	Е	B-	D-	D-	Е	B-		
11	Cultural Property and Heritage	E	E	Е	E	E	E	E	E	E		
12	Public Health Conditions k. Infectious Diseases (including HIV/AIDS)	Е	Е	D+	Е	D+	D+	D+	Е	C-		
	1. Other Health Problems	Е	Е	C+	Е	C+	C+	C+	C+	Е		
13	Water Rights/Rights of Common Land	Ε	Е	Е	Е	Е	Е	Е	Е	C-		
14	Hazards and Risk											
	k. Traffic Accidents	Ε	Ε	D+	Е	Е	Е	Ε	Ε	Е		
	1. Natural Hazards	Ε	Ε	Е	Ε	Ε	Ε	Ε	E	E		

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

CHAPTER 6 POLLUTION CONTROL MEASURES

6.1 INTRODUCTION

The Central Pollution Control Board (CPCB) is the statutory organization responsible to prevent and control pollution. It serves as a field formation and also provides technical services to the Ministry of Environment and Forests of the provisions of the Environment (Protection) Act, 1986. State Pollution Control Board (SPCB) plays the role in environmental management at the state level.

Pollution control study involves monitoring of Noise and Vibration along the Proposed DFC at selected Sensitive Receptors. Public consultation has been undertaken to get local people perception about the environmental quality. To establish the air quality, water quality, noise level, Soil quality etc. of the study corridor, secondary data have been collected from the Annual Report (2006-2007) of Gujarat Pollution Control Board and reviewed. Indian Relevant Standard regarding water, air, noise is presented in Annex -6.1

6.2 EXISTING CONDITION OF ENVIRONMENTAL PARAMETERS

6.2.1 Air Quality

Ambient air quality data has been collected from Gujarat State Pollution Control Board. In Banaskantha, Patan and Mahesana 24 hourly values of RSPM & SPM were observed to be above the limit of 100 μ g/m³ and 200 μ g/m³ respectively for residential, rural & other areas as stipulated in the National Ambient Air Quality Standards. In most of the locations of Gandhinagar, 24 hourly values of SPM was also observed to be above the limit (200 μ g/m³). At some locations, the value of RSMP was within the limit (100 μ g/m³) for residential, rural and other areas as stipulated in the National Ambient Air Quality Standards. In Ahmedabad, Anand and Vadodara also, except few locations, the 24 hourly values of SPM were observed above the limit of 200 μ g/m³ and 100 μ g/m³. Secondary data on ambient air quality is not available for Kheda district. The standards are reproduced in **Table 6-1**.

District	Location	Location	RSPM	SPM	SO ₂	NO _x
District	Code	Location	$(\mu g/m^3)$	$(\mu g/m^3)$	$(\mu g/m^3)$	$(\mu g/m^3)$
Banaskantha	AQ1	Near Hotel Capple, Palanpur	210	803	4	14
Banaskantha	AQ2	Municipality Office, Deesa	112	327	3	10
Patan	AQ1	Bagvada Darwaja	462	271	3	12
Mahesana	AQ1	Kadi Municipality Office	274	72	3	12
Mahesana	AQ2	At R.O. GPCB	381	121	4	17
Mahesana	AQ3	At R.O. GPCB	131	69	4	12
Gandhinagar	AQ1	Kadi School, Sector 23, Gandhinagar	319	137	5	24
Gandhinagar	AQ2	Dehgam Bus Stand	292	63	4	14
Gandhinagar	AQ3	St. Xaviers' High School, Sec. 8, Gandhinagar	389	81	9	12
Gandhinagar	AQ4	Switch YaRD, GEB, Gandhinagar	277	113	6	27
Gandhinagar	AQ5	IFFCO, Kalol	103	38	3	12
Gandhinagar	AQ6	At CEDS, GIDC, Kalol	578	147	3	16
Ahmedabad	AQ1	Cadila Loboratories, Narol	94	170	13	22
Ahmedabad	AQ2	Cadila Loboratories, Narol	112	231	12	25
Ahmedabad	AQ3	L.D. Engineering College, Ahmedabad	56	185	8	15
Ahmedabad	AQ4	L.D. Engineering College,	63	140	9	18

 Table 6-1 Ambient Air Quality

District	Location	Location	RSPM	SPM	SO ₂	NO _x
District	Code	Location	$(\mu g/m^3)$	$(\mu g/m^3)$	$(\mu g/m^3)$	(µg/m ³)
		Ahmedabad				
Ahmedabad	AQ5	Nehru Bridge, Ahmedabad	165	491	23	37
Ahmedabad	AQ6	CETP, Vatva GIDC	154	365	26	62
Ahmedabad	AQ7	GIDC Office, Naroda	87	395	8	21
Ahmedabad	AQ8	GIDC Office, Naroda	146	329	14	29
Ahmedabad	AQ9	At CETP, Odhav	125	340	8	18
Ahmedabad	AQ10	TPAEC, Sabarmati	138	349	6	21
Ahmedabad	AQ11	Karanj Police Station	299	483	6	28
Ahmedabad	AQ12	Gujarat Vidhyapith, Ahmedabad	86	297	5	17
Ahmedabad	AQ13	Municipality Office, Bavla	281	655	5	16
Ahmedabad	AQ14	Viramgam Bus Stand	39	147	3	13
Ahmedabad	AQ15	Sharadaben Hospital, Saraspur	84	193	11	22
Ahmedabad	AQ16	R.C. Technical High School, Mirzapur	81	207	10	22
Ahmedabad	AQ17	Behrampura	82	181	10	21
Anand	AQ1	Fire Station, Sadar Gunj	399	107	1	7
Anand	AQ2	Municipality Office, Petlad	194	91	1	5
Anand	AQ3	Municipality Office, Khambhat	305	89	1	14
Vadodara	AQ1	GIDC Office, Nandesari	187	263	4	15
Vadodara	AQ2	Laxmipura	119	197	1	12
Vadodara	AQ3	GPCB Office, Vadodara	115	174	10	19
Vadodara	AQ4	Fire Station, Vadodara	134	235	17	26
Vadodara	AQ5	Makarpura	79	187	18	22
Vadodara	AQ6	Subhanpura	139	248	9	16
Vadodara	AQ7	Karelibaug, Vadodara	31	168	6	19
Vadodara	AQ8	RO, GPCB Office	102	233	7	14
Vadodara	AQ9	RO, GPCB Office	115	174	10	19
Vadodara	AQ10	Sayajigunj Police Chowki	159	552	1	14
Vadodara	AQ11	Bakul Aromatics, BIDC Gorwa	135	344	2	13
Vadodara	AQ12	GIDC Makarpura	102	315	18	2
Vadodara	AQ13	I.D Hospital, Karelibaug	58	239	7	19
Vadodara	AQ14	Alembic Road, Vadodara	98	208	11	19
Vadodara	AQ15	Lanxess ABS Ltd. Nandesari	154	437	3	20
Vadodara	AQ16	Dandia Bazar, Vadodara	155	385	19	26
Vadodara	AQ17	Dandia Bazar, Vadodara	134	236	17	26

6.2.2 Water Quality

(1) Banaskantha

Surface Water Quality: Banas, Balaram, Arjuni, Saraswati and Sabarmati are the main rivers of Banaskantha district, out of which, secondary data on water quality is available only for Sabarmati River. The data is presented in **Table 6-2.**

Location	pН	TDS (mg/L)	DO (mg/L)	BOD (mg/L)	COD (mg/L)	TKN (mg/L)	NO ₂ -N (mg/L)	NO ₃ -N (mg/L)	TC MPN/ 100 ml	FC MPN/ 100 ml
Kheroj bridge	8.2	-	7.2	3	8	-	-	-	-	-
Hansol bridge	8.1	-	7.3	3	18	-	-	-	-	-
Vasna – Narol bridge	7.4	-	2.3	84	205	-	-	-	-	-
Vautha village	7.6	-	1.1	43	128	-	-	-	-	-
Miroli	7.5	-	0.7	65	150	-	-	-	-	-
Kheroj bridge	8.3	294	8.1	3	8	0.56	0.04	1.38	20	4
V.N. bridge	6.5	2,058	0.0	280	408	20.16	0.05	0.04	150,000	-

 Table 6-2
 Water Quality Data of the Sabarmati River

Source: Annual Report of Gujarat Pollution Control Board (2006-2007)

pH values were varies between (6.5-8.2) which were within the tolerance limit of 6.5-8.5 and the water is slightly alkaline. The value of TDS was ranging between 294-2,058 mg/l. Such medium to high values of TDS indicate that the water is appreciably mineralized. Levels of dissolved oxygen were varying between 0.0-8.1 mg/l and in three locations the value was above the permissible limit of 4 mg/l for Natural regeneration/ fish. reoxygenation could be main



reason of such levels of DO and pH. BOD varied between 3-280 mg/l indicating the presence of strong organic loads in most of the monitoring points.

The overall water of the river was not healthy and clean state in the monitored section and was significantly affected by extraneous pollution as evidenced from the observed value of BOD (280 mg/l).

Ground Water Quality: The available ground water quality data of three locations namely Ambaji, Deesa and Palanpur is presented in **Table 6-3**.

There has been little fluctuation in pH with overall range of 7.6-8.2, generally above the neutral mark, which were within the permissible limits of 6.5-8.5 stipulated in drinking water quality standards. TDS ranged between 680-1,298mg/l, having the value above the prescribed limit of 500 mg/l for drinking water. Such high value of TDS indicates that the water is highly mineralized of that area. Nitrate ranged between 1.7-5.4 mg/l, having the value within the prescribed limit of 45 mg/l for drinking water.

		Water Quality Parameters												
Location/Village Name	рН	TDS (mg/L)	DO (mg/L)	COD (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Fluorides (mg/L)	NH ₃ -N (mg/L)	TC MPN/ 100 ml	FC MPN/ 100 ml				
Tube well, Ambaji	7.6	1,298	4.6	20	5.4	0.03	1.09	-	<2	<2				
Tube well, Deesa	8.2	680	7.2	5	1.7	0.02	0.86	-	<2	<2				
Tube well, Palanpur	8.0	1,194			3.8	0.01	0.68	-	<2	<2				

 Table 6-3 Ground Water Quality Data

Source: Annual Report of Gujarat Pollution Control Board (2006-2007)

(2) Patan

Surface Water Quality: Saraswati is the main river of Patan district. But secondary data on water quality of Saraswati River is not available.

Ground Water Quality: The available ground water quality data of two locations namely Sidhpur and Patan is presented in Table 6-4.

There has been little fluctuation in pH with overall range of 7.6-8.4, generally above the neutral mark, which were within the permissible limits of 6.5-8.5 stipulated in drinking water quality standards. TDS ranged between 1,034-1,126 mg/l, having the value above the prescribed limit of 500 mg/l for drinking water. Such high value of TDS indicates that the water is highly mineralized of that area. Nitrate ranged between 0.72-4.96 mg/l, having the

05

value within the prescribed limit of 45 mg/l for drinking water. The ground water of the area has fecal contamination.

					Water Qu	ality Para	ameters			
Location/Village Name	рН	TDS (mg/L)	DO (mg/L)	COD (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Fluorides (mg/L)	NH ₃ -N (mg/L)	TC MPN/ 100 ml	FC MPN/ 100 ml
Tube well, Sidhapur	8.4	1,034	6.2	9	4.96	0.01	1.42	-	<2	<2
Tube well, Patan	7.6	1,126	5.5	9	0.72	0.01	1.78	-	<2	<2

 Table 6-4 Ground Water Quality Data

Source: Annual Report of Gujarat Pollution Control Board (2006-2007)

(3) Mahesana

Surface Water Quality: The Saraswati, Khari and Rupen are the main rivers of Mahesana district. DFC alignment crosses Khari River twice in Mahesana district. However, secondary data of river water quality is not available.

Ground Water Quality: The State Pollution Control Boards of Gujarat are doing the ground water quality monitoring of Mahesana District at several locations. The available ground water quality monitoring data is presented in **Table 6-5**.

There has been little fluctuation in pH with overall range of 7.6-7.9, generally above the neutral mark, which was within the permissible limits of 6.5-8.5 stipulated in drinking water quality standards. TDS ranged between 1,098-1,436 mg/l, having the value above the prescribed limit of 500 mg/l for drinking water in most of the locations. Such high value of TDS indicates that the water is highly mineralized of that area. Nitrate ranged between 1.9-4.8 mg/l, having the value within the prescribed limit of 45 mg/l for drinking water.

					Water Qu	ality Para	ameters			
Location/Village Name	рН	TDS (mg/L)	DO (mg/L)	COD (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Fluorides (mg/L)	NH ₃ -N (mg/L)	TC MPN/ 100 ml	FC MPN/ 100 ml
Tube well, Kadi	7.6	1,098	4.9	10	4.8	0.04	1.09	-	<2	<2

6

3.3

Table 6-5 Ground Water Quality Data

1,436 Source: Annual Report of Gujarat Pollution Control Board (2006-2007)

7.9

(4) Gandhinagar

Tube well, Mehsana

Surface Water Quality: There are only Sabarmati and Khari Rivers flowing through the district. Secondary data on water quality of Sabarmati River is not available. Further, the DFC alignment in Gandhinagar district does not cross any rivers.

1.9

0.02

1.31

Ground Water Quality: The available ground water quality data of one location is presented in Table 6-6.

Location/		Water Quality Parameters									
Village Name	рН	TDS (mg/L)	DO (mg/L)	COD (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Fluorides (mg/L)	NH ₃ -N (mg/L)	TC MPN/ 100 ml	FC MPN/ 100 ml	
Tube wel Kalol	^{l,} 7.5	1540	6.4	15	4.3	0.04	1.02	-	<2	<2	

Table 6-6 Ground Water Quality Data of Kalol

Source: Annual Report of Gujarat Pollution Control Board (2006-2007)

From the above data it can be concluded that ground water is highly mineralized. However, the physico-chemical quality satisfy the desired limit of the Drinking Water Standards and all the parameters are well within the maximum permissible limit and it does not pose threat to the health of the population concerned.

(5) Ahmedabad

Surface Water Quality: Sabarmati is the principal river of the district. It enters the district in the extreme north-eastern side and flows in southerly direction which ultimately merges along with its tributary i.e. Bhogava in the Gulf of Khambhat. Other river is Bhadar which also flows eastward and merges in the same Gulf.

The State Pollution Control Boards of Gujarat are doing the water quality monitoring of the Sabarmati River. The ranges of water quality observed in river Sabarmati with respect to pH, DO, BOD, COD, TDS, Coliform etc. are presented in **Table 6-7**



Location	pН	TDS (mg/L)	DO (mg/L)	BOD (mg/L)	COD (mg/L)	TKN (mg/L)	NO ₂ -N (mg/L)	NO ₃ -N (mg/L)	TC MPN/ 100 ml	FC MPN/ 100 ml
Kheroj bridge	8.2	-	7.2	3	8	-	-	-	-	-
Hansol bridge	8.1	-	7.3	3	18	-	-	-	-	-
Railway bridge, Ahmadabad	8.0	-	6.0	4	27	-	-	-	-	-
Vasna – Narol bridge	7.4	-	2.3	84	205	-	-	-	-	-
Vautha village	7.6	-	1.1	43	128	-	-	-	-	-
Miroli	7.5	-	0.7	65	150	-	-	-	-	-
Kheroj bridge	8.3	294	8.1	3	8	0.56	0.04	1.38	20	4
Railway bridge, Ahmadabad	7.8	222	7.4	5	16	1.68	0.11	0.46	460	-

Table 6-7	Water (Juality	Data of	the	Sabarmati River
	vvalei V	zuanty	Data UI	uie	Sabalmati Nivel

Source: Annual Report of Gujarat Pollution Control Board (2006-2007)

pH values were varies between 7.4 and 8.3 which are within the tolerance limit of 6.5-8.5 and the water is slightly alkaline. Levels of dissolved oxygen are varying between 0.7 and 8.1 mg/l which were above the permissible limit of 4 mg/l for fish in most of the monitoring location. Natural regeneration/reoxygenation could be main reason of such levels of DO and pH. BOD varied between 3 and 84 mg/l indicating the absence of strong oxidisable loads in the monitoring points. The overall water of the river was in healthy and clean state in the monitored section.

Ground Water Quality: The State Pollution Control Boards of Gujarat are doing the ground water quality monitoring of Ahmedabad district at several locations. The available ground water quality monitoring data is presented in **Table 6-8**.

					Water Qu	ality Para	meters			
Location/Village Name	рН	TDS (mg/L)	DO (mg/L)	COD (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Fluorides (mg/L)	NH ₃ -N (mg/L)	TC MPN/ 100 ml	FC MPN/ 100 ml
Tube well, Piplaj	8.1	1,388	0.0	19	3.20	0.07	1.84	-	<2	<2
Tube well, Viramgam	8.2	1,306	4.4	8	0.04	0.01	1.82	-	<2	<2
Tube well, Bavala	7.9	1,340	3.8	6	0.14	0.01	1.82	-	<2	<2
Tube well, Dholka	7.7	1,564	6.0	6	14.64	0.5	1.86	-	<2	<2
Tube well, Bareja	7.9	1,882	4.2	8	1.54	0.02	1.88	-	<2	<2
Tube well, Kalok	7.2	502	-	14	0.38	0.05	0.33	-	0	0

Table 6-8 Ground Water Quality Data

Source: Annual Report of Gujarat Pollution Control Board (2006-2007)

There has been little fluctuation in pH with overall range of 7.2-8.2, generally above the neutral mark, which were within the permissible limits of 6.5-8.5 stipulated in drinking water quality standards. TDS ranged between 502-1,882 mg/l, having the value above the prescribed limit of 500 mg/l for drinking water. Such high value of TDS indicates that the water is highly mineralized of that area. Nitrate ranged between 0.04-14.64 mg/l, having the value within the prescribed limit of 45 mg/l for drinking water. The ground water of the area has fecal contamination.

(6) Kheda

Surface Water Quality: The Sabarmati, Mahi, Vatrak and Khari are the main rivers of the district. Secondary data on river water quality (Sabarmati, Mahi, Vatrak and Khari Rivers) is not available.

Ground Water Quality: Ground water quality of Kheda district is presented in Table 6-9.

					Water Qu	ality Para	meters			
Location/Village Name	рН	TDS (mg/L)	DO (mg/L)	COD (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Fluorides (mg/L)	NH ₃ -N (mg/L)	TC MPN/ 100 ml	FC MPN/ 100 ml
Bore well, Balasinor	8.2	226	6.2	7	0.14	BDL	0.40	0.10	7	2
Bore well, Sevalia	8.1	1,842	5.1	7	0.14	0.01	0.53	0.08	15	4
Bore well, Pali	7.4	1,566	5.2	10	0.18	0.01	0.67	0.10	9	2
Bore well, Thasara Water Works	7.6	658	2.9	3	0.18	0.01	0.67	0.10	7	2
Bore well, Dakur Municipality	8.6	826	6.4	7	0.37	BDL	0.53	0.15	9	<2
Bore well, Umerth Water Works	7.2	1,026	2.7	3	0.28	0.01	0.40	0.10	11	4
Bore well, Ode Grampanchayat	8.0	568	6.0	3	0.55	BDL	0.40	0.08	9	2
Bore well, Sarsa Grampanchayat	8.1	516	5.7	3	1.1	BDL	0.53	0.13	15	2
Bore well, Uttarsanda	7.8	714	6.2	7	0.98	BDL	0.53	0.08	9	2
Bore well, Dumral	8.1	924	4.0	10	0.09	BDL	0.27	0.08	11	2
Bore well, Mehmadabad Water Works	7.4	1,374	5.3	7	1.07	BDL	0.53	0.08	20	2
Bore well, Near Mumtaz Theatre, Mehmadabad	8.2	606	7.1	10	0.58	0.02	0.40	0.05	15	2
Bore well, Matafal Industries, Nadiad	7.8	1,650	6.1	7	1.34	BDL	0.27	0.08	11	2
Bore well, Ramji Temple Chaklasi	8.1	1,140	6.1	10	1.02	0.04	0.53	0.05	20	2
Bore well, Danadara	7.4	484	3.3	3	1.38	BDL	0.67	0.08	14	2
Bore well, Laxmi Mill compound, Kapadwanj	7.9	594	4.7	7	0.92	0.01	0.80	0.05	15	2
Bore well, Grampanchayat office, Kathlal	7.5	506	4.5	10	0.92	0.01	0.53	0.10	7	2

Table 6-9	Ground	Water	Quality	v Data
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There has been little fluctuation in pH with overall range of 7.2-8.2, generally above the neutral mark, which were within the permissible limits of 6.5-8.5 stipulated in drinking water quality standards. TDS ranged between 226 and 1,842 mg/l, having the value above the prescribed limit of 500 mg/l for drinking water in most of the locations. Such value of TDS indicates that the water is highly mineralized. Nitrate ranged between 0.14 and 1.38 mg/l, having the value within the prescribed limit of 45 mg/l for drinking water.

From above it can be concluded that the physico-chemical quality does satisfy the desired limit of the Drinking Water Standards and all the parameters are well within the maximum permissible limit and it does not pose threat to the health of the population concerned.

(7) Anand

Surface Water Quality: River Mahi is the main river of the district. The State Pollution Control Boards of Gujarat at 7 locations are doing the water quality monitoring of the river Mahi and it's tributaries. The monitoring locations are on mainstream of river Mahi (7). The ranges of water quality observed in river Mahi, with respect to pH, DO, BOD, and COD are presented in **Table 6-10**.

Location		Water Qualit	y Parameters	
Location	рН	DO (mg/L)	BOD (mg/L)	COD (mg/L)
Anandpuri	8.3	9.0	2.3	7.0
Kadana Dam	8.1	8.2	2.1	10.0
Virpur	7.7	8.4	2.2	7.0
Sevalia	8.2	9.1	2.6	3.0
Vasad	8.3	8.4	2.5	10.0
Mujpur	8.1	9.3	4.0	17.0
Umeta	7.8	8.0	3.0	7.0

Table 6-10 Water Quality Data of the Mahi River

Source: Annual Report of Gujarat Pollution Control Board (2006-2007)

pH values were varies between (7.7-8.3) which are within the tolerance limit of 6.5-8.5 and the water is slightly alkaline. Levels of dissolved oxygen are varying between 8.0 and 9.3 mg/l which were above the permissible limit of 4 mg/l for fish. Natural regeneration/reoxygenation could be main reason of such levels of DO and pH. BOD varied between 2.1 and 4.0 mg/l indicating the absence of strong oxidisable loads in the monitoring points. The overall water of the river was in healthy and clean state in the monitored section.



Ground Water Quality: The State Pollution Control Boards of Gujarat are doing the ground

water quality monitoring of Anand district at several locations. The available ground water quality monitoring data is presented in **Table 6-11**.

There has been little fluctuation in pH with overall range of 7.4-8.3, generally above the neutral mark, which were within the permissible limits of 6.5-8.5 stipulated in drinking water quality standards. TDS ranged between 494 and 3,480 mg/l, having the value above the prescribed limit of 500 mg/l for drinking water in most of the locations. Such high value of TDS indicates that the water is highly mineralized of that area. Nitrate ranged between 0.23 and 2.68 mg/l, having the value within the prescribed limit of 45 mg/l for drinking water.

	Water Quality Parameters									
Location/Village Name	рН	TDS (mg/L)	DO (mg/L)	COD (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Fluorides (mg/L)	NH ₃ -N (mg/L)	TC MPN/ 100 ml	FC MPN/ 100 ml
Tube well, Vasad	7.6	494	5.1	7	0.23	BDL	0.30	0.10	9	2
Bore well, Khambhat	8.0	3,480	5.8	7	2.3	0.01	0.80	0.10	9	2
Bore well, Vasad	8.1	852	6.1	29	2.68	0.01	0.67	0.05	7	2
Bore well, Anklav	7.5	596	7.2	3	1.27	0.01	0.40	0.10	7	<2
Bore well, Umeta	7.8	626	6.7	6	0.89	0.01	0.53	0.10	9	2
Bore well, Mota Bazar, V.V. Nagar	7.5	700	5.8	7	1.56	0.01	0.27	0.10	9	2
Bore well, Karmsad	7.7	1,160	5.3	10	1.78	0.01	0.53	0.08	4	<2
Bore well, Anand- Sojitra Road	7.7	730	6.8	6	0.58	BDL	0.67	0.08	9	2
Bore well, Anand- Vidyanagar Road	7.4	636	5.0	3	1.15	BDL	0.40	0.08	15	4
Bore well, Lambhvel	7.7	580	6.9	7	0.81	0.01	0.40	0.10	9	2
Bore well, Hadgud	8.0	580	7.1	6	1.96	0.01	0.53	0.10	7	2
Bore well, Near Jalaram Temple, Dharmaj	7.6	894	4.0	6	1.84	0.01	0.27	0.08	9	2
Bore well, Opposite Ranchodraiji Temple, Petlad	7.4	722	3.7	7	1.56	0.01	0.40	0.08	7	2
Bore well, Municipality Office, Borsad	7.6	766	7.0	3	1.49	0.01	0.27	0.10	7	2
Bore well, Surya Temple, Borsad	7.6	904	4.8	10	0.81	BDL	0.53	0.10	15	2
Bore well, Khambhat	7.8	2,750	6.9	3	2.30	0.01	0.53	0.05	15	2
Bore well, Sokhada	8.2	1,160	6.8	10	1.38	0.02	0.40	0.08	7	2
Bore well, ONGC Colony, Khambhat	7.5	2,208	4.7	7	1.38	0.01	0.67	0.08	7	2
Bore well, GIDC Kansari	7.7	2,200	7.0	7	1.84	0.02	0.53	0.10	15	2
Bore well, Near Primary School, Kalamsar	8.3	580	6.5	10	0.69	BDL	0.53	0.10	7	2
Bore well, GWSSB, Dhuvaran	8.2	1,166	6.3	3	0.69	BDL	0.67	0.08	15	2
Bore well, Virsad	7.8	1,650	7.0	7	0.23	0.02	0.27	0.10	15	2

Table 6-11	Ground	Water	Quality Data
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(8) Vadodara

Surface Water Quality: Mahi and Vishwamitri are the principal rivers of Vadodara district. DFC alignment crosses the Mahi River, Mini Mahi River and Vishwamitri River in Vadodara district. The State Pollution Control Boards of Gujarat are doing the water quality monitoring of the river Mahi, Vishwamitri and it's tributaries. The ranges of water quality observed in river Mahi & Vishwamitri with respect to pH, DO, BOD, COD, Coliform etc. are presented in **Table 6-12** and **Table 6-13**.

Location	pН	TDS (mg/L)	DO (mg/L)	BOD (mg/L)	COD (mg/L)	TKN (mg/L)	NO ₂ -N (mg/L)	NO ₃ -N (mg/L)	TC MPN/ 100 ml	FC MPN/ 100 ml
Anandpuri	8.3	-	9.0	2.3	7	-	-	-	-	-
Kadana Dam	8.1	-	8.2	2.1	10	-	-	-	-	-
Virpur	7.7	-	8.4	2.2	7	-	-	-	-	-
Sevalia	8.2	-	9.1	2.6	3	-	-	-	-	-
Vasad	8.3	-	8.4	2.5	10	-	-	-	-	-
Mujpur	8.1	-	9.3	4.0	17	-	-	-	-	-
Umeta	7.8	-	8.0	3.0	7	-	-	-	-	-
Vasad, Vadodara	8.2	286	8.6	2.2	7	1.12	0.01	0.05	9	2
Sevalia, Kheda	8.4	250	9.3	-	3	0.83	0.01	0.05	15	2
Virpur	7.7	226	9.3	1.6	6	1.40	0.01	0.05	7	2

Table 6-12	Water	Quality	Data	of the	Mahi River
				••••••	

Mahi River: pH values were varies between 7.7-8.4 which are within the tolerance limit of 6.5-8.5 and the water is slightly alkaline. Levels of dissolved oxygen are varying between 8.0 and 9.3 mg/l which were above the permissible limit of 4 mg/l for fish. Natural regeneration/reoxygenation could be main reason of such levels of DO and pH. BOD varied between 1.6 and 4.0 mg/l indicating the absence of strong oxidisable loads in the monitoring points. The overall water of the river was in healthy and clean state in the monitored section.

Location	pН	TDS (mg/L)	DO (mg/L)	BOD (mg/L)	COD (mg/L)	TKN (mg/L)	NO ₂ -N (mg/L)	NO ₃ -N (mg/L)	TC MPN/ 100 ml	FC MPN/ 100 ml
Sayajibaug, Vadodara	7.7	574	5.9	5	10	5.04	0.01	1.61	21	4
Fatehgunj, Vadodara	7.9	730	3.4	12	47	5.6	0.01	1.61	28	2
Vadsar bridge, Vadodara	7.5	816	0.0	23	90	12.6	1.75	1.84	15	4
Munjmahuda, Vadodara	7.5	690	4.2	3	16	1.68	0.01	0.14	15	2

 Table 6-13 Water Quality Data of the Vishwamitri River

Source: Annual Report of Gujarat Pollution Control Board (2006-2007)

Vishwamitri River: pH values were varies between 7.5 and 7.9 which is within the tolerance limit of 6.5-8.5 and the water is slightly alkaline. Levels of dissolved oxygen are varying between 0.0 and 5.9 mg/l which is below the permissible limit of 4 mg/l for fish in most of the monitoring points. Values of TDS are varying between 574 and 816. It can be concluded that, high TDS reduces sunlight penetration, lowers the rate of photosynthesis of phytoplanktons and thus lowers the rate of oxygen production in the water column. This is the reason behind such low level of DO. BOD varied between 3and 23 mg/l and maximum probable number of total coliform is varying 15-28/100ml. The overall water of the river was not in healthy and clean state in the monitored section.

Ground Water Quality: The State Pollution Control Boards of Gujarat are doing the ground water quality monitoring of Vadodara district at several locations. The available ground water quality monitoring data is presented in **Table 6-14**.

Location/Village Name	Water Quality Parameters									
	рН	TDS (mg/L)	DO (mg/L)	COD (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Fluorides (mg/L)	NH ₃ -N (mg/L)	TC MPN/ 100 ml	FC MPN/ 100 ml
Bore well, Tilakwada	8.1	1,518	7.1	3	0.22	0.01	0.67	0.08	15	2
Bore well, Parda Water Works	7.9	1,776	3.9	10	0.37	0.01	0.50	0.13	7	2
Bore well, GIDC Ramangamadi	8.1	1,152	3.6	10	0.37	BDL	0.80	0.10	9	2
Bore well, Varnama	8.1	840	3.7	7	0.41	BDL	0.67	0.08	7	<2
Bore well, Primary School Koyali	7.9	1,136	7.0	6	1.34	0.01	0.53	0.08	9	<2
Bore well, Dashrath	7.4	1,764	2.7	10	2.68	BDL	0.67	0.08	15	2
Bore well, Padmala	7.7	1,434	7.1	20	1.23	0.01	0.67	0.05	11	2
Bore well, Chhotaudepur	8.2	294	7.0	6	0.22	BDL	0.40	0.08	11	4
Bore well, Kadipani	7.8	570	6.5	3	0.56	BDL	0.40	0.10	11	2
Bore well, Kawant	7.5	600	7.0	3	0.11	BDL	0.53	0.10	21	2
Bore well, Pavi-Jetpur	7.8	484	5.8	3	0.67	BDL	0.27	0.10	21	2
Bore well, Bodeli	7.5	740	6.4	6	0.56	BDL	0.27	0.08	4	<2
Bore well, Sankeda	7.9	560	7.2	6	1.45	BDL	0.53	0.08	9	<2
Bore well, Waghodia	7.3	1,154	6.3	6	1.78	0.01	0.40	0.08	15	2
Bore well, Enviro Infrastructure, Umaraya	7.2	2,820	6.0	3	1.23	0.02	0.53	0.08	11	4
Bore well, Conserve Chemicals, Luna	7.9	732	6.0	3	2.68	0.01	0.27	0.05	15	4
Bore well, Bajwa	7.9	870	4.9	26	2.45	BDL	0.40	0.08	9	2
Bore well, Grampanchayat Water Works, Bajwa	7.5	1,154	5.5	6	2.45	0.07	0.67	0.10	9	2
Bore well, Grampanchayat Water Works, Karachia	7.7	872	5.1	6	2.45	BDL	0.53	0.10	15	4
Bore well, Karachia	7.5	750	6.6	6	2.23	0.01	0.40	0.10	7	2
Tube well, Karachia	8.1	972	7.0	10	2.23	0.01	0.27	0.10	7	2
Bore well, Grampanchayat Water Works, Chhani	8.1	1,248	7.1	6	1	0.01	0.40	0.08	9	<2
Tube well, Chhani	8.0	1,272	7.0	6	2.0	0.01	0.27	0.08	15	4
Tube well, Undera	7.9	1,380	6.0	6	4.46	0.01	0.27	0.05	7	2
Bore well, Grampanchayat office, Undera	7.9	720	7.1	10	0.56	0.01	0.4	0.10	15	2
Bore well, Rampura	7.5	4,804	3.9	6	2.68	0.01	0.53	0.08	21	4
Bore well, Angadh	7.7	1,314	7.2	10	1.0	0.02	0.40	0.10	15	4
Tube well, Grampanchayat office, Jespur	7.6	902	7.4	6	1.12	0.01	0.53	0.05	7	2
Tube well, Varai Mata Temple, Luna	8.0	406	7.3	3	0.67	0.01	0.40	0.08	7	2

Table 6-14 Ground Water Quality Data

There has been little fluctuation in pH with overall range of 7.2-8.2, generally above the neutral mark, which were within the permissible limits of 6.5-8.5 stipulated in drinking water quality standards. TDS ranged between 406 and 4,804mg/l, having the value above the prescribed limit of 500 mg/l for drinking water in most of the locations. Such high value of TDS indicates that the water is highly mineralized of that area. Nitrate ranged between 0.11 and 4.46 mg/l, having the value within the prescribed limit of 45 mg/l for drinking water. The ground water of the area has fecal contamination.

6.2.3 Soil Quality

(1) Banaskantha

Secondary data on soil quality for Banaskantha district is not available. However, the soils of **Banaskantha** districts are poorest from agriculture point of view as the soil is deficient in organic matter and nitrogen. The sub soil well waters are however, highly saline and are not normally useful for irrigation. In western part of the district, saline soil is found with salt content varying from 0.5 to 2.5%. The western part of Banaskantha districts has coarse shallow soils derived from granites, known as alluvial soil. The soil type of the study corridor is mixed, calcareous, coarse, loamy soil with slight to moderate salinity.

(2) Patan

Secondary data on soil quality for Patan district is not available. However, the soils of **Patan** district in general are very deep (>150 cm) somewhat excessively to well drained and sandy to fine loamy in texture. They are slight to moderately alkaline and moderate to strongly calcareous: slightly eroded and saline. Salinity and sodicity increases in the areas adjoining the Rann.

(3) Mahesana

The soils of Mahesana district are poorest from agriculture point of view as the soil is deficient in organic matter and nitrogen. The sub soil well waters are however, highly saline and are not normally useful for irrigation. In western part of the district, saline soil is found with salt content varying from 0.5 to 2.5%. However, 90% of the soils of this area is of sandy nature, a soil which is black in colour is met with in patches, chiefly in south-west parts of Mehsana district. The western part of Mahesana district has coarse shallow soils derived from granites, known as alluvial soil. The DFC alignment in Mahesana district is passing through alluvial plain. Soil quality data collected from secondary sources is presented in **Table 6-15**.

Parameters	Values					
Farameters	Location-1	Location-2				
Coarse sand (%)	44.97	-				
Fine sand (%)	30.26	76.60				
Silt (%)	5.42	6.80				
Clay (%)	7.82	9.35				
Moisture (%)	1.26	1.59				
$CaCO_3(\mu g/g)$	8.25	-				
Nitrogen (µg/g)	0.067	0.036				
pH	8.5	7.5				
Total K ₂ O (µg/g)	0.212	-				
Total $P_2O_5(\mu g/g)$	0.141	-				
Available K_2O (µg/g)	0.0173	-				
Available $P_2O(\mu g/g)$	0.0376	-				
C/N ratio	9.8	-				

Source: District Gazetteer

(4) Gandhinagar

Secondary data on soil quality for Gandhinagar district is not available. However, the DFC alignment in Gandhinagar district is passing through alluvial plain. Gandhinagar district has sandy loam soils locally known as *goradu* which owe their origin to the Indo-Gangetic alluvium. This is one of the most fertile parts of the state and agriculturally much advanced.

(5) Ahmedabad

The soils of Ahmedabad district has sandy loam soils locally known as *goradu* which owe their origin to the Indo-Gangetic alluvium. The DFC alignment in Ahmedabad district is passing through alluvial plain. Soil quality data collected from secondary sources is presented in **Table 6-16**.

Parameters	Values
Coarse sand (%)	4.21
Fine sand (%)	33.78
Silt (%)	23.50
Clay (%)	21.35
Moisture (%)	8.42
$CaCO_3(\mu g/g)$	9.42
Nitrogen (µg/g)	0.068
pH	8.5
Total K ₂ O (µg/g)	0.042
Total $P_2O_5(\mu g/g)$	0.065
Available $K_2O(\mu g/g)$	0.0118
Available $P_2O(\mu g/g)$	0.0034
C/N ratio	9.5

 Table 6-16 Soil Quality Data of District Ahmedabad

Source: District Gazetteer

(6) Kheda

The DFC alignment in Valsad district is passing through alluvial plain. The soils in the **Kheda** district is popularly known as "pieces of gold" they respond vary well to manuring and irrigation Soil quality of Kheda, collected from secondary sources is presented in **Table 6-17**.

Parameters	Value
Coarse sand (%)	4.21
Fine sand (%)	33.78
Silt (%)	23.50
Clay (%)	21.35
Moisture (%)	8.42
$CaCO_3(\mu g/g)$	9.42
Nitrogen (µg/g)	0.068
pH	8.5
Total K ₂ O (μ g/g)	0.042
Total $P_2O_5(\mu g/g)$	0.065
Available $K_2O(\mu g/g)$	0.0118
Available $P_2O(\mu g/g)$	0.0034
C/N ratio	9.5

Table 6-17 Soil Quality of Kheda

Source: District Gazetteer

(7) Anand

The DFC alignment in Anand district is passing through alluvial plain. Soil quality data collected from secondary sources is presented in **Table 6-18**.

4.21
4.21
33.78
23.50
21.35
8.42
9.42
0.068
8.5
0.042
0.065
0.0118
0.0034
9.5

Table 6-18 Soil Quality Data of Anand

Source: District Gazetteer

(8) Vadodara

The soils of Vadodara districts are deep black and are very rich and fertile and suitable for cotton, jawar, rice, wheat and other garden crops. The DFC alignment in Vadodara district is passing through alluvial plain. Soil quality data collected from secondary sources is presented in Table 6-19.

Parameters	Values				
	Location-1	Location-2			
Coarse sand (%)	0.74	0.22			
Fine sand (%)	76.57	49.03			
Silt (%)	8.25	27.80			
Clay (%)	11.25	9.25			
Moisture (%)	2.2	4.45			
$CaCO_3(\mu g/g)$	0.26	-			
Nitrogen (µg/g)	0.053	0.062			
pH	7.8	7.8			
Total $K_2O(\mu g/g)$	0.120	0.110			
Total $P_2O_5(\mu g/g)$	0.139	0.107			
Available $K_2O(\mu g/g)$	0.0130	0.0060			
Available $P_2O(\mu g/g)$	0.0170	0.0085			
C/N ratio	9.8	9.8			

Table 6-19 Soil Quality Data of Vadodara District

Source: District Gazetteer

6.2.4 Solid Waste

The DFC alignment in Gujarat state is passing through rural areas, where the solid waste collection system does not exist. Villagers usually dispose their waste locally as it is mostly biodegradable. Municipal towns with domestic solid waste collection system are shown below.

S. No.	District	Municipal Towns along the alignment of DFC with solid waste collection system
1.	Banaskantha	Palanpur
2.	Patan	Sidhpur
3.	Mehsana	Unjha
4.	Gandhinagar	-
5.	Ahemdabad	Bavla
6.	Kheda	-
7.	Anand	Karamsad
8.	Vadodara	Vadodara, Karjan

There are no major industries close to the alignment in this district.

6.2.5 Noise & Vibration Level

Noise and Vibration monitoring has been conducted at the Sensitive Receptors along the railway in Patan, Gandhinagar, Anand and Vadodara districts and the analysis of data shows that noise level is higher than the permissible limit.

6.2.6 Ground Subsistence

No incidence of ground subsidence has been reported in the Gujarat State.

6.3 NOISE AND VIBRATION SURVEY

6.3.1 Background

One of the major environmental concerns arises out of the railway operation is the noise and vibration. While vibration may lead to damage of cultural assets and other establishments near railway track, noise has impacts on the human health. The country has definite statutory specifications, rules and regulations regarding noise level at different regions (provided in **Annex-2**). The noise and vibration survey has therefore been incorporated in the scope of study as a very important requirement to study the feasibility of a dedicated freight corridor (DFC) construction.

6.3.2 Purpose of Noise and Vibration Monitoring

Noise Monitoring:

The measurements are carried out to assure current noise levels at the selected sites for assessment of noise produced by various kinds of trains. The trains selected are passenger trains, freight trains with covered wagon and uncovered wagon, diesel and electric trains. The purpose of noise monitoring is to find out the increase in noise level by the running train covering peak noise (Lp), sound Exposure level (LAE), Equivalent noise level (L_{Aeq}).

Vibration Monitoring:

The measurements are carried out to assess the ground vibrations in proximity of the railway tracks due to movement of different categories of trains. The scope covers the plain routes as well as different types of bridges. The measurements are also expected to provide the attenuation pattern of vibrations with the change of distance from centerline of the railway track. This is established by measuring at specified distances (12.5 m, 25 m and 50 m) away from the centerline of the track.

6.3.3 Approach and Methodology of Railway Noise and Vibration Measurement

(1) Selection of Sensitive Receptors

As per the agreed methodologies, for noise and vibration survey a primary field visit was conducted to identify the locations of sensitive receptors. Total 20 points for ambient noise and vibration survey and 5 points of detailed railway noise and vibration survey were identified, along with a few other optional points where the measurement could be done if any of the scheduled point is missed. A few of the points selected for ambient noise and vibration measurement have also been chosen for measuring the noise and vibration level at the time of when a train either passenger or freight is passing by the existing railway track. Hence, the noise and vibration survey was conducted in three categories like detailed railway noise & vibration survey (DR) along the existing railway, ambient noise and vibration survey at sensitive receptors (ASR) and railway noise and vibration survey at sensitive receptors (RSR).

Along with the noise and vibration measurement and collection of secondary information on the sampling locations, a questionnaire survey was also done at all the points of noise and vibration survey to assess the people's perception regarding existing problem of railway noise and vibration at their neighbourhood. For each of the points total ten persons were interviewed on the aspect.

(2) Detailed 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, in India, there is no published data on railway noise and vibration.

2) Survey Method

Selection of Survey Sites: There have been total 5 numbers of detailed railway survey points chosen along the whole railway track covered in this package. Among those, two have been done near bridges and rests at the areas of plain running rail track on embankment.

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 6-20**.

Category		Specification							
C	ategory	Train	Traction	Load	Route				
1.	FD 1A	Freight Train	Diesel Traction	Container	Plain route				
2.	FD 1B	Freight Train	Diesel Traction	Container	Bridge				
3.	FD 2A	Freight Train	Diesel Traction	Container	Plain Route				
4.	FD 2B	Freight Train	Diesel Traction	Container	Bridge				
5.	FD 3A	Freight Train	Diesel Traction	Open Wagon for Bulk transportation	Plain Route				
6.	FD 3B	Freight Train	Diesel Traction	Open Wagon for Bulk transportation	Bridge				
7.	FE 1A	Freight Train	Electrified Traction	Container	Plain Route				
8.	FE 1B	Freight Train	Electrified Traction	Container	Bridge				
9.	FE 2A	Freight Train	Electrified Traction	Covered Wagon	Plain Route				
10.	FE 2B	Freight Train	Electrified Traction	Covered Wagon	Bridge				
11.	FE 3A	Freight Train	Electrified Traction	Open Wagon for Bulk transportation	Plain Route				
12.	FE 3B	Freight Train	Electrified Traction	Open Wagon for Bulk transportation	Bridge				
13.	PD A	Passenger Train	Diesel Traction		Plain Route				
14.	PD B	Passenger Train	Diesel Traction		Bridge				
15.	PE A	Passenger Train	Electrified Traction		Plain Route				
16.	PE B	Passenger Train	Electrified Traction		Bridge				

Table 6-20 Categorization of Trains

3) Measurement of Railway Noise and Vibration

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.

Railway Noise:

- As for railway noise level, sound pressure level (LAE) 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 and Vibration Level) of Japan was used for noise measurement.

Railway Vibration:

- As for railway vibration levels, peak level (L_{Amax}) 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.

The schematic layout of noise & vibration measurement sites has been shown in Figure 6-1.

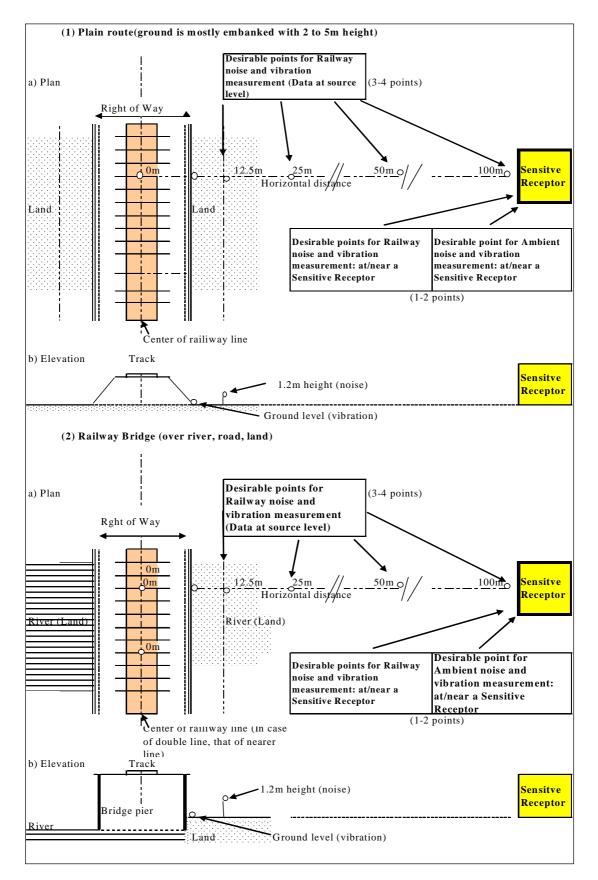


Figure 6-1 Schematic Layout of Noise & Vibration Measurement Sites

Definition of SR Sites: Facilities and structures such as schools, hospitals, temples, historical and 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.

ASR Study: Sensitive receptors are identified as educational institutes, hospitals and health centres, courts and religious establishments. Ambient noise and vibration were surveyed at or in near proximity of different identified sensitive receptors located close to the railway track or along the proposed DFC. The readings were taken continuously for 4 hours.

RSR Study: The noise and vibration survey conducted at the sensitive receptor points at the time of any train passing by the track is considered as railway noise and vibration survey at sensitive receptors or RSR. In case of RSR almost the same procedure of ASR is followed. The RSR measurements were conducted for all the trains passing including crossing trains passing both directions for a time interval of 2 hours. Among the total 20 SR points along whole of the DFC alignment RSR study was done in 10 points.

Stepwise general methodology of noise and vibration measurement near sensitive receptors is as follows,

- The measurement is done at a point near to the sensitive receptors for the stipulated time span of 4 or 2 hrs.
- Ambient noise and vibration levels were measured for L_{Aeq} and ambient vibration levels were also measured for LA_{max} and L_{10} at each SR sites.
- Together with ambient noise and vibration measurement, railway noise and vibration measurement at SR sites were measured for L_{Aeq} and LA_{max} , respectively.
- Measurement was conducted in accordance with JIS Z 8731 for noise and JIS Z 8735 for vibration.
- The detailed site conditions, like land use, urban/rural condition, structures and facilities prevailing around the sampling sites etc.
- Four photographs of each of the point have been taken to show the area profile of the point.

Questionnaire Survey Methodology: Parallel to the noise and vibration measurement, a questionnaire survey was also conducted among the local people residing around the Sensitive receptor point. They were asked to answer a few questions related to their perceptions over the disturbances and annoyance caused by railway noise and vibration due to existing railway track. 10 respondents were chosen randomly from each of the sampling sites and interviewed only after making them understand the purpose of the survey.

6.3.4 Detailed Railway Noise and Vibration Survey (DR Study)

Along the DFC alignment, detailed railway noise and vibration survey has been conducted at five selected points, but none of them falls in Patan, Gandhinagar, Anand and Vadodara district. Therefore, for these districts no DR study has been conducted.

6.3.5 Noise and Vibration Survey at Sensitive Receptors (SR Study)

(1) Patan

Sensitive Receptor includes Temple, Hospital, School etc. Ambient noise & vibration measurement survey has been conducted at sensitive receptor points, which are close to the existing railway track.

1) ASR Study

One hospital, near Siddhpur railway station was selected for ambient noise & vibration survey. The survey was carried out during day time. The details of the survey location and survey results are presented in **Table 6-21**. The rough sketch of survey location has been shown in **Figure 6-2**.

 Table 6-21 Results of Ambient Noise & Vibration Survey at Sensitive Receptor

Type of SR	Location of SR site	State (District)	Name of Railway	Type of Railway	Duration (Hrs)	Distance (m)	Ambient Noise	Ambient Vibration		Remarks
SK	of SIX SIC	(District)	Kallway	line	(1113)	(111)	LAeq	LA _{max}	L ₁₀	
Hospital	Hospital, Near Siddhpur Railway Station	Gujarat Patan	Western	Р*	4	35	66	110	38	Near by space is used as parking space for hospital

Note: P - The point is on existing track and the DFC will run parallel to the existing track

2) RSR Study

RSR study has not been conducted in Patan district

3) Conclusions

Noise is an important factor for any railway track to be established. The ambient noise level (L_{Aeq}) was observed 66dB at (ASR-1). It was observed that the during the day time, ambient noise scenario in sensitive area exceeded the acceptable limits.

The ambient vibration level (LA_{max}) and vibration level (L₁₀) was observed 110dB and 38dB at (ASR-1).

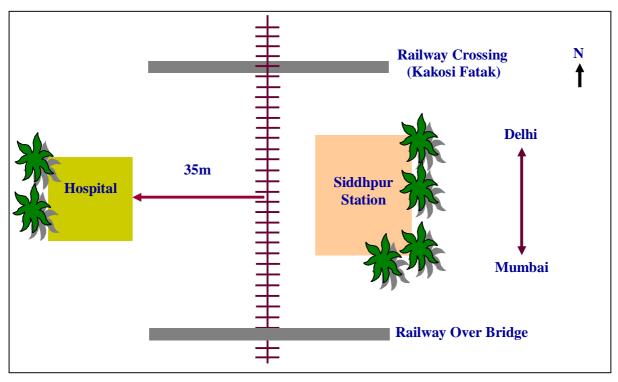


Figure 6-2 Rough Sketch of Monitoring Location near Siddhpur Railway station



(2) Gandhinagar

Sensitive Receptor includes Temple, Hospital, School etc. Ambient noise & vibration measurement survey was carried out at sensitive receptor points, which are close to the existing railway track.

1) ASR Study

Kuldeep hospital, near Kalol railway station was selected for ambient noise & vibration survey. The survey was carried out during day time. The details of the survey location and survey results are presented in **Table 6-22**. The rough sketches of survey locations have been shown in **Figure 6-3** Data Sheet is provided in **Annex-6.2**.

Table 6-22 Results of Ambient Noise and Vibration Survey at Sensitive Receptor

Type of SR	Location of SR site	State (District)	Name of Railway	Type of Railway	Duration (Hrs)	Distance (m)	AmbientAmbientNoiseVibrationRen		Remarks	
SK	of SIX SIC	(District)	Kaliway	line	(1113)	(111)	LAeq	LA _{max}	L ₁₀	
Hospital	Kuldeep Hospital, Near Kalol Station	Gujarat- Gandhinagar	Western	P*	4	45	71	64	44	Moderate traffic around the hospital

Note: *P - The point is located close to the existing track

2) RSR Study

Railway noise & vibration survey was carried out in front of Kuldeep hospital near Kalol railway station. The details of the survey location & results are presented in **Table 6-23**

Type of SR	Location of SR site	State (District)	Name of Railway	Type of Railway line	Duration (Hrs)	Distance (m)		lway bise	Railway Vibration	Remarks
				mit			LAeq	LAE	LA _{max}	
	KuldeepH									
	ospital,	Gujarat-								Heavy road
Hospital	Near	Gandhinaga	Western	P*	2	45	71	87	48	traffic, noise due to traffic
	Kalol	r								horn
	Station									nom

Note: *P - The point is located close to the existing track

3) Conclusions

Noise is an important factor for any railway track to be established. The maximum ambient noise level (L_{Aeq}) was observed 71 dB. It was observed that the during the day time, ambient noise scenario in sensitive area exceeded the acceptable limits. The maximum ambient vibration level (L_{Amax}) and vibration level (L_{10}) was observed 64 dB and 44d B.

The railway noise level (L_{Aeq}) and (L_{AE}) was observed 71 dB and 87 dB which exceed the acceptable limit; and vibration level (LA_{max}) observed 48dB.

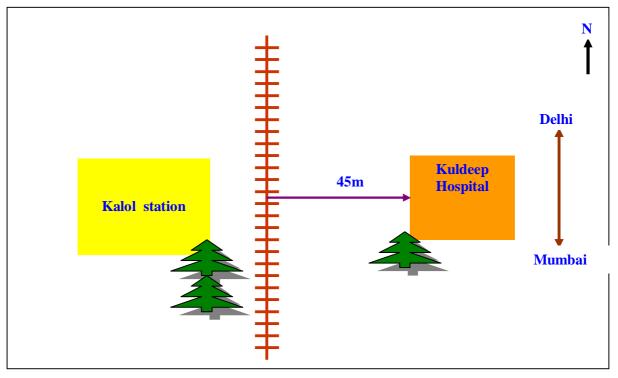


Figure 6-3 Rough Sketch of Monitoring Location-Near Kalol Station (ASR-1)



(3) Anand

Sensitive Receptor includes Temple, Hospital, School etc. Ambient noise & vibration measurement survey was carried out at sensitive receptor points, which are close to the existing railway track.

1) ASR Study

At two locations: Gopaldas Desai hospital, near Anand railway station was selected for ambient noise & vibration survey. The survey was carried out during day time. The details of the survey location and survey results are presented in **Table 6-24**. The rough sketches of survey locations have been shown in **Figure 6-4**.

Table 6-24	Posults of	Ambiont	Noiso and	Vibration	SURVOV 2	t Sonsitivo	Pocontor
Table 6-24	Results of	Amplent	NOISE and	VIDIATION	Survey a	il Sensilive	Receptor

Type of	Location	State	Name of	Type of Railway	Railway Duration Distan		Ambient Noise		oient ation	Remarks
SR	of SR site	(District)	Railway	line	(Hrs)	(m)	L _{Aeq}	LA _{max}	L ₁₀	
Hospital	Darbar Shri Gopaldas Desai Hospital, Near Anand Railway Station	Gujarat Anand	Western	E*	4	55	73	99	65	Heavy road traffic, movement of persons moving around, nearby land is used as taxi and auto stand

Note: *E - Existing railway line but out of DFC alignment

2) RSR Study

Railway noise and vibration survey was carried out in front of Gopaldas Desai Hospital near Anand railway station. The details of the survey location & results are presented in **Table 6-25**.

Type of SR	Location of SR site	State (District)	Name of Railway	Type of Railway	Duration (Hrs)	Distance		lway oise	Railway Vibration	Remarks
SK	of SK site	(District)	Kallway	line		(m)	LAeq	LAE	LA _{max}	
Hospital	Darbar Shri Gopaldas Desai Hospital, Near Anand Railway Station	Gujarat Anand	Western	E*	2	55	73	91	52	Heavy road traffic, movement of persons moving around , nearby land is used as taxi and auto stand

Note: *E - Existing railway line but out of DFC alignment

3) Conclusions

Noise is an important factor for any railway track to be established. The maximum ambient noise level (L_{Aeq}) was observed 73 dB at ASR-1. It was observed that the during the day time, ambient noise scenario in sensitive area exceeded the acceptable limits.

The ambient vibration level (L_{max}) and vibration level (L_{10}) was observed 99 dB and 65 dB at ASR-1.

The railway noise level (L_{Aeq}) and (LAE) was observed 73dB and 91dB at RSR-1, and vibration level (Lmax) observed 52dB at RSR-1 respectively, which are higher than the acceptable limit.

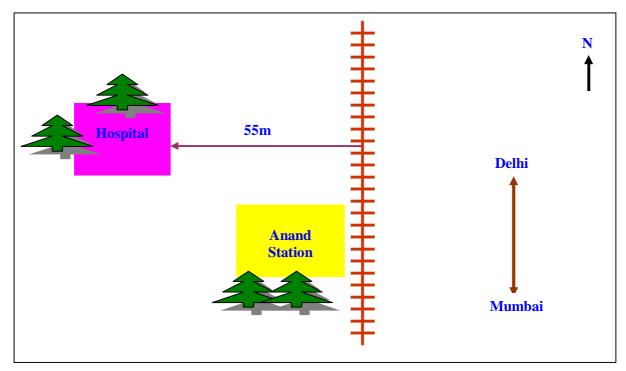


Figure 6-4 Rough Sketch of Monitoring Location-Near Anand Station (ASR-1)



(4) Vadodara

Sensitive Receptor includes Temple, Hospital, School etc. Ambient noise and vibration measurement survey was carried out at sensitive receptor points, which are close to the existing railway track.

1) ASR Study

Hindu Temple near Karjan Railway station and Mahalaxmi hospital, near Vishwamitri Railway station was selected for ambient noise & vibration survey. The survey was carried out during day time. The details of the survey location and survey results are presented in **Table 6-26**. The rough sketches of survey locations have been shown in **Figure 6-5** and Data Sheet is provided in **Annex-6.2**.

Type of SR	Location of SR site	State (District)	Name of Railway	Railway		Distance (m)	Ambient Noise	Ambient Vibration		Remarks
ы		(District)	Kallway	line			L _{Aeq}	LA _{max}	L ₁₀	
Temple	Hindu Temple, near Karjan Railway Station (ASR-1)	Gujarat Vadodra	Western	Р*	4	115	72	66	73	Occasional temple bells and heavy road traffic , point located at the tri junction
Hospital	Shree Mahalaxmi Mahilaji Hospital, Near Vishwamitri Railway Station (ASR-2)	Gujarat Vadodra	Western	E*	4	125	68	54	40	Horn by the passing by trains , Noise due to road traffic

Note: *P - The point is located close to the existing track, *E - Existing railway line but out of DFC alignment

2) RSR Study

Railway noise & vibration survey was carried out in front of Mahalaxmi hospital, near Vishwamitri Railway station. The details of the survey location & results are presented in **Table 6-27.**

Table 6-27 Results of Railway Noise and Vibration Survey at Sensitive Receptor

Type of SR	Location of SR site	State (District)	Name of Railway	Type of Railway line	Duration (Hrs)	Distance (m)	No	lway Dise LAE	Railway Vibration LA _{max}	Remarks
Hospital	Shree Mahalaxmi Mahilaji Hospital, Near Vishvamitri Railway Station (RSR-1)	Gujarat Vadodra	Western	E*	2	125	67.5	92.2	56.5	Horn by the passing by trains , noise due to road traffic

Note: *E - Existing railway line but out of DFC alignment

3) Conclusions

Noise is an important factor for any railway track to be established. The maximum ambient noise level (L_{Aeq}) was observed 72 dB at ASR-1. It was observed that the during the day time, ambient noise scenario in sensitive area exceeded the acceptable limits.

The ambient vibration level (LA_{max}) and vibration level (L₁₀) was observed 66 dB and 73 dB at ASR-1.

The railway noise level (L_{Aeq}) and (L_{AE}) was observed 68 dB and 92 dB and vibration level (LA_{max}) observed 57 dB at RSR-1 respectively, which are higher than the acceptable limit.

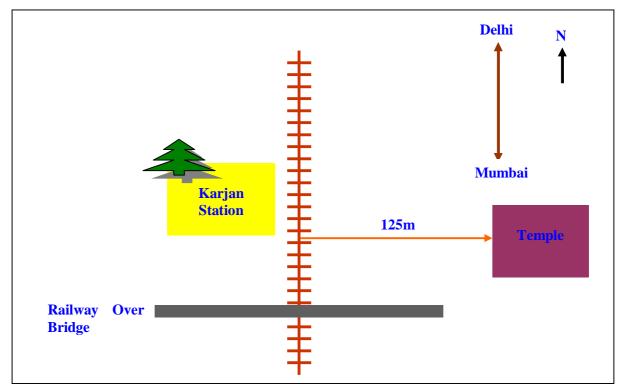


Figure 6-5 Rough Sketch of Monitoring Location-Near Miyagam Karjan Station



6.3.6 Result of Questionnaire Survey

(1) Patan

Questionnaire survey has been conducted among the local residents at all the sensitive receptors, where noise and vibration measurement was carried out. The survey questionnaire was framed after pre-testing it in several locations. In Patan district, noise and vibration monitoring was carried out at Sidhpur and interview surveys was also conducted among 10 local residents.

The respondents to the survey are from semi-urban backdrop of Sidhpur and their residences are located within 100 m from the existing track. The area between the residences and the track is open and therefore, in absence of any barrier (physical as well as vegetative) the sound waves propagate directly to the households.

Age of the Respondents: 90% of the respondents are adult (age: 18-60 years) while 10% of the respondents are senior citizens (age above 60 years).

Occupation of the Respondents: 90% of the respondents are employed (self employed or in service) while 10% of the respondents are unemployed (housewife).

Location of the respondents: 30% of the respondents are located within 25-50 m distance from the existing track while 70% of the respondents are location within 50-100 m from the existing track.

Anticipated Pollution Problem: The responses for anticipated pollution problem have been analyzed altogether with two different factors; distances from the track and age of the participants, which are detailed in **Table 6-28** and **Table 6-29**. Respondents of different ages and locations identified noise and vibration as the major pollution problem that affects their well being.

Distance	Anticipated Pollution Problem								
Distance	Noise	Air, Noise & Vibration	Noise & Vibration	Total					
25-50m	1	0	2	3					
50-100m	0	2	5	7					
Grand Total	1	2	7	10					

 Table 6-28 Distance-wise Anticipated Pollution Problem

Table 6-29 Age-wise Anticipated Pollution Prob	olem
--	------

Ago	Anticipated Pollution Problem							
Age	Noise	Air, Noise & Vibration	Noise & Vibration	Total				
Adults	1	2	6	9				
Senior Citizens	0	0	1	1				
Grand Total	1	2	7	10				

Ranking of Severance: Respondents were requested to rank the various types of pollution caused by rail traffic movement that affects their well being. The pollutants were ranked under WORST, WORSE & BAD category depending on their severance as perceived by the respondents. The flexibility of the questionnaire allowed the respondents to choose multiple pollutants into each of the three categories.

Respondents ranked noise as worst pollutant followed by vibration and air pollution. The responses of the participants are presented in **Table 6-30**.

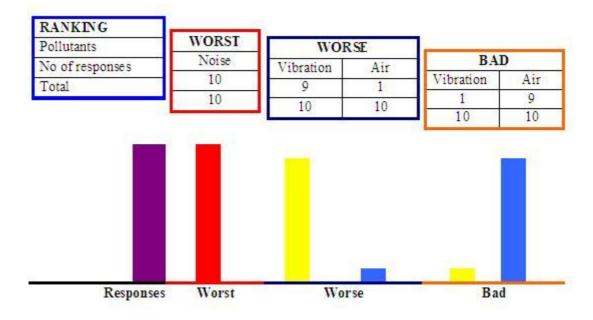


Table 6-30 Ranking of Pollution Severance by Respondents

Analysis of annoyance: All respondents unanimously agreed that the excessive noise level from the rail traffic movement causes irritation and annoyance. Majority of the respondents consider that both fright trains and passenger trains contribute equally for increase in noise level. The details of the respondents' view are presented in **Table 6-31**.

 Table 6-31
 Annoyance due to Noise: Respondent's View

Noise Annovance Status		Total		
Noise Annoyance Status	Freight (A)	Passenger (B)	Both A & B	Total
Annoyed	0	4	6	10
Not annoyed		0		

80% of the respondents opined that vibration from the rail traffic causes disturbance. Movement of the passenger trains were held responsible for vibration by majority of the participants. The details of the respondents' view are presented in **Table 6-32**.

Table 6-32 Annoyance due to Vibration: Respondent's View	/
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Vibration Annoyance	Type of Rail Traffic No Answer				
Status	Freight (A)	Passenger (B)	Both A & B	NU Allswei	Total
Annoyed	1	6	1	0	8
Not annoyed			2		2

Noise and vibration questionnaire format are provided in Annex-6.2 and compiled noise & vibration questionnaire survey are provided in Annex-6.3.

(2) Gandhinagar

Questionnaire survey has been conducted among the local residents at all the sensitive receptors, where noise and vibration measurement was carried out. The survey questionnaire was framed in consultation with JICA Study Team after pre-testing it in several locations. In Gandhinagar district, noise and vibration monitoring was carried out at near Kalol Railway Station. Interview surveys was carried out conducted among 10 local residents.

The respondents to the survey are from urban backdrop of Kalol. The residences of most of the respondents are located more than 100 m from the existing track.

Age of the Respondents: 70% of the respondents are adult (age: 18-60 years) and 30% of the respondents are senior citizens (age above 60 years).

Occupation of the Respondents: 40% of the respondents are employed (self employed or in service) while 30% of the respondents are unemployed (student, housewife etc).

Location of the respondents: 20% of the respondents are located within 50-100 m distance while 70% of the respondents are located at more than 100 m from the existing track. Only 10% of the respondents are located within 25-50 m from the track.

Anticipated Pollution Problem: The responses for anticipated pollution problem have been analyzed altogether with two different factors; distances from the track and age of the participants, which are detailed in Table 6-33 and Table 6-34. Respondents of different ages and locations identified noise and vibration as the major pollution problem that affects their well being.

r	r					
Distance		Anticipated Pollution Problem				
Distance	Noise	Noise & Vibration	Water, Noise & Vibration	Total		
25-50m	0	1	0	1		
50-100m	0	0	2	2		
>100m	1	2	4	7		
Grand Total	1	3	6	10		

 Table 6-33 Distance-wise anticipated Pollution Problem

Distance		Anticipated Pollution Problem				
Distance	Noise	Noise & Vibration	Water, Noise & Vibration	Total		
Adults	0	2	5	7		
Senior Citizens	1	1	1	3		
Grand Total	1	3	6	10		

Ranking of Severance: Respondents were requested to rank the various types of pollution caused by rail traffic movement that affects their well being. The pollutants were ranked as WORST, WORSE & BAD category depending on their severance as perceived by the respondents. The flexibility of the questionnaire allowed the respondents to choose multiple pollutants into each of the three categories.

Respondents ranked noise as worst pollutant followed by vibration and air pollution. The responses of the participants are presented in Table 6-35.

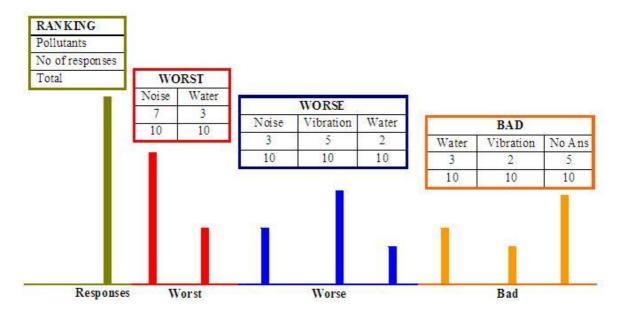


 Table 6-35 Ranking of Pollution Severance by Respondents

Analysis of annoyance: All respondents agreed that the excessive noise level from the rail traffic movement causes irritation and annoyance. Majority of the respondents (60%) consider that both fright trains and passenger trains contribute equally for increase in noise level. The details of the respondents' view are presented in **Table 6-36**.

Table 6-36	Annoyance due to Noise: Respondent's View
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Noise Annoyance	Type of Rail Traffic			Total	
Status	Freight (A)	Passenger (B)	Both A & B	Railway Station	Total
Annoyed	0	6	4	0	10
Not annoyed			0		0

70% of the respondents opined that vibration from the rail traffic causes disturbance. Movement of the passenger trains were held responsible for vibration by majority of the participants. The details of the respondents' view are presented in **Table 6-37**.

 Table 6-37 Annoyance due to Vibration: Respondent's View

Vibration		Type of Rail Traffic				
Annoyance Status	Freight (A)	Passenger (B)	Both A & B	No Answer		
Annoyed	1	5	1	0	7	
Not annoyed			3		3	

Noise and vibration questionnaire format are provided in Annex-6.2 and compiled noise & vibration questionnaire survey are provided in Annex-6.3.

(3) Anand

Questionnaire survey has been conducted among the local residents at all the sensitive receptors, where noise and vibration measurement was carried out. The survey questionnaire was framed after pre-testing it in several locations. In Anand district, noise and vibration

monitoring was carried out at near Anand Railway Station. Interview surveys were carried out conducted among 10 local residents.

The respondents to the survey are from urban backdrop of Anand. The residences of most of the respondents are located more than 100 m from the existing track.

Age of the Respondents: 50% of the respondents are adult (age: 18-60 years) and 30% of the respondents are senior citizens (age above 60 years). 20% of the respondents are young (below 18 years of age).

Occupation of the Respondents: 100% of the respondents are employed (self employed or in service), out of which 20% of the respondents are wage earners.

Location of the respondents: 50% of the respondents are located within 25-50 m distance while rest of the 50% respondents are located within 50-100 m from the existing track.

Anticipated Pollution Problem: The responses for anticipated pollution problem have been analyzed altogether with two different factors; distances from the track and age of the participants, which are detailed in Table 6-38 and Table 6-39. Respondents of different ages and locations identified noise and vibration as the major pollution problem that affects their well being.

Distance		Anticipated Pollution Problem				
Distance	Noise	Air, Noise & Vibration	Noise & Vibration	Total		
25-50m	0	3	2	5		
50-100m	2	1	2	5		
Grand Total	2	4	4	10		

Ago		Anticipated Pollution Problem					
Age	Noise	Air, Noise & Vibration	Noise & Vibration	Total			
Young	0	1	1	2			
Adults	0	3	2	5			
Senior Citizens	2	0	1	3			
Grand Total	2	4	4	10			

Table 6-39 Age-wise Anticipated Pollution Problem

Ranking of Severance: Respondents were requested to rank the various types of pollution caused by rail traffic movement that affects their well being. The pollutants were ranked as WORST, WORSE & BAD category depending on their severance as perceived by the respondents. The flexibility of the questionnaire allowed the respondents to choose multiple pollutants into each of the three categories.

Respondents ranked noise as worst pollutant followed by vibration and air pollution. The responses of the participants are presented in **Table 6-40**.

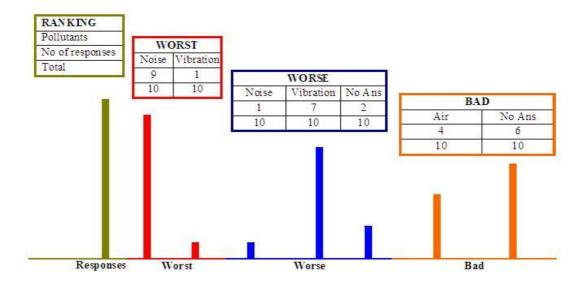


Table 6-40 Ranking of Pollution Severance by Respondents

Analysis of annoyance: All respondents agreed that the excessive noise level from the rail traffic movement causes irritation and annoyance. Majority of the respondents (90%) consider that passenger trains are responsible for increase in noise level. The details of the respondents' view are presented in **Table 6-41**.

Table 6-41 Annoyance due to Noise: Respondent's View

Noise Annoyance	Type of Rail Traffic				Total
Status	Freight (A)	Passenger (B)	Both A & B	Railway Station	Total
Annoyed	1	9	0	0	10
Not annoyed		0			

50% of the respondents opined that vibration from the rail traffic causes disturbance. Out of the total, 40% of the respondents consider that passengers trains responsible for the increased level of vibration. The details of the respondents' view are presented in **Table 6-42**.

Vibration		Total			
Annoyance Status	Freight (A)	Passenger (B)	Both A & B	No Answer	
Annoyed	1	4	0	0	5
Not annoyed		5			

Noise and vibration questionnaire format are provided in Annex-6.2 and compiled noise & vibration questionnaire survey are provided in Annex-6.3.

(4) Vadodara

Questionnaire survey has been conducted among the local residents at all the sensitive receptors, where noise and vibration measurement was carried out. The survey questionnaire was framed after pre-testing it in several locations. In Vadodara district, noise and vibration monitoring was carried out at near Viswamitri Railway Station and Karjan Railway Station. Interview surveys were carried out conducted among 10 local residents at each of the two places.

The respondents to the survey are from urban backdrop. The residences of most of the respondents are located more than 50 m from the existing track.

Age of the Respondents: 55% of the respondents are adult (age: 18-60 years) and 30% of the respondents are senior citizens (age above 60 years). 15% of the respondents are young (below 18 years of age).

Occupation of the Respondents: 75% of the respondents are employed (self employed or in service), out of which 25% of the respondents are wage earners.

Location of the respondents: 45% of the respondents are located within 25-50 m distance while 30% respondents are located within 50-100 m from the existing track. 25% of the respondents are located more than 100 m from the railway line.

Anticipated Pollution Problem: The responses for anticipated pollution problem have been analyzed altogether with two different factors; distances from the track and age of the participants, which are detailed in **Table 6-43** and **Table 6-44**. 95% of the respondents of different ages and locations identified noise and vibration as the major pollution problem that affects their well being.

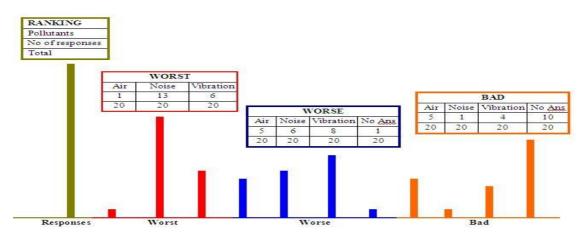
	Anticipated Pollution Problem							
Distance	Noise	Air, Noise & Vibration	Noise & Vibration	Noise & Air	Total			
25-50m	0	4	4	1	9			
50-100m	1	4	1	0	6			
>100m	0	2	3	0	5			
Grand Total	1	10	8	1	20			

 Table 6-43 Distance-wise anticipated Pollution Problem

		Anticipated Pollution Problem							
Age	Noise	Air, Noise & Vibration	Noise & Vibration	Noise & Air	Total				
Young	0	2	1	0	3				
Adult	0	5	6	0	11				
Senior citizens	1	3	1	1	6				
Grand Total	1	10	8	1	20				

Ranking of Severance: Respondents were requested to rank the various types of pollution caused by rail traffic movement that affects their well being. The pollutants were ranked as WORST, WORSE & BAD category depending on their severance as perceived by the respondents. The flexibility of the questionnaire allowed the respondents to choose multiple pollutants into each of the three categories.

Respondents ranked noise as worst pollutant followed by vibration and air pollution. The responses of the participants are presented in **Table 6-45**.





Analysis of annoyance: All respondents agreed that the excessive noise level from the rail traffic movement causes irritation and annoyance. Majority of the respondents (40%) consider that fright trains are responsible for increase in noise level. The details of the respondents' view are presented in **Table 6-46**.

Table 6-46	Δηηοι	ance d	lue to	Noise [.]	Resr	ondent's	View
	AIIIIOy	ance u		10130.	nesh	onucint 3	A IC AA

Noise Annoyance		Total			
Status	Freight (A)	Passenger (B)	Both A & B	Railway Station	
Annoyed	7	5	6	1	19
Not annoyed		1			

85% of the respondents opined that vibration from the rail traffic causes disturbance. Out of the total, 40% of the respondents consider that freight trains responsible for the increased level of vibration. The details of the respondents' view are presented in **Table 6-47**.

Vibration		Total			
Annoyance Status	Freight (A)	Passenger (B)	Both A & B	No Answer	
Annoyed	7	5	5	0	17
Not annoyed		3			

Noise & vibration questionnaire format are provided in Annex-6.2 and compiled noise & vibration questionnaire survey are provided in Annex-6.3.

6.3.7 Prediction & Evaluation of Railway Noise and Vibration

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 6-6**.

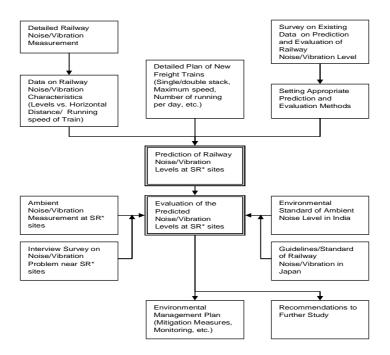


Figure 6-6 Procedure for Prediction and Evaluation of Noise and Vibration Levels

(1) **Prediction Method of Railway Noise**

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.

Several types of prediction equations were proposed for various types of railway track structures, such as the elevation, embankment and cutting.

However, prediction was carried out applying the actual data of railway noise level (LAE), 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.

LAE	=	A + B Log10 (D)	(1-1)
L _{Aeq}	=	LAE + 10 Log10 (N/T)	(1-2)

Traina	Trains Category A		A D		Railway Noise Level [LAeq(dB)]				
Trains	Category	А	Б	12.5m	25m	50m	100m	200m	Level
Freight	FEP	110.59	-8.89	101	98	96	93	90	LAE
Electric	TEF	110.39	-0.09	76	73	71	68	65	L _{Aeq}

Note 1: Electrified Freight Train (Plain Route) Running at 100km/h Note 2: LAE=A+BLog10(D), L_{Aeq}=LAE-10Long10(N/T)

Note 3: Number of Sample: 6 data, $r^2 = 0.899$

(2) Prediction Method of Railway Vibration

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.

However, prediction was carried out applying in the similar manner by applying the actual data of the railway vibration level (L_{Amax}), 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.

$LA_{max2} =$	A ₂ + B ₂ Log10 (D)	(2)
---------------	---	-----

 Table 6-49 Predicted Railway Vibration Level by Distance

Trains	Category	•	В	Railway Vibration Level [LA _{MAX} (dB)]				
Trains Ca	Category	A		12.5m	25m	50m	100m	200m
Freight Electric	FEP	120.86	-38.04	80	68	56	45	33

Note 1: Electrified Freight Train (Plain Route) Running at 100km/h Note 2: LA_{max}=A+BLog10(D)

Note 3: Number of Sample: 6 data, $r^2 = 0.973$

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

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 minutes)
- 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.

(4) **Prediction and Evaluation Points**

- SR sites along the existing railway lines within the parallel sections of the DFC Project
- SR sites along the existing railway lines within the detour sections of the DFC Project
- 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.

(5) **Prediction and Evaluation Results**

- 1) Patan
 - a) Prediction of Railway Noise Levels

Estimated noise levels (L_{Aeq}) in Patan district due to additional new freight trains are shown in **Table 6-50**. 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 level is 72 dB and existing noise level is 66 dB. Both existing & predicted noise levels exceed the ambient noise standard of India.

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.

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.

S.N.	Type of SR	Location of SR	State-District	Predicted Noise Level (dB)	Standard Noise Level (dB)	Present Ambient Noise Level (dB)	Present Railway Noise Level (dB)
				L _{Aeq}	L _{Aeq}	L _{Aeq}	LAeq
1	Hospital	Hospital near Siddhpur railway station	G-Patan	72	50	66	-

Table 6-50 Predicted Results of Railway Noise

b) Prediction of Railway Vibration Levels

Estimated vibration levels (LA_{max}) due to additional new freight trains are shown in **Table 6-51**. Estimated vibration levels (LA_{max}) 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.

Compared to the existing ambient vibration levels, which is 110 dB, the predicted railway vibration level is 62 dB, which is much lower. 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.

S.N.	Type of SR	Location of SR	State-District	Predicted Vibration Level (dB)	Ambient Vib (dF		Railway Vibration Level (dB)
				LA _{max}	LA _{max}	L 10	LA _{max}
1	Hospital	Hospital near Siddhpur railway station	G-Patan	62	110	38	-

Table 6-51 Predicted Results of Railway Vibration

2) Gandhinagar

a) Prediction of Railway Noise Levels

Estimated noise levels (L_{Aeq}) in Thane district due to additional new freight trains are shown in **Table 6-52**. 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 level is 71 dB and existing noise level is also 71 dB. Both existing & predicted noise levels exceed the ambient noise standard of India.

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.

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. It is suggested to adopt necessary mitigation measurements such as lowering the train speeds and establishing soundproof walls in the Detailed Deign stage.

S.N.	Type of SR	Location of SR	State-District	Predicted Noise Level (dB)	Standard Noise Level (dB)	Present Ambient Noise Level (dB)	Present Railway Noise Level (dB)
				L _{Aeq}	LAeq	LAeq	LAeq
1	Hospital	Kuldeep Hospital near Kakol railway station	G-Gandhinagar	71	50	71	71

Table 6-52 Predicted Results of Railway Noise

b) Prediction of Railway Vibration Levels

Estimated vibration levels (LA_{max}) due to additional new freight trains are shown in **Table 6-53**. Estimated vibration levels (LA_{max}) 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.

Compared to the existing ambient vibration levels, which is 64 dB, the predicted railway vibration level is 58 dB, which is much lower. 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.

S.N.	Type of SR	Location of SR	State-District	Predicted Vibration Level (dB)	Ambient Vib (dI		Railway Vibration Level (dB)
				LA _{max}	LA _{max}	L 10	LA _{max}
1	Hospital	Kuldeep Hospital near Kakol railway station	G-Gandhinagar	58	64	44	48

Table 6-53 Predicted Results of Railway Vibration

Package wise measurement, prediction & evaluation results of noise and vibration are provided in Annex-6.5.

3) Anand

a) Prediction of Railway Noise Levels

Estimated noise levels (L_{Aeq}) in Anand district due to additional new freight trains are shown in **Table 6-54**. 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 level is 70 dB and existing noise level is 63 dB. Both existing & predicted noise levels exceed the ambient noise standard of India.

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.

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.

S.N.	Type of SR	Location of SR	State-District	Predicted Noise Level (dB)	Standard Noise Level (dB)	Present Ambient Noise Level (dB)	Present Railway Noise Level (dB)
				L _{Aeq}	LAeq	L _{Aeq}	LAeq
		Darbar Shri Gopaldas Desai					
1	Hospital	Hospital, near Anand railway station	G-Anand	70	50	73	73

Table 6-54 Predicted Results of Railway Noise

b) Prediction of Railway Vibration Levels

Estimated vibration levels (LA_{max}) due to additional new freight trains are shown in **Table 6-55**. Estimated vibration levels (LA_{max}) 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.

Compared to the existing ambient vibration levels, which is 99 dB, the predicted railway vibration level is 54 dB, which is much lower. 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.

S.N.	Type of SR	Location of SR	State-District	Predicted Vibration Level (dB)	Ambient Vibration Level (dB)		Railway Vibration Level (dB)
				LA _{max}	LA _{max}	L 10	LA _{max}
1	Hospital	Darbar Shri Gopaldas Desai Hospital, near Anand railway station	G-Anand	54	99	65	52

Table 6-55 Predicted Results of Railway Vibration

Package wise measurement, prediction & evaluation results of noise & vibration are provided in Annex-6.5.

4) Vadodara

a) Prediction of Railway Noise Levels

Estimated noise levels (L_{Aeq}) in Vadodara district due to additional new freight trains are shown in **Table 6-56**. 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 level is 67 dB and existing noise level is 68 dB. Both existing & predicted noise levels exceed the ambient noise standard of India.

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.

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.

S.N.	Type of SR	Location of SR	State-District	Predicted Noise Level (dB)	Standard Noise Level (dB)	Present Ambient Noise Level (dB)	Present Railway Noise Level (dB)
				LAeq	LAeq	LAeq	LAeq
1	Hospital	Shri Mahalakshmi Mahilaji Hospital, near Vishyamitri railway station	G- Vadodara	67	50	68	68

 Table 6-56 Predicted Results of Railway Noise

b) Prediction of Railway Vibration Levels

Estimated vibration levels (L_{Amax}) due to additional new freight trains are shown in **Table 6-57**. Estimated vibration levels (L_{Amax}) 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.

Compared to the existing ambient vibration levels, which is 54 dB, the predicted railway vibration level is 41 dB, which is much lower. 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.

S.N.	Type of SR	Location of SR	State-District	Predicted Vibration Level (dB)	Ambient Vib (dF		Railway Vibration Level (dB)
				LA _{max}	LA _{max}	L 10	LA _{max}
		Shri Mahalakshmi					
1	Hospital	Mahilaji Hospital, near	G- Vadodara	41	54	40	57
		Vishyamitri railway station					

 Table 6-57 Predicted Results of Railway Vibration

Package wise measurement, prediction & evaluation results of noise & vibration are provided in Annex-6.3.

6.4 IMPACT AND MITIGATION MEASURES: ENVIRONMENTAL PARAMETERS

6.4.1 Air Quality

Preconstruction Phase: During operation phase no impact is envisaged on air quality.

Construction Phase: Particulate matter would be the predominant pollutant affecting the air quality during the construction phase as it is likely to generate considerable quantities of dust, especially during dry condition. However, the impact on air quality will be localized, short term and reversible.

Impacts:

- Deterioration of air quality due to fugitive dusts emission from construction activities like excavation, backfilling & concreting, and hauling & dumping of earth materials & construction spoils, and vehicular movement along unpaved roads.
- Deterioration of air quality due to gaseous emissions from construction equipment and vehicular traffic

Mitigation Measures:

- Prop will be undertaken to control fugitive dust during material handling and hauling activities particularly near habitation especially in the dry seasons
- Stringent construction material handling/overhauling procedures will be followed
- Low emission construction equipment, vehicles and generator sets will be used
- It will be ensured that all the construction equipment & vehicles are in good working condition, properly tuned and maintained to keep emissions within the permissible limits and engines turned off when not in use to reduce pollution.
- Air quality monitoring will be conducted once in every season, except monsoon at selected locations

Operation Phase: Rail is the environment friendly mode of transport. During operation phase the impact on air quality will be positive. At present, a major portion of the freight is

transported by road but after DFC, it will reduce to a great extent. As the road traffic will decrease significantly, the vehicular pollution will be reduced and the air quality of the area will improve. Plantation along the DFC will also act as sink of air pollutants.

6.4.2 Noise and Vibration Level

Preconstruction Phase: During operation phase no impact is envisaged on noise level.

Construction Phase: During the construction phase, noise and vibration will be generated due to movement of vehicles, and operation of light & heavy construction machineries including pneumatic tools (hot-mixer, dozer, tipper, loader, excavator, grader, scraper, roller, concrete mixer, generator, pump, vibrator, crane, compressor etc.) that are known to emit sounds with moderate to high decibel value. Noise generated from sources mentioned above will be intermittent and mostly during daytime.

Impacts:

- Increase in noise and vibration level due to construction activities like operation of construction equipment & vehicular traffic.

Operation of construction machinery will lead to rise in noise level to the range between 80-95 dB. The magnitude of impact from noise will depend upon types of equipment to be used, construction methods and also on work scheduling. The noise level generated from a source will decrease with distance as per the following empirical formula (inverse square law).

 $SPL2 = SPL1 - 20Log_{10}(r_2/r_1)$

where, SPL1 and SPL2 are the sound pressure levels at distance r_1 and r_2 respectively.

Considering the stationary construction equipment as a point source generating 90 dB at a reference distance of 2 m, computed minimum distance required from the stationery source to meet the permissible noise limits during day time for different land use categories are given in **Table 6-58**.

Category	Permissible Limits in Day Time (CPCB)	Distance Required (m)
Silence zone	50 dB	200
Residential	55 dB	113
Commercial	65 dB	36
Industrial	75 dB	11

 Table 6-58 Minimum Distance Required from Stationary Noise Source

From the above table it may be noted that residence within 113m from the track will be exposed to a noise higher than the permissible limit. The impacts will be significant on construction workers, working close to the machinery.

Mitigation Measures:

- Construction camp and temporary labour sheds will be located away from the immediate vicinity of the construction sites and major road traffic.
- Low noise construction equipment will be used.
- It will be ensured that all the construction equipment & vehicles used are in good working condition, properly lubricated & maintained to keep noise within the permissible limits and engines turned off when not in use to reduce noise.

- Stationary construction equipment will be placed away from inhabited areas.
- Stationary construction equipment will be placed away from the sensitive receptors (SRs) i.e. school, hospital etc.
- Construction activities carried out near residential area will be scheduled to the daytime only so that minimum disturbances are caused to people.
- The construction methods with lower vibration generation shall be applied.
- Machines and vehicles equipped with lower vibration devices such as vibration-proofing cover shall be used.
- Vibration propagation shall be prevented by keeping the distance and changing the direction and location of machines.
- Near settlement and forest areas, construction activities shall be conducted only during daytime, and vibration generating activities shall be prohibited during night time.
- Vibration level monitoring shall be conducted during the construction phase.

Operation Phase: During operation phase noise and vibration are likely to occur due to movement of trains and related facilities such as loading and unloading.

Mitigation Measures:

- Vibration level monitoring shall be conducted during the construction phase.
- New technologies shall be incorporated to lower vibration generation with respect to structures and rolling stocks.
- Use of long welded rails without fishplate joint is suggested for reduction in vibration.
- Crushed stones shall be used for ballast materials, and accumulation of crushed ballast by passing trains is to be removed through frequent ballast cleaning.
- For a railway bridge girder, steel may be replaced with concrete materials such as PC and RC to minimise oscillation of the bridge girder which generates vibration in addition to noise.
- If necessary, building the vibration-proof trench and underground wall may be built to prevent the vibration propagation.
- 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 vibration in addition to noise 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.

6.4.3 Water Quality

Preconstruction Phase: During preconstruction phase no impact is envisaged on water quality.

Construction Phase: Small quantity of water will be used in the compaction of embankment during construction process. Wastewater from construction activities would mostly contain

suspended impurities. Other pollutants which may find their way to it will be in insignificant concentrations and may be safely disregarded.

The deterioration of water quality during construction phase is expected due to wastewater disposal from the workers camp and sullage generated from construction sites. If adequate arrangements are not made to ensure proper drainage of wastewater from the construction sites, such waters may form stagnant pools and aggravate soil erosion. Stagnant pools of water promote breeding of mosquitoes and create generally unsanitary conditions.

Impacts:

- Water quality of Balaram river will be deteriorated during construction of bridge
- Increase of sediment load in the run off from construction sites and increase in turbidity in receiving streams/water bodies
- Water pollution due to sewage from construction camps
- Chances of groundwater contamination from fly ash

Mitigation Measures:

- Silt fencing may be provided near water bodies
- Quality of construction wastewater emanating from the construction site will be controlled through suitable drainage system with sediment traps (silting basin as water intercepting ditch) for arresting the silt/sediment load before its disposal into the main natural drainage system around the site
- Proper sanitation facilities will be provided at the construction site to prevent health related problems due water contamination.
- All the construction and preparatory activities including construction of culverts and bridges will be carried out during dry seasons only.

Operation Phase: During operation phase no impact is envisaged on water quality. However, the wastewater generated from rail depot, train washing, workshops and maintenance activities will be treated properly prior to discharge into the sewer.

6.4.4 Soil Quality

Preconstruction Phase: During preconstruction phase no impact is envisaged on soil quality.

Construction Phase:

- During construction phase soil contamination is likely to take place due to leakage of asphalt emulsifier at pavement of road.
- Soil contamination may also take place during filling of oil in vehicles or leakage from vehicles.

Mitigation Measures

- Asphalt emulsifier must be handled with caution and any leakage detected should be immediately rectified.
- Construction work should not be done during rainy season to avoid soil contamination

Operation Phase: During operation phase no impact is envisaged on soil quality.

6.4.5 Land Subsidence

Land subsidence is not envisaged as the DFC alignment is passing through plain terrain except at few stretches where it is passing through undulating terrain. Therefore, during construction and operation phase no impact is envisaged.

6.4.6 Bottom Sediment

Preconstruction Phase: During operation phase no impact is envisaged on bottom sediment.

Construction Phase:

Impacts:

- The DFC alignment crosses Balaram River twice in Banaskantha district. During construction of bridge over Balaram River, sediment pollution may occur.

Mitigation Measures:

- Silt fencing will be provided to restrict runoff into the water.
- Bridge construction and preparatory activities will be carried out during dry seasons only.

During **operation phase**, no significant impact is envisaged except accidental spillage.

6.4.7 Offensive Odor

No activities causing offensive odor is envisaged however cleanliness must be maintained at construction site during construction and at stations during operation phase to avoid any foul odor.

6.5 IMPACT MATRIX – ENVIRONMENTAL POLLUTION

A simple method that determines potential existence of impact has been employed. Matrix system is considered as a tool for organizing and presenting information on the environmental impacts caused to the natural and social environment by the DFC Project. Thus the following parameter and scale is used for producing matrix impacts

Parameter	Scale		Remarks
Significance	No impact	E	Positive : + Negative : -
	Neglectable impact	D	Positive : + Negative : -
	Insignificant impact	С	Positive : + Negative : -
	Relatively significant impact	В	Positive : + Negative : -
	Significant impact	А	Positive : + Negative : -

 Table 6-59 Parameter and Scale of Impact Matrix

The Environmental Impact Matrix is given below.

	Project Activities		PRE-	CONSTRUCTION ST	AGE
SI. No.	Environmental & Social Issues	Overall Evaluation on the Project	Surveying of Planned Areas and Sites	Selection of the Project Location & Sites	Land Acquisition and Resettlement
1.	Air Pollution	A +	Ε	Ε	Е
2.	Water Pollution	D-	Ε	Ε	E
3.	Soil Contamination	D-	Ε	Ε	Е
4.	Solid Waste and Industrial Discharge	D	Ε	Ε	Ε
5.	Noise and Vibration	В-	Е	Е	Е
6.	Land Subsidence	Ε	Ε	Е	E
7.	Bottom Sediment	Ε	Ε	Ε	E
8.	Offensive Odour	Ε	Е	Ε	Е

A: Significant impact, B: Relatively Significant impact, C: Insignificant impact, D: Neglectable impact,

E: No impact , - : Negative impact, + : Positive impact

	Project Activities	CONSTRUCTION STAGE											
SI. No.			g of	Preparation of Construction Plants, and Warehouses, Work Camps, etc.	Operation of Construction Plants, Machines & Vehicles for Construction Works	Construction Works for Railway line and related structures						es of	ities
	Environmental & Social Issues	Quarry & Borrow Areas	Earth Moving: Cutting and Filling the Construction Works			(A) Construction of Railway Lines& 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 ROBs and RUBs	(E) Construction Works for Bridges	(F) Construction Works for Tunnels	Localized Employment Opportunities the Construction Works	Localized Business Opportunities Related to the Construction Works
1.	Air Pollution	C-	C-	C-	C-	C-	B-	В-	C-	C-	Е	Е	D-
2.	Water Pollution	D-	D-	C-	D-	C-	D-	D-	B-	B-	Е	Е	Е
3.	Soil Contamination	C-	D-	C-	C-	C-	D-	D-	D-	D-	Е	Е	Е
4.	Solid Waste and Industrial Discharge	C-	C-	D-	D-	D-	D-	C-	D-	D-	Ε	Е	D-
5.	Noise and Vibration	D-	D-	D-	C-	C-	B-	B-	C-	C-	Е	Е	D-
6.	Land Subsidence	Е	Е	Е	E	E	Е	D-	Е	Е	Е	Е	Е
7.	Bottom Sediment	Е	Е	Е	Е	D-	Е	Е	C-	C-	Е	Е	Е
8.	Offensive Odour	Ε	Е	Е	Е	Е	Е	Ε	Е	Ε	Е	E	Е

Sl.			POST - CONSTRUCTION STAGE							
No.	Project Activitie Environmental & Social Issues	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
1.	Air Pollution	L H E		A+	D-	E D-	E	E	D-	D-
2.	Water Pollution	E	D-	E	D-	D-	E	E	D-	D-
3.	Soil Contamination	Е	D-	Е	D-	Ε	Ε	Е	D-	D-
4.	Solid Waste and Industrial Discharge	Ε	D-	E	D-	D-	D-	Е	D-	C-
5.	Noise and Vibration	В	C-	C+	В	D-	D-	E	D-	D-
6.	Land Subsidence	Ε	Ε	Е	Е	Е	Е	Е	Ε	Е
7.	Bottom Sediment	Ε	Ε	Ε	E	Ε	Ε	Ε	Ε	Ε
8.	Offensive Odour	Ε	D-	E	E	Ε	Ε	Ε	Ε	Ε

CHAPTER 7 STAKEHOLDER/ PUBLIC CONSULTATION MEETINGS

7.1 INTRODUCTION

Public Consultations or Stake holders meetings are the platforms where the project affected or project concerned individuals get to express their views and opinions on several issues related to the project without any biasness and on a public place. Since this is a process, it must be remembered in this context that the meetings were not the end of the public consultation process but rather the initiation of discussion among the participants whose opinions were incorporated not only in the meetings at the second and third stages but also during feedback/village meetings conducted subsequently. Precisely with this objective in mind, stakeholders were identified and invited to attend the meetings; meetings were held at venues most convenient to attend for the concerned and timings were fixed to suit their preferences. It was kept in mind to invite stakeholders from almost all villages so that opinion from all concerned could be addressed. Along with them, NGOs, local media were also invited to attend the meetings not only for the purpose of information dissemination but also for taking their views into consideration for overall policy making.

In order to assess feasibility of development of dedicated multimodal high-axle load freight corridor with computerized control for DFC Western Corridor stakeholder/public consultation meetings were organized in all three phases of the study.

-	Phase I	First Stage	(February 2007)

- Phase II Second Stage (June-July 2007)
- Phase III Third Stage (August-September 2007)

In the 2nd and 3rd phase, public consultation meetings were conducted in the district to disseminate information and make likely to be affected people aware about the project and seek their opinions about proposed DFC respectively. Stakeholders were invited from all the villages, gram panchayats and blocks and towns which were likely to be affected in both the parallel and detour section due to land acquisition in the proposed DFC corridor. The stakeholders expressed their views and provided valuable suggestions in respect to rehabilitation and resettlement issues and other socio-environmental concerns. It was followed by village feedback meetings in order to know the understanding and opinions of the villagers about the proposed DFC Project. The village meetings were conducted in each affected village of each district.

7.2 STAKEHOLDERS

Various categories of stakeholders ranging from Project Affected Persons to government officials to other opinion leaders such as NGOs, activists and media persons were identified in order to seek opinions on the "dedicated high axle load multimodal freight corridor" and to discuss social and environmental impacts, including the issue of resettlement and rehabilitation. The various categories of stakeholders who were invited to attend the public consultation meetings are as follows:

- a) PAPS: Project Affected Persons (likely)
- b) Govt. Officials local administration, revenue department, land acquisition officer, forest officers, railway officials, DFFCCIL officials, Central & State Pollution Control Boards etc
- c) Representation from Gram Panchayat, Pradhan, local municipal bodies, M.Ps and M.L.A.s in the area.

- d) Local NGOs actively working on environmental & social issues in the district
- e) Transporters Local transport operators, freight operators, stevedores
- f) MediaLocal press reporters, State level & National level reporters, electronic media (local and National level news channel)
- g) Industries Local industry owners
- h) Academicians in the field of Social and Environment Sciences, Head of reputed educational institutions
- i) Citizens Residents, merchants/businessmen, advocates, farmers, senior citizens etc.

7.3 METHOD OF PUBLIC CONSULTATION MEETING

The following steps were taken into account for conducting public consultation meetings: Ministry of Railways has issued formal letter to Secretary, revenue department, Government of Gujarat dated May 11, 2007. The letter clearly indicated that, public consultation and stakeholder meetings are to be undertaken as part of studies on environmental and social issues. An Inter Ministerial Working group called Environmental Working Group (EWG) has been set up to coordinate this aspect of the study. District Magistrate, Additional District Magistrate, Tahsildar, and Block Development officer and District Forest Officers were formally invited to participate in the Public Consultation Meetings.

The representatives of Panchayat Raj institutions and local Municipal bodies were personally invited.

Invitation letters were issued to the representatives of local media, opinion leaders and members of academician with the request to participate and contribute in the deliberations. Sincere efforts were made to meet likely affected PAPs personally along with the letter of invitation.

Due care was taken to address the issues of the poor, vulnerable groups, landless and other disadvantaged sections of the society likely to be affected by the project. The main objective of the stakeholders/public consultation meeting was to

- Disseminate the information about DFC project to the general public.
- Create awareness about the project among the likely PAPs.
- Discuss the positive/adverse environmental and social impacts of the project.
- Seek the suggestion of Gram Panchayat, PAPs and other stakeholders on the various issues related to compensation, resettlement and rehabilitation, social and environmental impacts.

7.3.1 Meeting Facilitators

Suitable agencies having strong local contacts were identified to carry out stakeholders/public consultation meeting. Preference was given to appoint non-government organization, who had good track record and experience in social work. The acquaintance with different cross sections of society and the ability to mobilize the stakeholders of the meeting were the major selection criteria. The ability to facilitate the following activities was taken into consideration:

- Fixation of Venue for the meetings;
- Logistic Arrangements like food, stationary distribution, public address system etc to be made;

- Assisting in publicity in local Gujarati language
- Invitations to the stakeholders and motivating them for participation in the meeting;
- Maintaining and compilation of the record;
- Other local arrangements like transport, hospitality, security and smooth conduct of the meeting proceedings

In the process, JeevanTirth, an NGO based in Juna Koba, Gandhinagar, and Gujarat was appointed to facilitate the stakeholders/public consultation meeting.

7.3.2 Method of Information Dissemination

The meeting facilitator team had visited nearly all the affected villages and requested Primary and Secondary Stakeholders to attend the meeting .Field team distributed leaflets highlighting DFC project information and invite those people who would likely be affected directly by this project.

Following were the methods used for notifying the meeting to the Participants

- 1) Date and venue of the stakeholders/Public Consultation Meeting was notified in local newspapers and the stakeholders were invited to attend to the meeting.
- 2) A handout containing the information about the project was distributed in likely to be affected villages.
- 3) Face to face meetings were organized to disseminate the information.
- 4) Efforts were made to publish the summary of stakeholders/Public consultation meeting in local newspaper
- 5) The stakeholders were also reminded to attend the meeting through personal phone calls wherever possible.

7.4 PUBLIC CONSULTATION SUMMARY SHEET

The stakeholder/public consultation meeting for the proposed DFC project is conducted in all districts which are falling along the corridor, to disseminate general information to public about the proposed project. District wise project summary sheets for the meeting are as follows:

	PROJECT SUMMARY SHEET		
Covering Districts	Banaskantha		
Organizing Place	Palanpur.		
Number of Invitees	100 (2nd Stage)/102 (3rd Stage)		
Number of Presence	136 (2nd Stage)/123 (3rd Stage)		
Methods Used for	Personal Meet		
Information Dissemination:	Dispatching letters / invitation		
	Advertisement in Newspaper		
	Announcement by auto/rickshaw.		
Stationary Served to the	Writing Pad - 1 Piece.		
participants	Ball Pen - 1 Piece		
	Questionnaire - 1 Piece		
	Literature - Pamphlet		
Methods adopted for	Power point Presentation		
discussion			

BANASKANTHA DISTRICT

	PROJECT SUMMARY SHEET
Methods adopted for	Still Photography
Documentation	Audio/Video Recording
	Minutes of meeting
Media Coverage	Editor, Dainik Bhaskar
	Local News Channel,
Time Schedule of Meeting	2nd Stage :15.6.2007 at Thakkar Bapa Hall,(N– 24° 09' 59.0'' & E- 072° 26' 07.2'') +/- 10 M Palanpur Time 11:00 AM to 3:00 PM 3rd Stage :21.8.2007 at Thakkar Bapa Hall,(N– 24° 09' 59.0'' & E- 072° 26' 07.2'') +/- 10 M Palanpur Time 11:00 AM to 3:00 PM
Videography	Enclosed in CD form separately.

PATAN DISTRICT

	PROJECT SUMMARY SHEET		
Local Organizer	Jeevan Tirth, Juna Koba, Gandhinagar.		
Covering Districts	Patan		
Organizing Place	Unjha		
Number of Invitees	45(2nd Stage)/60(3rd Stage)		
Number of Presence	90 (2nd Stage)/140 (3rd Stage)		
Methods Used for	Personal Meet		
Information Dissemination:	Dispatching letters / invitation		
	Advertisement in Newspaper		
	Announcement by auto/rickshaw.		
Stationary Served to the	Writing Pad - 1 Piece		
participants	Ball Pen - 1 Piece		
	Questionnaire - 1 Piece		
	Literature - Pamphlet		
Methods adopted for	Power point Presentation		
discussion			
Methods adopted for	Still Photography		
Documentation	Audio/Video Recording		
	Minutes of meeting		
Media Coverage	Editor, Dainik Bhaskar		
	Local News Channel,		
Time Schedule of Meeting	18.6.2007 at APMC Hall, Unjha {(N- 23° 48' 06.0'' & E-072° 23'		
	06.0'') +/- 16 M}		
	Time 3:00 PM to 5:00 PM		
Videography	In CD		

MEHASANA DISTRICT

	PROJECT SUMMARY SHEET
Covering Districts	Mahesana
Organizing Place	Mahesana
Number of Invitees	70/49
Number of Presence	139 (2 nd Stage)/ 118(3 rd Stage)
Methods Used for	Personal Meet
Information Dissemination:	Dispatching letters / invitation
	Advertisement in Newspaper

	PROJECT SUMMARY SHEET		
	Announcement by auto/rickshaw.		
Stationary Served to the	Writing Pad - 1 Piece.		
participants	Ball Pen - 1 Piece		
	Questionnaire - 1 Piece		
	Literature - Pamphlet		
Methods adopted for	Power point Presentation		
discussion			
Methods adopted for	Still Photography		
Documentation	Audio/Video Recording		
Minutes of meeting			
Media Coverage	Editor, Dainik Bhaskar		
Local News Channel,			
Time Schedule of Meeting	2nd Stage : Kamalaba Hall (N- 23° 36' 20.1'' & E- 72° 23' 32.3'')		
	near State Transport Bus Stand on 20 th June (10pm -2pm)		
	3rd Stage : Kamalaba Hall (N- 23° 36' 20.1'' & E- 72° 23' 32.3'')		
	near State Transport Bus Stand at 11.00 A.M. on 23 rd August 2007.		

GANDHINAGAR DISTRICT

	PROJECT SUMMARY SHEET
Covering Districts	Gandhinagar
Organizing Place	Gandhinagar city(2 nd stage), Rajpur, Dhanot (25 th August) Rancheda(8 th September).
Number of Invitees	38(2 nd Stage)/ 13 (3 rd Stage)
Number of Presence	$103(2^{\text{nd}} \text{ Stage})/56(3^{\text{nd}} \text{ Stage})$
	Personal Meet
Information Dissemination:	Dispatching letters / invitation
mormation Dissemmation.	
	Advertisement in Newspaper
	Announcement by auto/rickshaw.
	Writing Pad - 1 Piece.
participants	Ball Pen - 1 Piece
	Questionnaire - 1 Piece
	Literature - Pamphlet
Methods adopted for	Power point Presentation
discussion	
Methods adopted for	Still Photography
Documentation	Audio/Video Recording
	Minutes of meeting
Media Coverage	Editor, Dainik Bhaskar
	Local News Channel,
Time Schedule of Meeting	2 nd Stage: Dr. Ambedkar hall (N-23 ⁰ 13' 35.0'' & E-72 ⁰ 38' 19.7'')-
	22 nd June, 11 am.
	3 rd Stage: 25 th August -10:30 am at Rajpur; (23 19' 42.65"N, 72
	24'18.4"E)
	3.00 pm- Dhanot (23 16' 55.74"N and 72 24' 28.07"E)
	8^{th} September-11 am- Rancharada(23 03'56.76''N & 72 26'
	33.03"E)

AHMEDABAD DISTRICT

	PROJECT SUMMARY SHEET
Covering Districts	Ahmedabad
Organizing Place	Ahmedabad and Bavla
Number of Invitees	26 (2 nd Stage)/ 65 (3 rd Stage)
Number of Presence	104 (2 nd Stage)/ 70 (3 rd Stage)
Methods Used for	Personal Meet
Information Dissemination:	Dispatching letters / invitation
	Advertisement in Newspaper
	Announcement by auto/rickshaw.
Stationary Served to the	Writing Pad - 1 Piece.
participants	Ball Pen - 1 Piece
	Questionnaire - 1 Piece
	Literature - Pamphlet
Methods adopted for	Power point Presentation
discussion	
Methods adopted for	Still Photography
Documentation	Audio/Video Recording
	Minutes of meeting
Media Coverage	Editor, Dainik Bhaskar
	Local News Channel,
Time Schedule of Meeting	2nd Stage: Himavan – Mahendi Nawaj E Jang Hall –(N-23 ⁰
	00'53.4" & E-72 ⁰ 33' 55.4") Paldi, Ahmedabad on 25 th June,
	Monday at 11 am.
	3rd Stage: Patel Shiva Bhai Bhula Bhai Community Hall, BAVLA
	village on 6th of September, 11 a.m.

KHEDA DISTRICT

	PROJECT SUMMARY SHEET		
Organizing Place	Kheda		
Number of Invitees	30(2 nd Stage)/ 26(3 rd Stage)		
Number of Presence	152(2 nd Stage)/ 109(3 rd Stage)		
Methods Used for	Personal Meet		
Information Dissemination:	Dispatching letters / invitation		
	Advertisement in Newspaper		
	Announcement by auto/rickshaw.		
Stationary Served to the	Writing Pad - 1 Piece.		
participants	Ball Pen - 1 Piece		
	Questionnaire - 1 Piece		
	Literature - Pamphlet		
Methods adopted for	Power point Presentation		
discussion			
Methods adopted for	Still Photography		
Documentation	Audio/Video Recording		
	Minutes of meeting		
Media Coverage	Editor, Dainik Bhaskar		
	Local News Channel,		
Time Schedule of Meeting 2 nd Stage :27 th June -10:30 am at (APMC Hall, N-22 ⁰ 44' 5)			
	$E-72^{0} 41' 04.4'' (+/-9 M)$		
	3 rd Stage: 8 th September-10:30 am at (APMC Hall, N-22 ⁰ 44'		
	56.0''& E-72 ⁰ 41' 04.4'' (+/- 9 M)}		

ANAND DISTRICT

	PROJECT SUMMARY SHEET
Organizing Place	Anand
Number of Invitees	25(2 nd Stage)/ 40(3 rd Stage)
Number of Presence	67(2 nd Stage)/ 101(3 rd Stage)
Methods Used for	Personal Meet
Information Dissemination:	Dispatching letters / invitation
	Advertisement in Newspaper
	Announcement by auto/rickshaw.
Stationary Served to the	Writing Pad - 1 Piece.
participants	Ball Pen - 1 Piece
	Questionnaire - 1 Piece
	Literature - Pamphlet
Methods adopted for	Power point Presentation
discussion	
Methods adopted for	Still Photography
Documentation	Audio/Video Recording
	Minutes of meeting
Media Coverage	Editor, Dainik Bhaskar
	Local News Channel,
Time Schedule of Meeting	2 nd Stage : 29 th June, Arya Samaj Hall at Anand (22 33' 19.2"N &
	79 57' 49.2" E, +- 13 M).
	3 rd Stage: 8 th September, 2007 at 3 p.m., Amba Mata, Mahadev
	Mandir Hall (22 50' 09.1"N and 72 22'00.7" E), at Mahalev
	Village.

VADODARA DISTRICT

	PROJECT SUMMARY SHEET		
Organizing Place	Vadodara		
Number of Invitees	47 (2 nd Stage)/ 100 (3 rd Stage)		
Number of Presence	111(2 nd Stage)/ 124(3 rd Stage)		
Methods Used for	Personal Meet		
Information Dissemination:	Dispatching letters / invitation		
	Advertisement in Newspaper		
	Announcement by auto/rickshaw.		
Stationary Served to the	Writing Pad - 1 Piece.		
participants	Ball Pen - 1 Piece		
	Questionnaire - 1 Piece		
	Literature - Pamphlet		
Methods adopted for	Power point Presentation		
discussion			
Methods adopted for	Still Photography		
Documentation	Audio/Video Recording		
	Minutes of meeting		
Media Coverage	Editor, Dainik Bhaskar		
	Local News Channel,		
Time Schedule of Meeting	2nd Stage: 2nd July, Kalali (Patel Bari, 22 15' 31.2" N and 73		
	09'15.5"E) at 11 am.		
	3rd Stage: 26th August, Kalali (Patel Bari, 22 15' 31.2" N and 73		
	09'15.5"E) at 11 am.		

7.5 SUMMARY OF PROFILE OF THE PARTICIPANTS BASED ON DISTRIBUTED QUESTIONNAIRE – 2ND STAGE IN BANASKANTHA DISTRICT

No.	Village name	Numbers	Percentage (%)
1	Amirgadh	7	5.1
2	Chadotar	9	6.6
3	Chapi	3	2.2
4	Dhanpura	6	4.4
5	Disha	6	4.4
6	Gathaman	11	8.0
7	Iqbalgadh	9	6.6
8	Jagana	37	27.0
9	Jethi	3	2.2
10	Kalimati	7	5.1
11	Karjoda	5	3.7
12	Koitapura	5	3.7
13	Majadar	10	7.3
14	Ruppura	7	5.1
15	Sadarpur	3	2.2
16	Sedrasana	9	6.6
	Grand Total	137	100.0

Table 7-1 Distribution of Participants by Village (2nd Stage)

Note: As is evident from the table, maximum participation was from Jagana Village. All other villages were almost equally represented.

No.	Particulars	Numbers	Percentage (%)
1	Less than 4	26	22.0
2	Between 4 and 6	41	34.7
3	Between 6 & 8	23	19.4
4	More than 8	20	17.0
5	Did not answer	8	6.8
	Total	118	100.0



As is clear from the family size table, most participants had average family size of 4-6 members while less than 4 members and more than 6 members were in equal proportions.

No.	Particulars	Numbers	Percentage (%)
1	General	30	25.4
2	Other Backward Caste	53	44.9
3	Schedule Caste	17	14.4
4	Schedule Tribes	1	0.9
5	Other	12	10.2
5	Did not answer	5	4.2
	Total	118	100.0

Table 7-3 Social Structure of the Participants (2nd Stage)	Table 7-3	Social Structure of the Participants (2nd Stage)
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Most participants were from OBC (other backward caste) and general category. Proportion of scheduled castes was more than scheduled tribes.

No.	Particulars	Numbers	Percentage (%)
1	Native	90	76.3
2	Non-Native	8	6.8
3	Did not answer	20	17.0
	Total	118	100.0

Table 7-4 Origin of the Participant (2nd Stage)

Most participants in this district were of native origin, meaning non-natives were of little significance. This hints that the respondents were very attached to their native place and would by all possibility resist to move out.

Table 7-5	Education	Level of the	Participants	(2nd Stage)
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No.	Particulars	Numbers	Percentage (%)
1	Illiterate	15	12.7
2	Can read	10	8.7
3	Can read & write	17	14.4
4	Up to 7 th Standard	12	10.2
5	Up to 12 th Standard	25	21.2
6	Graduate	23	19.5
7	Other Professional	11	9.3
8	Did not answer	5	4.2
	Total	118	100.0

It was interesting to find that most participants were educated up to 12th standard and quite a few up to graduation level (ranking next). Literate and semi literate were next in rank and professional were few in number.

No.	Particulars	Numbers	Percentage (%)
1	Agriculture	68	57.6
2	Daily wage	12	10.2
3	Government Service	4	3.4
4	Private Service	13	11.0
5	Business	5	4.2
6	Self Employed	6	5.1
7	Others	9	7.6
8	Did not answer	1	0.9
	Total	118	100.0

From the table above, agriculture stands out to be the dominant occupation of maximum participants. Daily wage earners and private service are far less important and other occupation not important at all.

7.6 SUMMARY OF STAKE HOLDER/PUBLIC CONSULTATION – 2ND STAGE IN BANASKANTHA

Summarizing, several issues were raised in the question – answer session. In sequence they were as follows:

- 1) DFC why not parallel to existing railway line? There seems to be enough land along the alignment so why bypass in the first place as it passes through rich farm land. Why can't it be avoided.
- 2) Concern over farm land being divided into two parts because of DFC project. In that case, communication between them becomes difficult and risky (crossing railway line (by farmers and cattle) and also water supply, irrigation mechanisms and electricity lines get severed and has to be reinstalled. There was a demand that such facilities prevailing before the DFC project should be ensured in the divided land as well without much hassle and that should be incorporated in the policy itself.
- 3) Kanti Bhai Patel of Iqbalgarh raised farmer's concern over how DFC would address hidden cost such as the tedious process of making a piece of land fertile over years, boring tube well, constructing well etc. They demanded that they need to be compensated for such hidden costs before they receive any compensation for the land acquired. Only then can the process of implementation start.
- 4) One issue raised was that why not divert the bypass or take the DFC line along wasteland and forests? Why are funding/ implementing agencies so concerned over flora and fauna when livelihoods of human beings are at stake because of the DFC bypass? Are humans then less important?
- 5) People want development but not at the cost of farmers.
- 6) Compensation and other things should be provided before the start the project.
- 7) Certain common concerns were as follows which were repetitive.
 - Compensation package.
 - Provision of employment of any family member
 - Compensation for each PAF even if they are living as a single HH under joint family setup.

7.7 SUMMARY OF THE PROFILE OF PARTICIPANTS BASED ON THE DISTRIBUTED QUESTIONNAIRE - 3RD STAGE IN BANASKANTHA

No.	Village name	Numbers	Percentage (%)
1	Akesan	16	13.0
2	Antroli	7	5.7
3	Chadotar	17	13.8
4	Devpura	12	9.8
5	Dharewada	3	2.4
6	Dhuliya	1	0.8
7	Gathaman	2	1.6
8	Iqbalgarh	7	5.7
9	Jagana	7	5.7
10	Jorapura	1	0.8
11	Kalimati	3	2.4
12	Koitapura	2	1.6
13	Laxmanpura	1	0.8
14	Laxmipura	2	1.6
15	Lunava	1	0.8
16	Madhupura	2	1.6
17	Majadar	12	9.8
18	Malana	4	3.3
19	Moriya	4	3.3
20	Muriya	3	2.4
21	Pakhanava	1	0.8
22	Palanpur	6	4.9
23	Parpada	3	2.4
24	Sadrasan	4	3.3
25	Sonpura	1	0.8
26	Umardasi	1	0.8
	Grand Total	123	100.0

Table 7-7 Distribution of Participants By Village (3rd Stage)

As is evident, out of 26 villages, the prominent ones from where participants came in large numbers are Chadotar, Akesan, Devpura and Majadar in decreasing order.

No.	Particulars	Numbers	Percentage (%)
1	Less than 4	34	34.3
2	Between 4 and 6	33	33.3
3	Between 6 & 8	15	15.2
4	More than 8	12	12.2
5	Did not answer	5	5.1
	TOTAL	99	100.0

Table 7-8 Family Size (3rd Stage)

As is clear from the family size table, most participants had average family size of less than 4 members while more than 4 and less than 6 members were next in number.

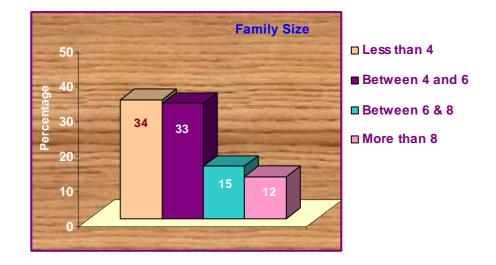


Table 7-9 Social Structure of the Participants (3rd Stage)

No.	Particulars	Numbers	Percentage (%)
1	General	40	40.4
2	Other Backward Caste	45	45.5
3	Schedule Caste	6	6.1
4	Schedule Tribes	3	3.0
5	Other	2	2.0
5	Did not answer	3	3.0
	TOTAL	99	100.0

Most participants were from general category and OBC (other backward caste). Proportion of scheduled castes were more than scheduled tribes.

No.	Particulars	Numbers	Percentage (%)
1	Native	94	64.7
2	Non-Native	5	5.1
3	Did not answer	0	0.0
	TOTAL	99	100.0

Table 7-10 Origin of the Participant (3rd Stage)

Most participants in this district were of native origin (65%), meaning non-natives were of little significance. This hints that the respondents were very attached to their native place and would by all possibility resist to move out.

No.	Particulars	Numbers	Percentage (%)
1	Illiterate	12	12.1
2	Can read	19	19.2
3	Can read & write	15	15.2
4	Up to 7 th Standard	16	16.2
5	Up to 12 th Standard	17	17.2
6	Graduate	11	11.1
7	Other Professional	5	5.1
8	Did not answer	4	4.1
	TOTAL	99	100.0

It was interesting to find that participants who could read and were educated upto 12th standard were about 20% each. Literate and semi literate were next in rank and professionals were few in number.

No.	Particulars	Numbers	Percentage (%)
1	Agriculture	74	74.8
2	Daily wage	2	2.0
3	Government Service	0	0.0
4	Private Service	6	6.1
5	Business	5	5.1
6	Self Employed	3	3.0
7	Others	4	4.0
8	Did not answer	5	5.1
	TOTAL	99	100.0

Table 7-12 Occupation of the Participants (3rd Stage)

From the table above, agriculture stands out to be the dominant occupation of maximum participants. Other occupations are almost insignificant.

7.8 SUMMARY OF FINDINGS – 3RD STAGE IN BANASKANTHA

In Conclusion it may be summarized that people at Palanpur PCM objected to the bypass proposal and expressed resistance to DFC project. Some went to the extent to say that they would commit suicide if JICA acquired their land for this purpose. They were surprised and expressed annoyance that how was Balaram Sanctuary more important than the poor marginal farmers. Some suggested tube rail option. Others mentioned there exists enough land along the existing railway track so why the need of bypass at all?



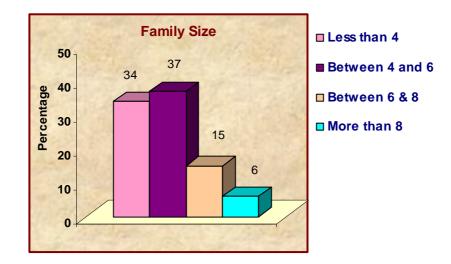
7.9 SUMMARY OF PROFILE OF THE PARTICIPANTS BASED ON DISTRIBUTED QUESTIONNAIRE – SECOND (2ND) STAGE IN PATAN

No.	Village name	Numbers	Percentage (%)
1	Aithor	17	21.0
2	Ankvi	10	12.4
3	Kamli	12	14.8
4	Muktapur	8	9.9
5	Unjha (town)	26	32.1
6	Jethalvasana	8	9.9
	Grand Total	81	100.0

There were in all 81 participants who responded to the questionnaire of which maximum were from Unjha town (26). Though Unjha town comes under Mahesana District, but venue for public consultation was fixed at Unjha as it would cover maximum of Patan District. Maybe proximity to venue can be the reason for this high participation ratio from Unjha town. Also, being a trading centre, many from the business community had come to attend the meeting.

No.	Particulars	Numbers	Percentage (%)
1	Less than 4	23	33.8
2	Between 4 and 6	25	36.8
3	Between 6 & 8	10	14.7
4	More than 8	4	5.9
5	Did not answer	6	8.8
	Total	68	100.0

 Table 7-14 Family Size (2nd Stage)



As is clear from the family size table, most participants had average family size of 4-6 members while less than 4 members followed next

 Table 7-15 Social Structure of the Participants (2nd Stage)

No.	Particulars		Numbers	Percentage (%)
1	General		42	61.8
2	Other Backward Caste		15	22.1
3	Schedule Caste		1	1.5
4	Schedule Tribes		1	1.5
5	Other		1	1.5
5	Did not answer		8	11.8
		Total	68	100.0

Most participants were from the general category followed by OBC. Proportion of scheduled castes and scheduled tribes were nominal and equal in proportion.

No.	Particulars	Numbers	Percentage (%)
1	Native	63	92.5
2	Non-Native	4	5.9
3	Did not answer	1	1.5
	Total	68	100.0

Most participants in this meeting were of native origin, meaning non-natives were of little significance. This hints that the respondents were very attached to their native place and would by all possibility resist to move out in case of land acquisition.

 Table 7-17 Education Level of the Participants (2nd Stage)

No.	Particulars	Numbers	Percentage (%)
1	Illiterate	14	20.6
2	Can read	8	11.8
3	Can read & write	9	13.2
4	Up to 7 th Standard	3	4.4
5	Up to 12 th Standard	16	23.5
6	Graduate	10	14.7
7	Other Professional	3	4.4
8	Did not answer	5	7.4
	Total	68	100.0

It was interesting to find that most participants were educated up to 12th standard and few up to graduation level. A huge chunk came from the squatters living along the railway track near Unjha railway who were all illiterate. Literate and semi literates were next in rank and professionals were few in number.

No.	Particulars	Numbers	Percentage (%)
1	Agriculture	33	48.5
2	Daily wage	2	2.9
3	Government Service	0	0.0
4	Private Service	5	7.4
5	Business	20	29.4
6	Self Employed	2	2.9
7	Others	2	2.9
8	Did not answer	4	5.9
	Total	68	100.0

 Table 7-18 Occupation of the Participants (2nd Stage)

From the table above, agriculture stands out to be the dominant occupation of maximum participants followed by business. This is quite obvious as Unjha is Asia's largest trading centre for cumin seeds and "Isabgul" (Ayurvedic laxative). None of the participants were in Government service.

7.10 SUMMARY OF STAKE HOLDER/PUBLIC CONSULTATION – 2ND STAGE IN PATAN

Summarizing, several issues were raised in the question – answer session. In sequence they were as follows:

- 1) In general, the participants welcomed the DFC project as they agreed that any development project would have positive trickle down effect which would benefit the country at large. But the businessmen (mostly dealing in jeera, isabgul, 80% of it is exported, demanded a stop at Unjha (even a weekly stoppage would do) so that they can directly benefit from the DFC project. They justified their demand by the volume of freight that they daily load.
- 2) Waiting time at railway crossing causes lot of inconvenience to local movement with loss of time. At frequent intervals railway crossing is closed at Unjha and people suffer a lot due to it, therefore there is urgent need of ROB or RUB at Unjha.
- 3) He further added that when a piece of farmland is divided in to two pieces due to railway line, then, firstly railway authorities do not allow taking water pipe line across the railway line for irrigation. In that case, also water supply, irrigation mechanisms and electricity lines get severed and have to be reinstalled. Moreover, crossing railway line by farmers and cattle becomes difficult and risky. There was a demand that such facilities should be ensured in the divided land as well without much hassle and that should be incorporated in the policy itself.
- 4) If enough land is available to Railway authority on the eastern side, then new alignment should be laid on the eastern side so that there is no need to acquire new land. If there is no option left, then only land should be acquired.
- 5) A squatter representative requested the Government and representatives of DFC that justice should be made to them by providing alternative place to build their houses and their case should be considered sympathetically. Alternative land/ structure should be provided and one of the family members should be offered employment in DFC.
- 6) So the common demands from PAF in general were compensation at market rate, employment in Railway and access to water, electricity when farmland gets severed by the DFC.
- 7) Another issue was the drainage problem in the adjoining areas near the railway line. People requested that more number of broad drain/nala should be provided so that water drains off easily. Before the commencement of monsoon season, cleaning of drains/nalas are also needed to prevent water logging.
- 8) To determine value of any land, it has to be agreed upon through mutual consent between the implementing authority and the PAP. With the help of good active NGO, farmers should approach the authority directly so that agents and brokers do not play any negative role so that land acquisition becomes easy and transparent with no middlemen intervention. There was also a suggestion that land value assessment committee should be formed to decide on the rate of land for compensation. If any land gets divided into two parts, then some method should be worked out for redistribution as it is done in town planning scheme.
- 9) DFC may consider to give lump sum amount every year to the project affected families to compensate loss as it is being done in the case of ONGC, (when they acquired land).
- 10) Certain common concerns were as follows which were repetitive.
 - Compensation package.
 - Provision of employment of any family member of PAF in DFC.
 - Provision of DFC station at Unjha, where loading/unloading can take place at least weekly.
 - Solving water pipeline issue when land gets divided due to laying of new railway line.
 - Water drainage problem.
 - RUB/ROB at railway junction Unjha to facilitate free flow of traffic with no time wasted at railway crossing.

7.11 SUMMARY OF THE PROFILE OF PARTICIPANTS BASED ON THE DISTRIBUTED QUESTIONNAIRE - 3RD STAGE IN PATAN

No.	Village name	Numbers	Percentage (%)
1	Siddhpur	96	82
2	Bhandu	5	4
3	Motidau	3	3
4	Sujanpur	13	11
	Total	117	100

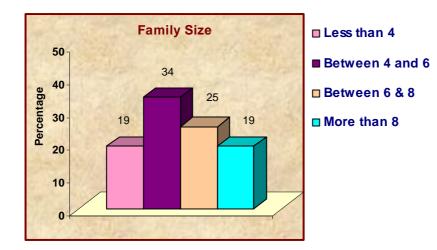
Table 7-19 Distribution of Participants By Village (3rd Stage)

As is evident from the above table, 82% of the participants came from Siddhpur town as that would have greatest impact in northern part of Western corridor with 98 structures(total) getting affected in 5 localities. Major impact would be in 54 APMC shops that would get affected here and one APMC shopping complex too with private shops. Besides this, one squatter called Bindusar colony would also get affected near Kakoci Phatak. Other affected structures are scattered. Participants in the public consultation represented all the above mentioned areas that would come under DFC corridor so that maximum feedback could be captured in the meeting.

Table 7-20	Family Size	(3rd Stage)
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No.	Particulars	Numbers	Percentage (%)
1	Less than 4	23	18.9
2	Between 4 and 6	42	34.4
3	Between 6 & 8	30	24.6
4	More than 8	23	18.9
5	Did not answer	4	3.3
	TOTAL	122	100.0

As is clear from the family size table, most participants had average family size of 4-6 members while less than 4 members and more than 6 members were in equal proportions.



No.	Particulars	Numbers	Percentage (%)
1	General	59	48.4
2	Other Backward Caste	60	49.2
3	Schedule Caste	1	0.8
4	Schedule Tribes	0	0.0
5	Other	1	0.8
5	Did not answer	1	0.8
	TOTAL	122	100.0

Table 7-21 Social Structure of the Participants (3rd	Stage)
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Most participants were from general category and OBC (other backward caste). Proportion of scheduled castes was marginal whereas there were no scheduled tribes.

 Table 7-22 Origin of the Participant (3rd Stage)

No.	Particulars	Numbers	Percentage (%)
1	Native	121	99.2
2	Non-Native	0	0.0
3	Did not answer	1	0.8
	TOTAL	122	100.0

All participants were of native origin, meaning non-natives were of no significance at all. This hints that the respondents were very attached to their native place and would by all possibility resist to move out.

No.	Particulars	Numbers	Percentage (%)
1	Illiterate	53	43.4
2	Can read	8	6.6
3	Can read & write	11	9.0
4	Up to 7 th Standard	11	9.0
5	Up to 12 th Standard	22	18.0
6	Graduate	16	13.1
7	Other Professional	0	0.0
8	Did not answer	1	0.8
	TOTAL	122	100.0

Table 7-23 Education Level of the Participants (3rd Stage)

It was interesting to find that most participants were illiterate. Few were educated up to 12th standard and quite a few up to graduation level (ranking next). Literate and semi literate were next in rank and professional were absent.

Table 7-24	Occupation	of the	Participants	(3rd Stage)
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No.	Particulars	Numbers	Percentage (%)
1	Agriculture	31	25.4
2	Daily wage	49	40.2
3	Government Service	6	4.9
4	Private Service	1	0.8
5	Business	32	26.2
6	Self Employed	1	0.8
7	Others	1	0.8
8	Did not answer	1	0.8
	TOTAL	122	100.0

From the table above, daily wage earners stand out to be the dominant occupation of maximum participants. This is expected as 80% of participants were from various areas of Siddhpur town as it would have maximum impact in the northern section of DFC corridor affecting over 1,000 PAPs and affecting 98 structures. Business seems to be the next important category as shop owners of APMC had participated in the meeting in large numbers as 54 shops on the front line of APMC would be affected. Few came from neighbouring villages so agriculture comparatively was not important here.

7.12 SUMMARY OF FINDINGS – 3RD STAGE IN PATAN

People from Siddhpur municipality strongly opposed the DFC and suggested alternative bypass. Daily wage earners from Indiranagar belonged to BPL category but had no cards. Women representatives from Pattani community also opposed. Representatives from Siddhpur municipality also proposed bypass and so did the APMC at Siddhpur and Unjha. Since there is no stoppage at Unjha station, traders would get no direct benefit from DFC and were simply not interested in DFC.

7.13 SUMMARY OF PROFILE OF THE PARTICIPANTS BASED ON DISTRIBUTED QUESTIONNAIRE – 2ND STAGE IN MAHESANA

No.	Village name	Numbers	Percentage (%)
1.	Ambasan	3	2.2
2.	Fatepura	2	1.4
3.	Heduva	16	11.5
4.	Jagusan	1	0.7
5.	Linch	3	2.2
6.	Mehsana	17	12.2
7.	Mavad	3	2.2
8.	Nandasan	3	2.2
9.	Palodar	12	8.6
10.	Panchot	13	9.4
11.	Ramosana	8	5.8
12.	Sakhpurda	5	3.6
13.	Sametra	4	2.9
14.	Samri	5	3.6
15.	Sobhason	9	6.5
16.	Soneripura	20	14.4
17.	Vadosana	2	1.4
18.	Dediasan	13	9.4
19.	Grand Total	139	100.0

 Table 7-25 Distribution of Participants by Village (2nd Stage)

As is evident, out of 18 villages, the prominent ones from where participants came in large numbers are Soneripura, Mehsana, Hedwa, Panchot and Dediasan are other important villages.

No.	Particulars	Numbers	Percentage (%)
1	Less than 4	38	31.4
2	Between 4 and 6	44	36.4
3	Between 6 & 8	17	14.1
4	More than 8	18	14.9
5	Did not answer	4	3.3
	Total	121	100.0

 Table 7-26 Family Size (2nd Stage)

As is clear from the family size table, most of the participants had average family size of 4-6 members while less than 4 members were next in importance.

No.	Particulars	Numbers	Percentage (%)
1	General	72	59.5
2	Other Backward Caste	33	27.3
3	Schedule Caste	7	5.8
4	Schedule Tribes	1	0.8
5	Other	7	5.8
6	Did not answer	1	0.8
	Total	121	100.0

 Table 7-27 Social Structure of the Participants (2nd Stage)

Most participants (60%) were from general category, followed by OBC. Proportions of scheduled castes were much more than scheduled tribes.

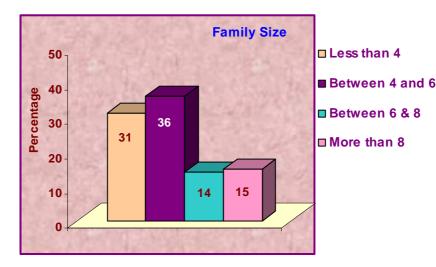


 Table 7-28 Origin of the Participant (2nd Stage)

No.	Particulars	Numbers	Percentage (%)
1	Native	120	99.2
2	Non-Native	1	0.8
3	Did not answer	0	0.0
	Total	121	100.0

Most participants in this district were of native origin, meaning non-natives were of little significance. This hints that the respondents were very attached to their native place and would by all possibility resist to move out.

No.	Particulars	Numbers	Percentage (%)
1	Illiterate	15	12.4
2	Can read	17	14.1
3	Can read & write	31	25.6
	Up to 7 th Standard	14	11.6
5	Up to 12 th Standard	28	21.5
6	Graduate	8	6.6
7	Other Professional	6	5.0
8	Did not answer	4	3.3
	Total	121	100.0

It was interesting to find that most participants were educated up to 12th standard and quite a few up to graduation level (ranking next). Literate and semi literates were next in rank and professionals were few in number.

No.	Particulars	Numbers	Percentage (%)
1	Agriculture	87	71.9
2	Daily wage	7	5.8
3	Government Service	7	5.8
4	Private Service	4	3.3
5	Business	5	4.1
6	Self Employed	2	1.7
7	Others	6	5.0
8	Did not answer	3	2.5
	Total	121	100.0

Table 7-30 Occupation of the Participants (2nd Stage)

From the table above, agriculture stands out to be the dominant occupation of maximum participants. Daily wage earners and private service are far less important and other occupation not important at all.

7.14 SUMMARY OF STAKE HOLDER/PUBLIC CONSULTATION – 2ND STAGE IN MEHSANA

Summarizing, several issues were raised in the question – answer session. In sequence they were as follows:

- 1) To consider DFC being made parallel to existing railway line so that the acquisition of land could be avoided altogether.
- 2) If at all that is not possible then alignment should be made with due considerations keeping in view the growth of Mahesana town. In other words, expected population projection should be considered before the final alignment is fixed. Keeping the perspective of Gujarat developing very fast, within next 15 years of time cities would expand and at that time DFC would probably be cutting across the city.
- 3) Past experience with development projects has been disappointing so far. So farmers / common people are skeptical. When farmers have lost land in various development schemes such as Narmada Water Pipe Line or Canal, Gas Pipe Line, Express Highway etc. conditions of farmers have deteriorated and they never benefited directly/indirectly from such projects. So participants were skeptical about DFC project as well.

- 4) Another issue has been when farm land is split into two because of any railway line, it becomes difficult to cross water pipe line, electricity supply etc. from one side to another. It takes a long time to get NOC and it is expensive also. Therefore, some simple solution is needed with respect to this at district level.
- 5) Most of the farmers of Mahesana District were small/marginal farmers and so there are a number of associated problems. They might lose whole of their land and become land less without any title or legal status. There was question as to how JICA would tackle this problem in their policy implementation.
- 6) There is always a difference between documented price and market value of any land. In any sale deed, the registered price is far below (15-20 times difference in price depending on the type and location of the land) the current market rate. So while giving compensation JICA should consider market price keeping in minds that the affected individual is in a position to purchase new land.
- 7) There was a demand that one person from each PAF should get a Government job.
- 8) In extremity, many participants (about 30%) simply refused to co-operate with this project. They were not ready to negotiate even if the compensation was at the market rate. Further, in case of corridor development and land leveling, land filling would be required, and at that time they would refuse to give even a pinch of soil from their farms.
- 9) Some other common concerns were:
- 10) Demand for RUB/ROB in railway crossings to facilitate smooth traffic flow. Milk and associated items like ice-cream are perishable commodities so waiting in transit is a huge loss to people who trade with these products.
 - Environmental clearance for DFC required.
 - Compensation package for different categories of PAPs.
 - Exact alignment details so that the affected land plots can be identified.

7.15 SUMMARY OF THE PROFILE OF PARTICIPANTS BASED ON THE DISTRIBUTED QUESTIONNAIRE - 3RD STAGE IN MAHESANA

No.	Village name	Numbers	Percentage (%)
1.	Ganeshpura	6	5.1
2.	Hedva	16	13.6
3.	Motidau	4	3.4
4.	Panchot	34	28.8
5.	Palodar	6	5.1
6.	Sunehripura	22	18.6
7.	Nandasan	1	0.9
8.	Mathasur	2	1.7
9.	Dhanali	2	1.7
10.	Baliyasan	5	4.2
11.	Linch	3	2.5
12.	Heduva	1	0.9
13.	Dediyasan	1	0.9
14.	Vadosan	2	1.7
15.	Sametra	6	5.1
16.	Tundali	7	5.9
17.	Grand Total	118	100.0

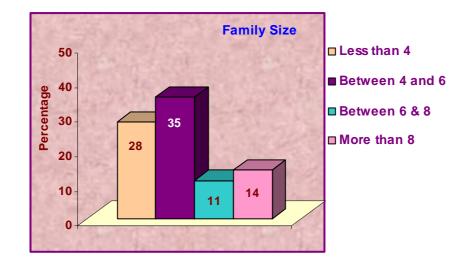
Table 7-31 Distribution of Participants by Village (3rd Stage)

As is evident, out of 16 villages, the prominent ones from where participants came in large numbers are Panchot, other villages which followed are Sunheripura, Hedwa in decreasing order.

No.	Particulars	Numbers	Percentage (%)
1	Less than 4	26	27.7
2	Between 4 and 6	33	35.1
3	Between 6 & 8	10	10.6
4	More than 8	13	13.8
5	Did not answer	12	12.8
	TOTAL	94	100.0

Table 7-32 Family Size (3rd Stage)

As is clear from the family size table, most participants had average family size of less than 4 members while more than 4 and less than 6 members were next in number.



No.	Particulars	Numbers	Percentage (%)
1	General	70	74.5
2	Other Backward Caste	12	12.8
3	Schedule Caste	0	0.0
4	Schedule Tribes	1	1.1
5	Other	1	1.1
5	Did not answer	10	10.6
	TOTAL	94	100.0

Most participants were from general category and OBC (other backward caste) lagged far behind. Proportion of scheduled castes and scheduled tribes were equal.

No.	Particulars	Numbers	Percentage (%)	
1	Native	87	92.6	
2	Non-Native	0	0.0	
3	Did not answer	7	7.5	
	TOTAL	94	100.0	

Table 7-34 Origin of the Participant (3rd Stage)

Most participants in this District were of native origin (65%), meaning non-natives were of little significance. This hints that the respondents were very attached to their native place and would by all possibility resist to move out.

Table 7-35	Education	Level o	of the	Participants	(3rd Stage)
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No.	Particulars	Numbers	Percentage (%)
1	Illiterate	23	24.5
2	Can read	10	10.6
3	Can read & write	17	18.1
4	Up to 7 th Standard	14	14.9
5	Up to 12 th Standard	17	18.1
6	Graduate	6	6.4
7	Other Professional	2	2.1
8	Did not answer	5	5.3
	TOTAL	94	100.0

It was interesting to find that maximum participants were illiterate; few could read. Literate and semi literate were next in rank and professionals were few in number.

No.	Particulars	Numbers	Percentage (%)
1	Agriculture	82	87.2
2	Daily wage	5	5.3
3	Government Service	0	0.0
4	Private Service	0	0.0
5	Business	2	2.1
6	Self Employed	1	1.1
7	Others	1	1.1
8	Did not answer	3	3.2
	TOTAL	94	100.0

Table 7-36 Occupation of the Participants (3rd Stage)

From the table above, agriculture stands out to be the dominant occupation of maximum participants. Other occupations are almost insignificant.

7.16 SUMMARY OF FINDINGS – 3RD STAGE IN MEHSANA

Since Mahesana town would extend its limits (3times) in near future, DFC should shift its bypass further away. Of all villages, Panchot resisted the most as several independent projects are all acquiring land for their work in the same area. Sunheripura too supported Panchot. Residents of Baliyasan Village have also strongly opposed the project as the present alignment will result in large scale displacement of people as well as demolition of good number of residential structures. In general, participants opposed DFC as they would not be the direct beneficiary.



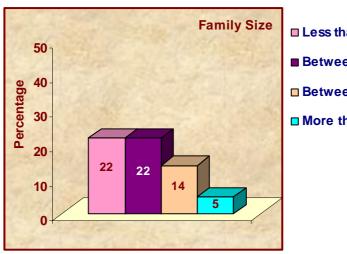
7.17 SUMMARY OF PROFILE OF THE PARTICIPANTS BASED ON **DISTRIBUTED QUESTIONNAIRE – 2ND STAGE IN GANDHINAGAR**

No.	Village name	Numbers	Percentage (%)
1	Adalaj	2	1.9
2	Ahemdabad	1	1.0
3	Bhadaj	7	6.8
4	Chhatral	1	1.0
5	Dantali	5	4.9
6	Daskoi	1	1.0
7	Dhanaj	3	2.9
8	Gandhinagar	11	10.7
9	Isand	7	6.8
10	Iswarpura	1	1.0
11	Kalol	7	6.8
12	Khatraj	31	30.1
13	Rajpur	9	8.7
14	Santej	2	1.9
15	Shertha	15	14.6
	Grand Total	103	100.0

There were in all 103 participants who responded to the questionnaire of which maximum were from Khatraj Village.

No.	Particulars	Numbers	Percentage (%)
1	Less than 4	22	34.9
2	Between 4 and 6	22	34.9
3	Between 6 & 8	14	22.2
4	More than 8	5	7.9
5	Did not answer	0	0.0
	Total	63	100.0

Table 7-38 Family Size (2nd Stage)



Less than 4

- Between 4 and 6
- Between 6 & 8
- More than 8

As is clear from the family size table, most participants had average family size of 4-6 members while less than 4 members followed next.

No.	Particulars	Numbers	Percentage (%)
1	General	29	46.0
2	Other Backward Caste	27	42.9
3	Schedule Caste	6	9.5
4	Schedule Tribes	0	0.0
5	Other	1	1.6
5	Did not answer	0	0.0
	Total	63	100.0

 Table 7-39 Social Structure of the Participants (2nd Stage)

Most participants were from the general category followed by OBC. Proportion of scheduled castes was negligible and none were from scheduled tribes.

No.	Particulars	Numbers	Percentage (%)
1	Native	63	100.0
2	Non-Native	0	0.0
3	Did not answer	0	0.0
	Total	63	100

Table 7-40 Origin of the Participant (2nd Stage)

All participants in this meeting were of native origin, meaning non-natives were of little significance. This hints that the respondents were very attached to their native place and would by all possibility resist to move out in case of land acquisition.

Table 7-41	Education Level	of the Participants	(2nd Stage)
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No.	Particulars	Numbers	Percentage (%)
1	Illiterate	11	17.5
2	Can read	5	8.0
3	Can read & write	9	14.3
4	Up to 7 th Standard	9	14.3
5	Up to 12 th Standard	15	23.8
6	Graduate	10	15.9
7	Other Professional	3	4.8
8	Did not answer	1	1.6
	Total	63	100.0

It was interesting to find that most participants were educated up to 12^{th} standard and few up to graduation levels. A huge chunk was illiterate marginal farmers. Literate and semi literates were next in rank and professionals were few in number.

No.	Particulars	Numbers	Percentage (%)
1	Agriculture	33	52.4
2	Daily wage	8	12.7
3	Government Service	6	9.5
4	Private Service	7	1.1
5	Business	1	1.6
6	Self Employed	1	1.6
7	Others	5	7.9
8	Did not answer	2	3.2
	Total	63	100.0

Table 7-42	Occupation of the Participants (2nd Stage)
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From the table above, agriculture stands out to be the dominant occupation of maximum participants followed by daily wage earners.

7.18 SUMMARY OF FINDINGS – 2ND STAGE IN GANDHINAGAR

- DFC should be laid down parallel to existing railway line. By doing so, money would be saved and also land of many farmers. When farm gets fragmented into pieces because of railway line, then the farmer has problems in supplying irrigation water to the other side. He had to sell his land under such compulsion. He requested to grant compensation as per market rate.
- 2) It is possible that authority may acquire land today and put in to use after some years. In that case he suggested that the implementing agency should give them rent for the in between years and pay compensation at the time of implementation so that they may get the benefit of price escalation, if any.
- 3) After considering the new town planning scheme of Ahmedabad city, it would be prudent to shift the DFC 9-10 km. away from the existing alignment. JICA should consider that too.
- 4) Giving options to farmers while deciding upon compensation.
- 5) Cash compensation is of no value because they spent it in short span of time and in mostly unproductive ways. So employment opportunity to PAF is the only sustainable way as in that case their livelihood problem would be solved permanently.
- 6) Local employment should be generated by DFC projects; unlike past experience when the entrepreneur mobilized human labour from outside Gujarat which is not fair.
- 7) There is a great potential for water recharge structures. If <u>rain water harvesting and</u> <u>recharge systems</u> are build along with DFC then there would be green belt- an attempt to restore ecological balance. In this way, we can solve storm water problems and make positive impact on ecology by proper water management.
- 8) Laying DFC parallel to the existing line is beneficial in three ways; like capital investment would be reduced, time would be saved and no diversification would be required.
- 9) DFC should consider the case about farmers whose land would be divided into two because of DFC. It might so happen that the division would result in unequal pieces of land, and it often happens that the smaller piece of land becomes economically unviable. In other words, it becomes useless to the farmer was he would not be able to cultivate nor sell. DFC should consider such cases while framing the compensation package.
 - Both Central and State Government should work in tandem across party lines so that DFC should work smoothly and peoples' interests are protected

7.19 SUMMARY OF THE PROFILE OF PARTICIPANTS BASED ON THE DISTRIBUTED QUESTIONNAIRE - 3RD STAGE GANDHINAGAR

With the final DFC alignment, it was found that in Gandhinagar District, DFC passes through only 8 villages where no structures are getting affected. Therefore, during the third stage, instead of full fledged public consultation, village meetings were conducted at three suitable locations (Rajpur, Dhanot and Rancharada) to cover most of the villages in Gandhinagar district along the DFC. Since they were small meetings, questionnaire survey was not conducted as they might be misleading statistics –wise. Therefore analysis of the same has not been provided in this section. However, detailed proceedings of all the village meetings have been provided in the annexure.

7.20 SUMMARY OF FINDINGS – 3RD STAGE IN GANDHINAGAR

It may well be said that in all the village level public consultations, people were concerned about what JICA would offer as compensation in terms of land acquired, job in the railways, and compensating for fruit bearing trees like chiku and mangoes (Rajpura)and vegetables (Dhanot). In general they showed no strong opposition against DFC. But people who attended the meeting at Rancharda were in general not in favour of DFC as they were in no way benefited. However, only by offering current market rate of land perhaps some could be made to agree in case of land acquisition. Many suggested shifting DFC further as it would soon come within the urban growth of the twin cities of Ahmedabad and Gandhinagar adding to urban chaos and turmoil.

7.21 SUMMARY OF PROFILE OF THE PARTICIPANTS BASED ON DISTRIBUTED QUESTIONNAIRE – 2ND STAGE IN AHMEDABAD

No.	Village name	Numbers	Percentage (%)
1	Aslali	5	4.8
2	Bareja	8	7.7
3	Changodar	3	2.9
4	Girmatha	2	1.9
5	Kasindra	11	10.6
6	Naj	2	1.9
7	Navrangpura	1	1.0
8	Paldi	5	4.8
9	Pirana	12	11.5
10	Shetra	4	3.9
11	Shiyala	2	1.9
12	Surendranagar	4	3.9
13	Telav	11	10.6
14	Vadala	11	10.6
15	Giramtha	4	3.85
16	Jethalpur	6	5.77
17	Biraj	7	6.73
18	Ahmedabad	6	5.77
	Grand Total	104	100.00

 Table 7-43 Distribution of Participants by Village (2nd Stage)

There were in all 104 participants who responded to the questionnaire of which maximum representation were from Kasindra, Paldi, Telav and Vadala.

Table 7-44 Family Size (2nd Stage)

No.	Particulars	Numbers	Percentage (%)
1	Less than 4	34	42.5
2	Between 4 and 6	31	38.8
3	Between 6 & 8	12	15.0
4	More than 8	3	3.8
5	Did not answer	0	0.0
	Total	80	100.0

As is clear from the family size table, most participants had average family size of less than 4 members followed by 4-6 members.

No.	Particulars	Numbers	Percentage (%)
1	General	30	37.5
2	Other Backward Caste	11	13.8
3	Schedule Caste	27	33.8
4	Schedule Tribes	2	2.5
5	Other	10	12.5
5	Did not answer	0	0.0
	Total	80	100.0

Most participants were from the general category followed by scheduled castes. Proportion of scheduled tribes was nominal.

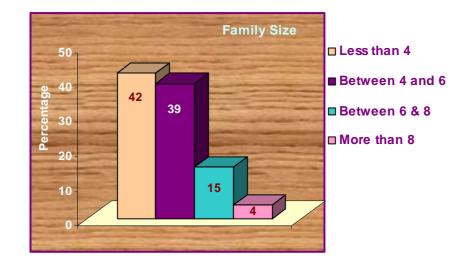


 Table 7-46 Origin of the Participant (2nd Stage)

No.	Particulars	Numbers	Percentage (%)
1	Native	79	98.8
2	Non-Native	1	1.3
3	Did not answer	0	0.0
	Total	80	100.0

Most participants in this district were of native origin, meaning non-natives were of little significance. This hints that the respondents were very attached to their native place and would by all possibility resist to move out in case of land acquisition.

No.	Particulars	Numbers	Percentage (%)
1	Illiterate	9	11.3
2	Can read	7	8.8
3	Can read & write	5	6.3
4	Up to 7 th Standard	9	11.3
5	Up to 12 th Standard	23	28.8
6	Graduate	24	30.0
7	Other Professional	3	3.8
8	Did not answer	0	0.0
	Total	80	100.0

 Table 7-47 Education Level of the Participants (2nd Stage)

It was interesting to find that most participants were educated up to graduation level. Equal proportion up to 12th standard. This indicates that the participants at this meeting were generally well educated and could be expected a high awareness level.

No.	Particulars	Numbers	Percentage (%)
1	Agriculture	46	57.5
2	Daily wage	2	2.5
3	Government Service	3	3.8
4	Private Service	9	11.3
5	Business	4	5.0
6	Self Employed	0	0.0
7	Others	15	18.8
8	Did not answer	1	1.3
	Total	80	100.0

From the table above, agriculture stands out to be the dominant occupation of maximum participants. Few were in Government service.

7.22 SUMMARY OF STAKE HOLDER/PUBLIC CONSULTATION – SECOND STAGE IN AHEMDABAD

Certain issues which came up in this public consultation were:

- 1) Example of Narmada project was cited where comparatively good compensation was given to PAFs. In addition, they got water as well. So they wanted to know that what would be given to the farmers by DFC whose land would be acquired by the project. They also wanted to know merits and demerits of the project. It is not clear that how much land acquisition would take place but when small farmers would lose their land they would also lose title as a farmer. This should not be happen.
- 2) Representative from Changodar industrial belt (DFC alignment passes close to it) mentioned that there is no need to make any change in the proposed alignment. There would be some effect on the life of industrial estate but they would be able to cope up with the situation, of course some special package should be given to the industrial area.
- 3) Valuable suggestions were made about land acquisition process. Some of the points were as under:
 - Our demand is not for money but same quality of land should be given to the farmers.
 - If any PAF opt for cash compensation, market value should be given.
 - If any farmer loses his entire land, even then the title of the farmer should be retained so that in future his family members can buy land if they so wish.
 - Stamp duty and other expenditure should be exempted by railway authority.
 - There should be no tax on the cash compensation given under R&R policy.
 - Because of express highway, whole of Kheda District was under water during last monsoon i.e. 2006. Even one train was under water for one week. Proper drainage should be given to avoid such disaster in future.
 - Because of DFC railway line some of the farmers land would be divided in to two pieces. It would be difficult for him to cultivate the land on both the sides of the railway and would not be able to cross railway line very often and easily. To avoid such situations, he should be provided that much land on the either of the sides.
 - We should also think of the landless labourers and Maldharies (daily wage labourers). There would be negative effect on their life and they should be also considered as PAFs, because their livelihood is dependent on Gochar or waste land (common grazing ground under village panchayat).

- 4) An interesting suggestion that if project is to be implemented by some private company then PAFs should be made share holders of the company so that they can get life time benefit in addition to employment in DFC. DFC implementing authority should keep that in mind while framing R&R policy that local Gujarati people should get employment opportunity. In DFC developmental project, Gujarati people should get job opportunity at least in Gujarat stretch.
- 5) In case of DFC, farmers should be given rent benefit so they do not face hardship in the interim period between acquisition and compensation.
- 6) In 90% of cases, cash compensation is given in the developmental projects like this, out of that it has been observed that only 5% of the PAFs purchase land. This has maximum impact on small and marginal farmers who become land less in such cases.
- 7) There exists a vast difference between market value and documented value of the land, some reasonable value, midway, should be decided upon. Secondly, he mentioned that Bareja is fast developing as a trading centre. In nearby villages there are more then 100 Rice mills and latest Agriculture Productivity Market and the Apron Park are also coming up soon, along the Ring Road. On an average they produce 400 to 500 truck loads daily. So he demanded that if loading facility at Bareja can be provided by DFC.
- 8) A participant questioned what opportunity the local contractor would get and how they would be benefited? Secondly he mentioned that each year land yields and farmers get returns out of it. But when DFC would acquire land, they may get one-time good compensation, but no care is taken after that. He suggested a farmers committee to get co-operation from fellow farmers for deciding R&R policy.
- 9) One person from each PAF should get employment in DFC. If a family has more than one adult member and when only one gets a govt. job, it creates family tension and sometime creates even bigger economical and sociological imbalance within the family. This has to be looked into as well.
- 10) Land price also depends upon the location of land i.e. "road touch" or interior. Raju Bhai of Jeevantirth added that there are seasonal changes in value of land also.
- 11) It was common experience of the people that M.P. & M.L.A., get information about Govt.'s development project well in advance. Accordingly, they purchase land on very large scale at a comparatively lower price and when implementing authority acquires land, and then they bargain for the land at a very high price and are mostly successful.
- 12) Afforestation is also important. Some villages have their forest under Joint Forest Management or Social Forestry Scheme. Afforestation should be encouraged so that landless or marginal farmers may not find any difficulty in grazing their cattle. Compensation should be given at the village level (through gram panchayat maybe) for such forest land.

7.23 SUMMARY OF THE PROFILE OF PARTICIPANTS BASED ON THE DISTRIBUTED QUESTIONNAIRE - 3RD STAGE IN AHMEDABAD

No.	Village name	Numbers	Percentage (%)
1	Ambaliyara	3	4.3
2	Godhavi	12	17.1
3	Jalalpur	1	1.4
4	Kanethi	5	7.1
5	Kavitha	1	1.4
6	Matoda	7	10.0
7	Moriya	7	10.0
8	Moti Devti	10	14.3
9	Saroda	2	2.9
10	Vasna Chacharwadi	18	25.7
11	Bawala	2	2.9
12	Badarkha	2	2.9
	Grand Total	70	100.0

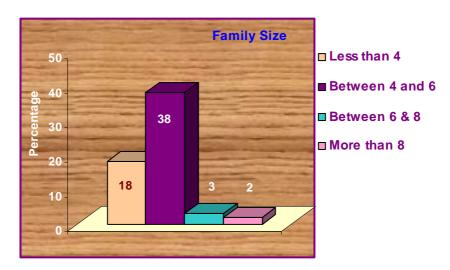
Table 7-49	Distribution of Partic	ipants By Village	(3rd Stage)
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As is evident from the above table, out of 70 participants who attended the third stage of the meeting, Maximum came from Vasna Chacharwadi. Other villages from where maximum representatives came are Godhavi, Matoda, Moriya, Moti Devti.

Table 7-50	Family Size (3rd Stage)
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No.	Particulars	Numbers	Percentage (%)
1	Less than 4	12	18.5
2	Between 4 and 6	25	38.5
3	Between 6 & 8	2	3.1
4	More than 8	1	1.5
5	Did not answer	25	38.5
	TOTAL	65	100.0

As is clear from the family size table, most participants had average family size of 4-6 members while less than 4 members and more than 6 members were in equal proportions.



No.	Particulars	Numbers	Percentage (%)
1	General	9	13.9
2	Other Backward Caste	11	16.9
3	Schedule Caste	24	36.9
4	Schedule Tribes	0	0.0
5	Other	1	1.5
5	Did not answer	20	30.8
	TOTAL	65	100.0

	Table 7-51	Social Structure	of the Partici	ipants (3rd Stage)
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Most participants were from scheduled castes category while quite a few never answered this question.

No.	Particulars	Numbers	Percentage (%)
1	Native	47	72.3
2	Non-Native	0	0.0
3	Did not answer	18	27.7
	TOTAL	65	100.0

Table 7-52 Origin of the Participant (3rd Stage)

All participants were of native origin, meaning non-natives were of no significance at all. This hints that the respondents were very attached to their native place and would by all possibility resist to move out.

Table 7-53	Education	Level of	the Pa	articipants	(3rd Stage)
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No.	Particulars	Numbers	Percentage (%)
1	Illiterate	2	3.1
2	Can read	7	10.8
3	Can read & write	21	32.3
4	Up to 7 th Standard	8	12.3
5	Up to 12 th Standard	10	15.4
6	Graduate	10	15.4
7	Other Professional	2	3.1
8	Did not answer	5	7.7
	TOTAL	65	100.0

It was interesting to find that most participants were semi-literate. Few were educated upto 12th standard and few up to graduation level (ranking next). Literate and semi literate were next in rank and professional were very few.

Table 7-54	Occupation	of the	Participants	(3rd Stage)
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No.	Particulars	Numbers	Percentage (%)
1	Agriculture	36	55.4
2	Daily wage	5	7.7
3	Government Service	0	0.0
4	Private Service	10	15.4
5	Business	3	4.6
6	Self Employed	5	7.7
7	Others	4	6.2
8	Did not answer	2	3.1
	TOTAL	65	100.0

From the table above, agriculture stands out to be the dominant occupation of maximum participants. This is expected as 80% of participants were from various areas of detour which are mostly agricultural land.

7.24 SUMMARY OF FINDINGS – 3RD STAGE IN AHEMDABAD

In general participants opposed the DFC and showed no interest in industrial corridor or DFC in particular. Land is costly so any acquisition would not be easy. With the water from Narmada Canal coming in, the fertility of the area has improved over the last few years making it costlier.

7.25 SUMMARY OF PROFILE OF THE PARTICIPANTS BASED ON DISTRIBUTED QUESTIONNAIRE – 2ND STAGE IN KHEDA

No.	Village name	Numbers	Percentage (%)
1	Bareja	7	4.6
2	Bodej	1	0.7
3	Damri	8	5.3
4	Dharkar	2	1.3
5	Dhathal	11	7.2
6	Garmala	5	3.3
7	Gharoda	2	1.3
8	Govindpura	8	5.3
9	Hardoa	4	2.6
10	Heranj	8	5.3
11	Kajipura	2	1.3
12	Kaloli	6	4.0
13	Kanera	4	2.6
14	Kathwada	1	0.7
15	Kazipura	4	2.6
16	Kheda	6	4.0
17	Machhiel	1	0.7
18	Mahelaj	12	7.9
19	Malarpura	4	2.6
20	Navagam	3	2.0
21	Naika	10	6.6
22	Santipura	8	5.3
23	Sarsa	2	1.3
24	Shetra	13	8.6
25	Traj	2	1.3
26	Vadala	4	2.6
27	Varandi	1	0.7
28	Vasana	4	2.6
29	Vavdi	9	5.9
	Grand Total	152	100.0

Table 7-55 Distribution of Participants by Village (2nd Stage)

There were in all 152 participants who responded to the questionnaire of which maximum were from Shetra, Dathal and Mahelaj.

No.	Particulars	Numbers	Percentage (%)
1	Less than 4	43	30.5
2	Between 4 and 6	66	46.8
3	Between 6 & 8	16	11.4
4	More than 8	12	8.5
5	Did not answer	4	2.8
	Total	141	100.0

Table 7-56	Family	/ Size	(2nd	Stage)
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As is clear from the family size table, most participants had average family size of 4-6 members while less than 4 members followed next

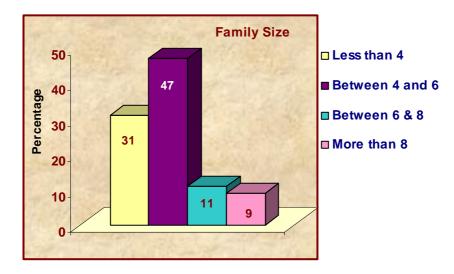


 Table 7-57 Social Structure of the Participants (2nd Stage)

No.	Particulars	Numbers	Percentage (%)
1	General	31	22.0
2	Other Backward Caste	62	44.0
3	Schedule Caste	33	23.4
4	Schedule Tribes	3	2.1
5	Other	12	8.5
6	Did not answer	0	0.0
	Total	141	100.0

Most participants were from the OBC category while scheduled castes and general category participants were equal in number. Proportions of scheduled tribes were nominal in proportion.

No.	Particulars	Numbers	Percentage (%)
1	Native	135	95.7
2	Non-Native	6	4.3
3	Did not answer	0	0.0
	Total	141	100.0

 Table 7-58 Origin of the Participant (2nd Stage)

Most participants in this District were of native origin, meaning non-natives were of little significance. This hints that the respondents were very attached to their native place and would by all possibility resist to move out in case of land acquisition.

No.	Particulars	Numbers	Percentage (%)
1	Illiterate	7	5.0
2	Can read	12	8.5
3	Can read & write	28	19.9
	Up to 7 th Standard	17	12.1
5	Up to 12 th Standard	37	26.2
6	Graduate	29	20.6
7	Other Professional	4	2.8
8	Did not answer	7	5.0
	Total	141	100.0

 Table 7-59 Education Level of the Participants (2nd Stage)

It was interesting to find that most participants were educated up to 12th standard and few up to graduation level. Literate and semi literates were next in rank and professionals were few in number.

No.	Particulars	Numbers	Percentage (%)
1	Agriculture	97	68.8
2	Daily wage	8	5.7
3	Government Service	6	4.3
4	Private Service	3	2.1
5	Business	3	2.1
6	Self Employed	8	5.7
7	Others	9	6.4
8	Did not answer	7	5.0
	Total	141	100.0

Table 7-60 Occupation of the Participants (2nd Stage)

From the table above, agriculture stands out to be the dominant occupation of maximum participants.

7.26 SUMMARY OF STAKE HOLDER/PUBLIC CONSULTATION – 2ND STAGE IN KHEDA

Summarizing, several issues were raised. In sequence they were as follows:

- 1) A fortnight for information to disseminate properly so that firstly they could understand the pros and cons of the project and then pass on the information to the public in general.
- 2) Only compensation is not enough as when PAPs receive cash compensation, people tend to spend it within no time. Rather employment for the family is a better option.
- 3) To avoid difficulties, concrete plan need to be prepared.
- 4) People were aware that none can stop any development work nor is it advisable to do so. State and Central Govt. has the right to acquire land in the interest of the Nation. So when they cannot stop that, the least they can do is ask for good compensation package. Regarding compensation, he also suggested that if market rate is offered, most of the PAFs would be satisfied and so fewer litigation cases would come up. JICA should offer a package which would be acceptable without many grievances.
- 5) Kheda does not have any passenger train facilities; neither would they get any benefit of goods train facility from DFC. There was a demand therefore that MEMU train on the same track can ply when it is not in use for DFC.

- 6) Previously, all planning and development schemes were prepared at office level and when everything was ready, the implementing authority informed people when they were left with no choice. In contrast, at PCM organized by CES-JICA, concerned people could raise their concerns and let their voices heard. He appreciated the public consultation mechanism as organized by JICA study team. They were appreciated for their efforts towards this and their new way of thinking.
- 7) Village level meetings should be organized when the actual survey numbers come forth.
- 8) Another suggestion was that DFC should provide 1% to 3% of its earning for the development of the project affected villages.
- 9) Problem of water logging is very serious. So enough nalas/ water drainage channels should be provided by DFC.
- 10) It is difficult for an individual to pursue his/her case. So if they could form a committee, then their representation becomes strong.
- 11) Whether JICA had any provision for PAFs of old couples who do not have any children? Something like a pension scheme/or some social security measure was recommended. Life long pension/measures of social security to old project affected families who have no other option and who has no other caretakers, as a part of social security scheme on humanitarian basis.
- 12) For deciding actual value of land, they could form a neutral land valuation committee at village level. Perhaps they could decide on some thumb rule for land valuation.
- 13) Compensation against social forestry for which his panchayat had made effort. He informed that local people got fuel and fodder from forests and village panchayat also got some income from such 'Joint Forest Management' scheme. In the same way compensation against Gauchar land Free Grazing land' to the people should be given.
- 14) Whenever railway line passes, every care should be taken for storm water management so that standing crops and top soil erosion do not take place. He also advised that JICA representatives should meet local experienced people to know about water flow during monsoon.
- **15**) Women participants were concerned about approach roads and ROB or RUB in the case of emergency like delivery or accident cases.

7.27 SUMMARY OF THE PROFILE OF PARTICIPANTS BASED ON THE DISTRIBUTED QUESTIONNAIRE - 3RD STAGE IN KHEDA

No.	Village name	Numbers	Percentage (%)
1	Damari	7	6.4
2	Dathal	6	5.5
3	Dharampur	1	0.9
4	Garmala	3	2.8
5	Govindpura	4	3.7
6	Heranj	10	9.2
7	Khandhli	6	5.5
8	Limbashi	1	0.9
9	Machhiel	2	1.8
10	Matar	4	3.7
11	Radhu	2	1.8

Table 7-61	Distribution of Par	ticipants By	Village (3rd Stage)

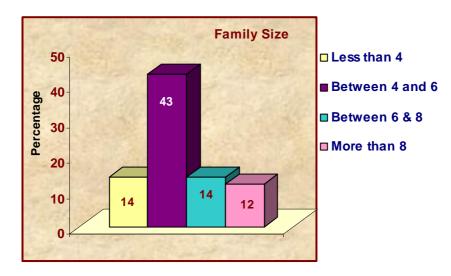
No.	Village name	Numbers	Percentage (%)
12	Shetra	13	11.9
13	Vasna Bujarg	6	5.5
14	Kaloli	5	4.6
15	Naika	12	11.0
16	Palla	4	3.7
17	Traj	10	9.2
18	Pimpariya	5	4.6
19	Kathoda	8	7.3
	Grand Total	109	100.0

About 100 participants attended the third stage public consultation meeting at Kheda. As is evident from the above table, maximum participants came from Shetra and Naika Villages as DFC passes through the first village affecting two structures and very close to the second village.

No.	Particulars	Numbers	Percentage (%)
1	Less than 4	15	14.3
2	Between 4 and 6	45	42.9
3	Between 6 & 8	15	14.3
4	More than 8	13	12.4
5	Did not answer	17	16.2
	TOTAL	105	100.0

Table 7-62 Family Size (3rd Stage)

As is clear from the family size table, most participants had average family size of 4-6 members while less than 4 members and more than 6 members were in equal proportions.



No.	Particulars	Numbers	Percentage (%)
1	General	27	25.7
2	Other Backward Caste	49	46.7
3	Schedule Caste	11	10.5
4	Schedule Tribes	1	1.0
5	Other	7	6.7
6	Did not answer	10	9.5
	TOTAL	105	100.0

Table 7-63	Social Structure	of the	Participants	(3rd Stage)
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Most participants were from OBC (other backward caste) and general category. Proportion of scheduled castes was marginal whereas there were hardly any scheduled tribes.

No.	Particulars	Numbers	Percentage (%)
1	Native	96	95.1
2	Non-Native	2	2.0
3	Did not answer	3	3.0
	TOTAL	101	100.0

Table 7-64 Origin of the Participant (3rd Stage)

All participants were of native origin, meaning non-natives were of no significance at all. This hints that the respondents were very attached to their native place and would by all possibility resist moving out.

Table 7-65	Education	Level of	i the Parti	cipants	(3rd Stage)
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No.	Particulars	Numbers	Percentage (%)
1	Illiterate	5	4.8
2	Can read	5	4.8
3	Can read & write	39	37.1
4	Up to 7 th Standard	8	7.6
5	Up to 12 th Standard	25	23.8
6	Graduate	15	14.3
7	Other Professional	4	3.8
8	Did not answer	4	3.8
	TOTAL	105	100.0

It was interesting to find that most participants could read and write. Few were educated up to 12th standard. Literate and semi literates were next in rank and professional were absent.

No.	Particulars	Numbers	Percentage (%)
1	Agriculture	80	76.2
2	Daily wage	2	1.9
3	Government Service	1	1.0
4	Private Service	2	1.9
5	Business	4	3.8
6	Self Employed	6	5.7
7	Others	7	6.7
8	Did not answer	3	2.9
	TOTAL	105	100.0

From the table above, agriculture stands out to be the dominant occupation of maximum participants.

7.28 SUMMARY OF FINDINGS – 3RD STAGE IN KHEDA

It may well be concluded that in Kheda District, participants vehemently opposed the project in totality. They also mentioned that the most important concern of the people here was the floods which occur almost every alternate year by over-flooding of the 7 rivers which cross through the district. The 5 m high embankment proposed for DFC corridor was the main point of contention as the people felt that this would aggravate the flood situation further, adding to misery of the farmers. They unanimously opposed the project and requested the alignment to be shifted further from the present one.

7.29 SUMMARY OF PROFILE OF THE PARTICIPANTS BASED ON THE DISTRIBUTED QUESTIONNAIRE – 2ND STAGE IN ANAND

No.	Village name	Numbers	Percentage (%)
1.	Changa	11	16.4
2.	Chapad	3	4.5
3.	Kasor	27	40.3
4.	Meghva	1	1.5
5.	Shihol	2	3.0
6.	Shilol	1	1.5
7.	Sunav	20	29.9
8.	Visnoli	2	3.0
	Grand Total	67	100.0

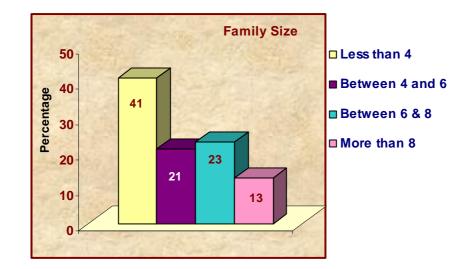
 Table 7-67 Distribution of Participants by Village (2nd Stage)

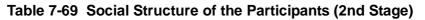
There were in all participants who responded to the questionnaire of which maximum were from Kasor Village (40%) followed by Sunav (30%). Changa was another important village that would be affected by DFC.

No.	Particulars	Numbers	Percentage (%)
1	Less than 4	23	41.1
2	Between 4 and 6	12	21.4
3	Between 6 & 8	13	23.2
4	More than 8	7	12.5
5	Did not answer	1	1.8
	Total	56	100.0

Table 7-68 Family Size (2nd Stage)

As is clear from the family size table, most participants had average family size of less than 4 members while between 4 -6 members followed next.





No.	Particulars	Numbers	Percentage (%)
1	General	31	55.4
2	Other Backward Caste	20	35.7
3	Schedule Caste	2	3.6
4	Schedule Tribes	3	5.4
5	Other	0	0.0
6	Did not answer	0	0.0
	Total	56	100.0

Most participants were from the general category followed by OBC. Proportion of scheduled castes and scheduled tribes were nominal and almost equal in proportion.

Table 7 70 Origin of the Farticipant (2nd Otage)				
No.	Particulars	Numbers	Percentage (%)	
1	Native	54	96.4	
2	Non-Native	2	3.6	
3	Did not answer	0	0.0	

Table 7-70 Origin of the Participant (2nd Stage)

Most participants in this district were of native origin, meaning non-natives were of little significance. This hints that the respondents were very attached to their native place and would by all possibility resist moving out in case of land acquisition.

Total

56

100.0

No.	Particulars	Numbers	Percentage (%)
1	Illiterate	19	33.9
2	Can read	5	8.7
3	Can read & write	14	25.0
4	Up to 7 th Standard	2	3.6
5	Up to 12 th Standard	10	17.9
6	Graduate	4	7.1
7	Other Professional	1	1.8
8	Did not answer	1	1.8
	Total	56	100.0

It was interesting to find that most participants were illiterates and few educated upto 12th standard. A huge chunk was semi literates next in rank and professionals were few in number.

No.	Particulars	Numbers	Percentage (%)
1	Agriculture	41	73.2
2	Daily wage	5	8.9
3	Government Service	1	1.8
4	Private Service	4	7.1
5	Business	0	0.0
6	Self Employed	4	7.1
7	Others	1	1.8
8	Did not answer	0	0.0
	Total	56	100.0

Table 7-72 Occupation of the Participants (2nd Stage)

From the table above, agriculture stands out to be the dominant occupation of maximum participants.

7.30 SUMMARY OF STAKE HOLDER/PUBLIC CONSULTATION – 2ND STAGE IN ANAND

Summarizing, several issues were raised in the question – answer session. In sequence they were as follows:

- 1) Amul dairy products, (a brand name today), are supplied all over India and if DFC project has provision for trains with special facility to load perishable items, then Amul would surely emerge as a bulk user of DFC in future.
- 2) People were not happy with the past experiences like Narmada project, Express Highway, ONGC etc. They would not like DFC to repeat that.
- 3) Some engineering industries exist near Charotar Village. More than 150 people from the village are employed there and have their source of livelihood. DFC alignment should not affect them adversely so that they may continue their work and do not lose their livelihood source.
- 4) Land at 'Charotar' Village is precious like gold, so maximum compensation is expected if land is acquired by DFC.
- 5) In each village the market rate of land is different. Not only that, in any particular village, the market value of land different from one place to another depending upon its location, i.e. if it is near the road in the village or is far from the road. Value of land decreases with increasing distance from the highway/ road connectivity. This is however, an universal rule.
- 6) The meeting of all the farmers and leaders should be arranged once the alignment gets finalized. Land here is very fertile and if land is lost, then it would disturb their livelihood. The market value of land is so high that affected family would not be able to purchase new land out of what usually compensation package offers. So if they do not get satisfactory land compensation money, they would oppose the project. Besides, the ROBs & RUBs should be constructed with consultation of the villagers.
- 7) Some agreement could be worked out between the implementing agency and the PAPs but even for that consent of each farmer is required. One committee should be formed which will evaluate the land cost neutrally and meeting of all PAFs should be organized to come to some justifiable agreement.

- 8) Due to establishment of an international college at Changa which would be an university in near future, the cost of land has increased many fold. Presently, land is being purchased to build hostel blocks. So, Changa would demand quite a high rate of land, employment opportunity in public sector undertaking and provision of RUB, ROBs.
- 9) The small farmers and landless labourers, especially whose life is dependent on cattle rearing (maldharies) suffer a lot with land acquisition as they graze their animals on Gauchar land (common village property): they should also be considered as project affected by JICA and some assistance should be provided to them as well.
- 10) The provisions of JICA when land would be divided by DFC. Proper information dissemination among PAFs after advertisement and written documents. Also there was demand for house against house, or implementing authority could built it on their behalf or else grant construction cost at current rate.
- 11) The market value of land should be considered at the time of actual acquisition.
- 12) Small farmers should not lose their title as a farmer. Secondly he said that more than 3000 students study in that college and the college authority do not want DFC railway line to pass near the college as it would create noise pollution and vibration disturbing students.
- 13) Small farmers should not lose their title as a farmer.
- 14) More than 3000 students study in Changa international college and the college authority would not want DFC railway line to pass near the college as it would create noise pollution and vibration disturbing students.
- 15) With implementation of new development project like DFC, crop production suffers and even the crops of adjoining fields may suffer due to some reason or the other like theft, disturbances etc. They should also get compensation for loss of crop when DFC project would be implemented.
- 16) Some times it so happens that the road towards a farm passes through another farm and then the farmer loses his right to pass through. He also should be considered as a PAP and be eligible for compensation or else his right to pass should be retained.

7.31 SUMMARY OF THE PROFILE OF PARTICIPANTS BASED ON THE DISTRIBUTED QUESTIONNAIRE - 3RD STAGE IN ANAND

No.	Village name	Numbers	Percentage (%)
1	Asodar	6	5.9
2	Bandhni	6	5.9
3	Bhadkad	2	2.0
4	Karamsad	2	2.0
5	Kasor	6	5.9
6	Morad	5	5.0
7	Porda	2	2.0
8	Napa Vanto	7	6.9
9	Vishnoli	9	8.9
10	Mahelav	20	19.8
11	Kasumbad	2	2.0
12	Airdi	8	7.9
13	Vanas Khilya	7	6.9
14	Bantwa	4	4.0
15	Sunav	8	7.9
16	Malataj	4	4.0
17	Virsadpura	3	3.0
	Grand Total	101	100.0

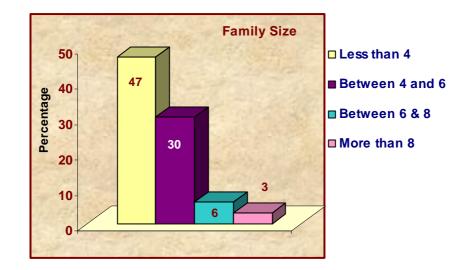
Table 7-73	Distribution	of Participants	By Village	e (3rd Stage)
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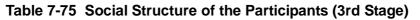
As is evident from the above table, maximum participants came from Mehelav, Airdi and Sunav Villages.

No.	Particulars	Numbers	Percentage (%)
1	Less than 4	47	46.5
2	Between 4 and 6	30	29.7
3	Between 6 & 8	6	5.9
4	More than 8	3	3.0
5	Did not answer	15	14.9
	TOTAL	101	100.0

Table 7-74 Family Size (3rd Stage)

As is clear from the family size table, most participants had average family size of less than 4 members while between 4 -6 members were next.





No.	Particulars	Numbers	Percentage (%)
1	General	53	52.5
2	Other Backward Caste	18	17.8
3	Schedule Caste	3	3.0
4	Schedule Tribes	6	5.9
5	Other	15	14.9
6	Did not answer	6	5.9
	TOTAL	101	100.0

Most participants were from general category and OBC (other backward caste). Proportion of scheduled castes and scheduled tribes was marginal.

No.	Particulars	Numbers	Percentage (%)
1	Native	96	95.1
2	Non-Native	2	2.0
3	Did not answer	3	3.0
	TOTAL	101	100.0

Table 7-76 Origin of the Participant (3rd Stage)

All participants were of native origin, meaning non-natives were of no significance at all. This hints that the respondents were very attached to their native place and would by all possibility resist to move out.

No.	Particulars	Numbers	Percentage (%)
1	Illiterate	0	0.0
2	Can read	1	1.0
3	Can read & write	34	33.7
4	Up to 7 th Standard	9	8.9
5	Up to 12 th Standard	24	23.8
6	Graduate	19	18.8
7	Other Professional	12	11.9
8	Did not answer	2	2.0
	TOTAL	101	100.0

It was interesting to find that most participants could read and write and quite a few were educated up to 12th standard.

No.	Particulars	Numbers	Percentage (%)
1	Agriculture	85	84.2
2	Daily wage	2	2.0
3	Government Service	0	0.0
4	Private Service	8	7.9
5	Business	4	4.0
6	Self Employed	0	0.0
7	Others	1	1.0
8	Did not answer	1	1.0
	TOTAL	101	100.0

Table 7-78 Occupation of the Participants (3rd Stage)

From the table above, agriculture stands out as the dominant occupation.

7.32 SUMMARY OF FINDINGS – 3RD STAGE IN ANAND

It may be mentioned that the affected villages in Anand District all lie in the extreme interior and many have difficulty in accessibility. The participants mentioned that they were against the DFC project in general. They complained that all development policies like DFC were proindustrialists and in no way do farmers' benefit. They demanded railway pass for the PAFs and since this area is very rich agriculturally many of these farmers' are well off. Many relatives of farmers stay in the US- they revealed and were in no mood to part with their fertile land.

7.33 SUMMARY OF PROFILE OF THE PARTICIPANTS BASED ON DISTRIBUTED QUESTIONNAIRE – 2ND STAGE IN VADODARA

No.	Village name	Numbers	Percentage (%)
1.	Chapad	16	14.4
2.	Chhapriyapura	8	7.2
3.	Gokulpura	8	7.2
4.	Kalali	18	16.2
5.	Khajipura	10	9.0
6.	Mahapura	8	7.2
7.	Maretha	13	11.7
8.	Raypura	6	5.4
9.	Samyala	15	13.5
10.	Talsat	9	8.1
	Grand Total	111	100.0

 Table 7-79 Distribution of Participants by Village (2nd Stage)

There were in all 111 participants who responded to the questionnaire of which maximum were from Kalali (the venue of SHMs), Maretha, Samyala and Chapad. It must be noted that all these 4 villages are in close proximity within 3-4 km.

No.	Particulars	Numbers	Percentage (%)
1	Less than 4	33	39.8
2	Between 4 and 6	35	42.2
3	Between 6 & 8	6	7.2
4	More than 8	7	8.4
5	Did not answer	2	2.4
	Total	83	100.0

Table 7-80 Family Size (2nd Stage)

As is clear from the family size table, most participants had average family size of 4-6 members while less than 4 members followed next

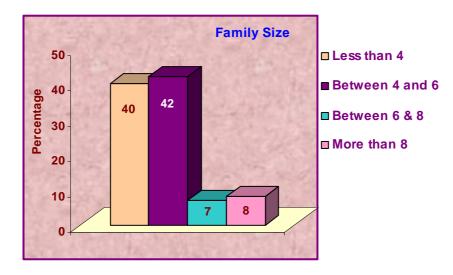


 Table 7-81 Social Structure of the Participants (2nd Stage)

No.	Particulars	Numbers	Percentage (%)
1	General	57	68.7
2	Other Backward Caste	18	21.7
3	Schedule Caste	6	7.2
4	Schedule Tribes	1	1.2
5	Other	1	1.2
6	Did not answer	0	0.0
	Total	83	100.0

Most participants were from the general category followed by OBC. Proportion of scheduled castes and scheduled tribes were nominal and equal in proportion.

No.	Particulars	Numbers	Percentage (%)
1	Native	82	98.8
2	Non-Native	1	1.2
3	Did not answer	0	0.0
	Total	83	100.0

 Table 7-82 Origin of the Participant (2nd Stage)

Most participants in this district were of native origin, meaning non-natives were of little significance. This hints that the respondents were very attached to their native place and would by all possibility resist to move out in case of land acquisition.

No.	Particulars	Numbers	Percentage (%)
1	Illiterate	16	19.3
2	Can read	9	10.8
3	Can read & write	23	27.7
4	Up to 7 th Standard	6	7.2
5	Up to 12 th Standard	17	20.5
6	Graduate	11	13.3
7	Other Professional	1	1.2
8	Did not answer	0	0.0
	Total	83	100.0

Table 7-83 Education Level of the Participants (2nd Sta	ge)
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It was interesting to find that most participants could read and write and quite a few were educated upto 12th standard and few up to graduation level as well. Literate and semi literates were next in rank and professionals were few in number.

No.	Particulars	Numbers	Percentage (%)
1	Agriculture	63	75.9
2	Daily wage	8	9.6
3	Government Service	3	3.6
4	Private Service	3	3.6
5	Business	2	2.4
6	Self Employed	3	3.6
7	Others	1	1.2
8	Did not answer	0	0.0
	Total	83	100.0

 Table 7-84 Occupation of the Participants (2nd Stage)

From the table above, agriculture stands out to be the dominant occupation of maximum participants.

7.34 SUMMARY OF STAKE HOLDER/PUBLIC CONSULTATION – 2ND STAGE IN VADODARA

Summarizing, several issues were raised in the question – answer session. In sequence they were as follows:

- 1) Questions were raised like who was organizing this consultation and whether this meeting was in the individual capacity of Jeevantirth or organized by JICA?
 - How much would be the breath of railway line?
 - How many Yards and Junctions would be in Gujarat?
- 2) Demand for compensation at market rate (market value of land was Rs 50 lakhs /Bigha) and employment of one member of PAF in DFC. People expressed dissatisfaction about what compensation they received from Narmada dam canal project. He said that they wanted compensation at Market Rate and not at Jantri Rate or any lump sump amount. Some amicable solution must be found out to bridge the difference between Jantri Rate and Market Rate of land.
- 3) The provisions for small farmers who would lose their entire land and cease to be a farmer. If PAF loses entire land, their family members should be given title of "farmer" so that they can purchase land from anywhere in Gujarat.

- 4) Maretha Village would be covered under Vadodara Urban Development Authority (VUDA) in near future. One road of 600 meter width has already been proposed and now DFC would require additional land. In that case he questioned that how much land from the village would be acquired in total?
- 5) The Vishwamitra River passes through the area and all the villages on the bank of river are flood prone. He was skeptical that with DFC, the problem of flood and water logging would increase manifold.
- 6) Several surveys were going on from different agencies but there is no co-ordination between the various departments of government organization and as a result it so happens that many times land is acquired in excess of what is required causing pain to people which could have been avoided with proper planning beforehand.
- 7) If small farmers lose their land, they would lose everything. It is the basic question of their survival. Even if JICA gives compensation, even then what about their livelihood and employment restoration plans?
- 8) Provisions for the farmers whose land would get divided due to DFC implementation? What about water pipe line, electricity line etc across DFC? Does JICA have any guideline on this? When farm is divided, at that time prior permission should be given to transfer pipeline for irrigation across the DFC. Maintenance cost should be given in the case of breakage of electricity/irrigation pipelines due to vibration and losses which should be compensated
- 9) VUDA is developing fast so in that perspective, there was that DFC should be laid down 20 km. away from the village.
- 10) Lack of co-ordination among various agencies; every now and then common people become victimized of inconvenience and harassment created by various departments.

7.35 SUMMARY OF THE PROFILE OF PARTICIPANTS BASED ON THE DISTRIBUTED QUESTIONNAIRE - 3RD STAGE IN VADODARA

No.	Village name	Numbers	Percentage (%)
1	Alamgir	5	4.0
2	Atladar	1	0.8
3	Bhayali	2	1.6
4	Chapad	15	12.1
5	Gohukhana	3	2.4
6	Gokulpura	5	4.0
7	Itola	2	1.6
8	Kalali	16	12.9
9	Raypura	5	4.0
10	Samiyala	9	7.3
11	Sarar	2	1.6
12	Talsat	6	4.8
13	Vadodara	2	1.6
14	Varnama	6	4.8
15	Vadsala	6	4.8
16	Hinglot	8	6.5
17	Miyagam	6	4.8
18	Kherda	3	2.4
19	Maretha	11	8.9
20	Bill	11	8.9

Table 7-85 Distribution of Participants by Village (3rd Stage)

No.	Village name	Numbers	Percentage (%)
	Grand Total	124	100.0

As is evident from the above table, participants came from 20 villages of which Kalali and Chappad had maximum representation.

No.	Particulars	Numbers	Percentage (%)
1	Less than 4	30	36.1
2	Between 4 and 6	32	38.6
3	Between 6 & 8	16	19.3
4	More than 8	2	2.4
5	Did not answer	3	3.6
	TOTAL	83	100.0

Table 7-86 Family Size (3rd Stage)

As is clear from the family size table, most participants had average family size of 4-6 members while less than 4 members followed very close.

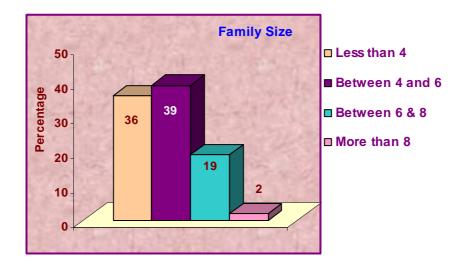


Table 7-87 Social Structure of the Participants (3rd Stage)

No.	Particulars	Numbers	Percentage (%)
1	General	61	73.5
2	Other Backward Caste	17	20.5
3	Schedule Caste	2	2.4
4	Schedule Tribes	0	0.0
5	Other	2	2.4
6	Did not answer	1	1.2
	TOTAL	83	100.0

Most participants were from general category, few from OBC and none from ST category.

No.	Particulars	Numbers	Percentage (%)
1	Native	81	97.6
2	Non-Native	2	2.4
3	Did not answer	0	0.0
	TOTAL	83	100.0

Table 7-88	Origin of the	Participant	(3rd Stage)
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All participants were of native origin, meaning non-natives were of no significance at all. This hints that the respondents were very attached to their native place and would by all possibility resist to move out.

Table 7-89 Education Level of the Participants (3rd Stage)

No.	Particulars	Numbers	Percentage (%)
1	Illiterate	4	4.8
2	Can read	8	9.6
3	Can read & write	22	26.5
	Up to 7 th Standard	8	9.6
5	Up to 12 th Standard	25	30.1
6	Graduate	12	14.5
7	Other Professional	3	3.6
8	Did not answer	1	1.2
	TOTAL	83	100.0

It was interesting to find that most participants were educated up to 12th standard followed by semi-literates and quite a few up to graduation level (ranking next). Literate and semi literate were next in rank and professional were negligible.

No.	Particulars	Numbers	Percentage (%)
1	Agriculture	66	79.5
2	Daily wage	3	3.6
3	Government Service	2	2.4
4	Private Service	6	7.2
5	Business	3	3.6
6	Self Employed	2	2.4
7	Others	1	1.2
8	Did not answer	0	0.0
	TOTAL	83	100.0

Table 7-90 Occupation of the Participants (3rd Stage)

From the table above, agriculture stands out to be the dominant occupation of maximum participants.

7.36 SUMMARY OF FINDINGS – 3RD SATGE IN VADODARA

It needs to be mentioned that since the SHM was held at Kalali Village, quite obviously most participants were from this village. Besides the usual concerns of compensation, exact alignment and job assurance etc, few issues were raised typical of this meeting. Firstly, it was pointed out that there has been no coordination between different Government projects, leave aside private ones. This has created confusion among the people of Vadodara and has caused severe scarcity of land due to land acquisition on account of several projects. About 600 m of land has been acquired off late by the Government for some project which the local people

were not aware of. In fact, all infrastructure related projects involving land acquisition should be in tandem so that the people at large do not suffer. Secondly, it was pointed out that Kalali Village has been declared as "health zone" and so no railway track should disturb the peace of the area by noise pollution etc. In general the gathered participants clearly expressed their disagreement with the project and mentioned that since their livelihood is agriculture based, in no way are they direct beneficiary of the project, so are not concerned and are against





7.37 FEEDBACK MEETINGS

(1) Introduction

Village or feedback meetings were conducted intermittently by our team in between public consultations and socioeconomic survey work. 97% of the total affected villages in 12 districts of Gujarat and 1 district of Maharashtra were covered by feedback meetings during Juneearly September. The intention of the feedback meetings was to capture informally the reactions/comments of the likely to be affected PAPs by holding meetings at village sites. Effort was made to involve the village head along with other villagers, at places even few women participated in these discussions and some headed them too. (This is perhaps due women seat reservation for the position of Sarpanch/Village Head, There are several women village heads). In all 343 feedback meetings were held out of total of 352 villages. The logic behind selecting these villages are that:

- They would be directly affected by proposed DFC.
- The impact would probably be high in these villages as they are in close proximity to the DFC corridor. .

(2) Summary of Feedback Meetings

1) Banaskantha

In Banaskantha District, feedback meetings were conducted at all 31 villages (covering both parallel and detour) likely to be affected by the DFC. So in this district, feedback meetings were conducted 100%, indicating information dissemination with regard to DFC to be complete. A summary of issues discussed at the feedback meetings in Banaskantha is presented in the table below:

Issues	No. of Villages		
155065	Banaskantha	Total (DFC villages)	
LMR	31	343	
LAL	20	174	
JAL	24	264	
CAS	22	279	
SAS	12	114	
SR	14	158	
DR	14	161	
FRP	1	21	
SHP	0	47	
CBL	14	162	
ULS	13	162	
RFT	31	324	
NDT	14	160	
WKS	0	50	
PPT	14	163	

Issues Legend

1	LMR	Land at market rate (compensation in financial terms for acquired land at market rate	
2		Land against land (Provision of alternative agricultural land of similar size &	
		condition against acquired land)	
3	JAL	Job for at least one member of project affected family	
4	CAS	Compensation for affected structures	
5	SAS	Replacement cost of structure	
6	SR	Provision of service road for accessibility	
7	DR	Provision of drainage facility	
8	FRP	Free railway pass for life time	
9	SHP	Share Holding Profit (Share of profit of DFCCIL against acquired land)	
10	CBL	Compensation for bisected land (uneconomic land holding due to bisection by DFC)	
11	ULS	Utility Shifting free of cost (viz water pipelines, hand pumps, bore wells etc unit across the DFC lines)	
12	RFT	Retention of Farmer's Title	
13	NDT	No Detour; new track to be constructed parallel to the existing tracks	
14	WKS	Provision of Weekly Stoppages of Goods Trains to facilitate export of goods	
15	PPT	Provision of Passenger Trains in DFC tracks	

In decreasing order of priority of issues raised, the number of villages has been tabulated above. In all 31 villages, market rate for land to be acquired was of highest priority followed by compensatory job for any one member of PAF. Replacement value for affected structure and retention of farmers' title were other important issues raised at village meetings.

2) Patan

In Patan District, feedback meetings were conducted at all 5 villages – (covering only parallel section) likely to be affected by the DFC. So in this district, feedback meetings were conducted 100%, indicating information dissemination with regard to DFC to be complete. All 5 affected villages lie in the parallel section and come under Sidhpur Taluka as mentioned below and the issues raised have been summarized as under:

District	Taluka	Villages
Patan	Sidhpur	Maloj
Patan	Sidhpur	Ganeshpura
Patan	Sidhpur	Ankvi
Patan	Sidhpur	Sidhpur
Patan	Sidhpur	Lalpur

A summary of issues discussed at the feedback meetings in Patan is presented in the table below:

Issues	No.	No. of Villages		
	Patan	Total (DFC villages)		
LMR	5	343		
LAL	0	174		
JAL	5	264		
CAS	5	279		
SAS	0	114		
SR	0	158		
DR	0	161		
FRP	0	21		
SHP	0	47		
CBL	0	162		
ULS	0	162		
RFT	5	324		
NDT	0	160		
WKS	0	50		
PPT	0	163		

All 5 HH survey conducted stated 4/5 issues of land price at market rate if acquired; job against agricultural land if acquired, compensation for structure at replacement cost and retention of farmers' title.

3) Mehasana

In Anand District, feedback meetings were conducted at 27 villages – (covering only detour section) likely to be affected by the DFC, out of 28 villages. So in this district, feedback meetings were conducted almost100%, indicating information dissemination with regard to DFC to be complete. All 27 likely to be affected villages (1 left out is in Anklav taluka with * mark) lie in the detour section and comes under 5 Talukas as mentioned below and the issues raised have been summarized as under:

District	Taluka	Villages
Anand	Sojitra	5
	Anand	5
	Petlad	8
	Borsad	4
	Anklav	6*

Note: * Bhetasi (Talpad) was left out in Anklav taluka as it was far away from the DFC alignment.

A summary of issues discussed at the feedback meetings in Anand is presented in the table below:

Issues	No. of	Villages	
158065	Anand	Total	
LMR	27	343	
LAL	27	174	
JAL	16	264	
CAS	16	279	
SAS	17	114	
SR	27	158	
DR	27	161	
FRP	3	21	
SHP	0	47	
CBL	27	162	
ULS	27	162	
RFT	27	324	
NDT	27	160	
WKS	0	50	
PPT	PPT 27 16.	163	

In all 27 villages, 5/6 issues came up repetitively as follows:

- Land at market rate (compensation in financial terms for acquired land at market rate
- Land against land (Provision of alternative agricultural land of similar size & condition against acquired land)
- Provision of service road for accessibility
- Provision of drainage facility
- Compensation for bisected land (uneconomic land holding due to bisection by DFC)
- Utility Shifting free of cost (viz. water pipelines, hand pumps, bore wells etc unit across the DFC lines)
- Retention of Farmer's Title
- No Detour; new track to be constructed parallel to the existing tracks
- Provision of Passenger Trains in DFC tracks

In addition, it was found that in some villages of Anand District, (Sunav and Mahalev) farmers had NRI relatives, mostly settled in US and were aware of modern developments. They refused to divulge information about their income as they felt it was intrusion into their privacy.

4) Gandhinagar

Summary of Feedback Meetings

In Gandhinagar District, feedback meetings were conducted at 7 villages –likely to be covered by the DFC. So in this district, feedback meetings were conducted 99% (7 out of 8), indicating information dissemination with regard to DFC to be complete. All 7 affected villages are in the detour section and come under Kalol Taluka as mentioned below and the issues raised have been summarized as under:

District	Taluka	Villages
	Kalol	Dhanot
		Chhatral*
		Hajipur
Candhinagan		Bhimasan
Gandhinagar		Nasmed
		Adhana
		Unali
		Rancharada

Note: * Feedback meeting not conducted as the alignment is farthest from this village.

A summary of issues discussed at the feedback meetings in Gandhinagar is presented in the table below:

Issues	No. of Villages	
Issues	Gandhinagar	Total (DFC villages)
LMR	7	343
LAL	0	174
JAL	7	264
CAS	6	279
SAS	0	114
SR	0	158
DR	0	161
FRP	0	21
SHP	6	47
CBL	0	162
ULS	0	162
RFT	5	324
NDT	0 160 4 50	160
WKS		50
PPT	0 163	

5) Ahmedabad

Summary of Feedback Meetings

In Ahmedabad District, feedback meetings were conducted at all 18 villages – (covering only parallel section) likely to be affected by the DFC. So in this district, feedback meetings were conducted 100%, indicating information dissemination with regard to DFC to be complete. All 18 affected villages lie in the detour section and come under 3 Talukas of Sanand, Dholka and Bavla as mentioned below and the issues raised have been summarized as under:

District	Taluka	Villages
Ahmedabad	Sanand	9
	Dholka	7
	Bavla	2

A summary of issues discussed at the feedback meetings in Ahmedabad is presented in the table below:

Icanog	No. of Villages	
Issues	Ahmedabad	Total (DFC villages)
LMR	18	343
LAL	18	174
JAL	11	264
CAS	10	279
SAS	12	114
SR	15	158
DR	18	161
FRP	6	21
SHP	0	47
CBL	18	162
ULS	18	162
RFT	16	324
NDT		160
WKS		50
PPT	18	163

All 18 village feedback survey conducted stated 4/5 issues of land price at market rate if acquired; job against agricultural land if acquired, compensation for structure at replacement cost and retention of farmers' title as most important. None stated share in profit of DFCCIL as their demand; there was no demand for weekly stoppage as well.

6) Kheda

In Kheda District, feedback meetings were conducted at all 13 villages – (covering only detour section) likely to be affected by the DFC. So in this district, feedback meetings were conducted 100%, indicating information dissemination with regard to DFC to be complete. All 13 villages come under 2 Talukas as mentioned below and the issues raised have been summarized as under:

District	Taluka	Villages
Kheda	Kheda	6
	Matar	7

A summary of issues discussed at the feedback meetings in Kheda District is presented in the table below:

Iggung	No. of Villages	
Issues	Kheda	Total (DFC villages)
LMR	13	343
LAL	13	174
JAL	6	264
CAS	8	279
SAS	13	114
SR	13	158
DR	13	161
FRP	3	21
SHP	0	47
CBL	13	162
ULS	13	162
RFT	13	324
NDT	13	160
WKS	0	50
PPT	13	163

In all 13 feedback meetings conducted, 4/5 issues of land price at market rate if acquired; job against agricultural land if acquired, compensation for structure at replacement cost and retention of farmers' title were repetitively raised. In none of the meetings were two issues raised of provision of weekly stoppages and share holding profit.

7) Anand

Summary of Feedback Meetings: In Anand District, feedback meetings were conducted at 27 villages – (covering only detour section) likely to be affected by the DFC, out of 28 villages. So in this district, feedback meetings were conducted almost100%, indicating information dissemination with regard to DFC to be complete. All 27 likely to be affected villages (1 left out is in Anklav taluka with * mark) lie in the detour section and comes under 5 Talukas as mentioned below and the issues raised have been summarized as under:

District	Taluka	Villages
Anand	Sojitra 5	
	Anand 5	
	Petlad	8
	Borsad	4
	Anklav	6*

Note: * Bhetasi (Talpad) was left out in Anklav taluka as it was far away from the DFC alignment.

A summary of issues discussed at the feedback meetings in Anand is presented in the table below:

Issues	No. of	Villages
Issues	Anand	Total
LMR	27	343
LAL	27	174
JAL	16	264
CAS	16	279
SAS	17	114
SR	27	158
DR	27	161
FRP	3	21
SHP	0	47
CBL	27	162
ULS	27	162
RFT	27	324
NDT	27	160
WKS	0	50
PPT	PPT 27 163	

In all 27 villages, 5/6 issues came up repetitively like:

- Land at market rate (compensation in financial terms for acquired land at market rate
- Land against land (Provision of alternative agricultural land of similar size & condition against acquired land)
- Provision of service road for accessibility
- Provision of drainage facility
- Compensation for bisected land (uneconomic land holding due to bisection by DFC)
- Utility Shifting free of cost (viz. water pipelines, hand pumps, bore wells etc unit across the DFC lines)
- Retention of Farmer's Title
- No Detour; new track to be constructed parallel to the existing tracks
- Provision of Passenger Trains in DFC tracks

In addition, it was found that in some villages of Anand District, (Sunav and Mahalev) farmers had NRI relatives, mostly settled in US and were aware of modern developments. They refused to divulge information about their income as they felt it was intrusion into their privacy.

8) Vadodara

In Vadodara District, feedback meetings were conducted at all 29 villages – (covering both detour and parallel sections) likely to be affected by the DFC. So in this district, feedback meetings were conducted 100%, indicating information dissemination with regard to DFC to be complete. All 29 affected villages comes under 2 Talukas of Vadodara and Karjan as mentioned below and the issues raised have been summarized as under:

District	Taluka	Villages/Towns
Vadodara	Vadodara	17/1
	Karjan	10/1

A summary of issues discussed at the feedback meetings in Vadodara is presented in the table below:

Issues	No. of Villages	
Issues	Vadodara	Grand Total
LMR	29	343
LAL	12	174
JAL	21	264
CAS	24	279
SAS	6	114
SR	11	158
DR	11	161
FRP	0	21
SHP	7	47
CBL	11	162
ULS	11	162
RFT	29	324
NDT	11	160
WKS	0	50
PPT	11 163	

In all 29 feedback meetings conducted, 3 issues of land price at market rate if acquired; compensation for structure at replacement cost and retention of farmers' title. It is interesting to note that none mentioned about weekly stoppages for DFC nor was there any demand for railway passes.

CHAPTER 8 ENVIRONMENT MANAGEMENT PLAN

8.1 INTRODUCTION

Environmental Management Plan (EMP) is the key to ensure a safe and clean environment. The desired results from the environmental mitigation measures proposed in the project may not be obtained without a management plan to assure its proper implementation & function. The EMP envisages the plans for the proper implementation of mitigation measures to reduce the adverse impacts arising out of the project activities during pre-construction, construction and operation stage.

Pre-construction Stage:

During the pre-construction stage, management measures required will include land acquisition, the clearance of the ROW, borrow area & quarry area identification, arrangement of construction water, measures for relocation of community property resources such as hand pumps and other utilities likely to be impacted etc.

Construction Stage:

Construction stage is the most crucial and active stage of the EMP. The construction of freight corridor includes civil work including construction of cross stations, junction stations etc. The construction activities may increase pollution load in the atmosphere as well as there will be some other impacts. Therefore, in addition to the monitoring of construction activity to ensure that the environment is not impacted beyond permissible limits, safety of the workers, labour camp management, disposal of construction waste and risks associated with construction activities such as accidental spillages and consequent damage to the surrounding environment in terms of loss of flora, fauna, agricultural crops or loss of fertile land will be monitored simultaneously.

Operation Stage

The operation stage will essentially entail monitoring activity along the corridor. The monitoring for pollutants specified in the monitoring plan will serve two purposes. In addition to checking the efficacy of the protection/mitigation/enhancement measures implemented, this will help verify or refute the predictions made as a part of impact assessment. Thus, it will complete a very important feedback loop for DFCCI.

EMP has been prepared addressing the issues like:

- Details of Management Plan
 - Greenbelt Development Plan
 - Solid Waste Management Plan
 - Management / Rehabilitation Plan for Quarry/Borrow Areas
 - Guidelines for Sanitation and House Keeping at the Construction Labour Camps
 - Procedures for Storage, Handling & Emergency Response for Hazardous Chemical
- Stage wise Environmental Management Measures & Responsibilities
- Expenditures for environmental protection measures and budget for implementation of the EMP.

8.2 DETAILS OF MANAGEMENT PLANS

8.2.1 Greenbelt Development Plan

The detail Greenbelt Development Plan provided here contains:

- Objective & General Guidelines
- Species suggested for plantation
- Technical specification for plantation
- Precautionary & protection measures
- Cost of plantation

Objective and General Guidelines

Green areas not only improve the floral status, land use and the aesthetic look of an area, but also serve the dual purpose of filtering any fugitive dust from open areas, help to abate noise effects through dampening, and replenish oxygen and ameliorate the surrounding temperature. Therefore, development of green belt is nowadays imperative as a part of development projects. The main objectives of plantation along the railway track (parallel section) and along the road (detour section) are:

- To reduce impact of noise caused due to movement of train
- To reduce impacts of dust pollution
- To arrest soil erosion at embankment slopes
- Beautification of the project corridor by planting selective ornamental trees and shrubs
- To compensate for trees to be felled during construction

Considering the inadequacy or limitation of space, a nominal green belt has been considered along the corridor, in junction station & cross station. The following general guidelines and measures have been adopted:

- Destruction of existing trees will be minimized.
- The plantation of trees will be completed in the construction stage so that substantial growth is achieved when the project is completed.
- The plantation programme has been drawn to conform to natural climatic conditions and adaptability of the species.
- The plantations would consist of a mixture of carefully chosen locally available indigenous, fast growing and sturdy species of trees having ornamental value.
- Preferential plantation of flowering trees with less timber & fruit value will be carried out. Fruit bearing trees will not be planted to avoid accident
- Proper drainage system and proper plantation techniques will be adopted.
- Plantation in the initial stage of 3 years will be properly maintained and protected by fencing from grazing and felling.
- Within 100 m from the signal, no tree will be planted

Species Suggested for Plantation

The plant species have been selected based on criteria such as:

- Indigenous, fast growing, sturdy & perennial having ornamental values, preferably evergreen
- Growth and morphological characteristics (height, crown and flowering)

- Other factors like availability of local species, resistance to pollutants and adverse environmental conditions
- Adaptability to local climatic conditions & water availability

The list of indigenous plant species suggested for plantation along the corridor is presented in **Table 8-1**.

SN	Common Name	Scientific Name	Characteristics	
1.	Lal Kachnar	Bauhinea purpurea	Medium size ornamental tree, conspicuous pink flowers	
2.	White Kachnar	Bauhinea variegata	Medium size ornamental tree, conspicuous white flowers	
3.	Bottle brush	Callistemon viminalis	Medium size ornamental tree, conspicuous red flowers	
4.	Amaltas	Cassia fistula	Medium size tree, conspicuous yellow flowers	
5.	Gulmohar	Delonix regia	Medium size ornamental tree, consp. scarlet flowers	
6.	Lagerstroemia	Lagerstroemia thorelli	Ornamental tree bearing pink flowers.	
7.	Mahua	Madhuca indica	Shady tree with large canopy	
8.	Neem	Azadirachta indica	Shady tree with large canopy	
9.	Jamun	Syzygium cumini	Shady tree with large canopy	
10.	Sisham	Dalbergia sisoo	Shady tree with large canopy	
11.	Devdaru	Polyalthia longifolia	Conical shaped tree	
12.	Safeda/Nilgiri	Eucalyptus sps.	Conical shaped tree	
13.	Arjun	Terminalia arjuna	Shady tree with large canopy	
14.	Ain	Terminalia alata	Shady tree with large canopy	
15.	Siris	Albizzia lebbek	Shady tree with large canopy	
16.	Khair	Acacia catechu	Shady tree with large canopy	
17.	Teak/Sag	Tectona grandis	Shady tree with large canopy	

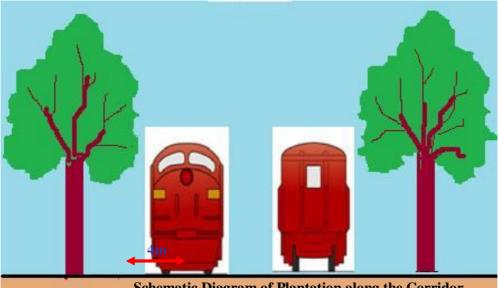
 Table 8-1
 Species Suggested for Plantation

Technical Specification for Plantation

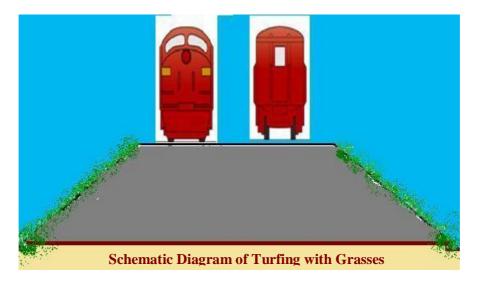
Distance from the last track	:	4 m
Spacing between the plants	:	3 m
Size of the pits	:	60 X 60 X 60 cm
Species recommended	:	List of species provided in Table 8-1
No of plants per km	:	330 (Approximately 1 tree/3 m)
Height of the plant	:	Not less than 2 m
Age of the plant	:	Not less than 3 years

Precautionary Measures:

- Plantation will be made in the monsoon months
- The height of the plants should not be less than 1 ft and should be in polythene bags and are not to be removed till the time of planting
- All plants supplied must be planted within three days of removal from the nursery
- The contractor will be required to water the area in case of insufficient rains after planting
- 2 kg of compost /manure are suggested for each pit before plantation



Schematic Diagram of Plantation along the Corridor



Turfing with grasses:

Grass lines are used to provide a strong surface cover at the slope but it also needs a wellprepared surface in which to be planted. For a well spread grass cover, the surface should not be disturbed in the initial stages of turfing. The grass species recommended for turfing are *Cynodon dactylon, Cythocline purpurea, Solanum nigrum, Xanthium strumerium. Desmostachya bipinnata, Cenchrus ciliaris* and *Aristida hysterix* are recommended for side embankment of eroded and dry patches.

All these species are locally available in the surrounding area. Contractor will ensure that the condition of the site is good enough for successful establishment of grasses. They will also supervise all field operations like preparation of surface, sowing of grasses and quality of grass seeds used.

8.2.2 Solid Waste Management Plan

Solid waste from the project during construction will be mainly domestic scraps & wastes from the construction camp and construction spoils from construction sites.

- The small amount of construction debris will be disposed of in suitable preidentified dumping areas in tune with the local condition to avoid land degradation & water logging due to indiscriminate dumping.
- Dumping areas will be reclaimed through top soil cover & plantation.
- Regular inspection of haul roads, construction site & camp will be carried out to ensure regular and timely removal of construction debris to the dumping sites.
- During operation phase, solid waste management system will be framed.
- Biodegradable and non-biodegradable waste will be collected separately.

8.2.3 Management / Rehabilitation Plan for Quarry/Borrow Areas

The contractor is required to take quarry material only from licensed quarries. In the case of existing quarries the contractor through the Engineer's representative will have to ensure that all actions in these quarries are in accordance with the environmentally sound and acceptable manner.

In case the contractor establishes additional quarries and dedicated crusher plants, the contractor has to ensure that all actions are in accordance with the environmental requirements.

In the case of borrow areas, Contractor need to specify a detailed arrangement including the agreement with the owner of the land. The Contractor must comply with provisions of taxes, levies, royalties etc. of the State.

(1) Plan Required for Borrow / Quarry Areas

The contractor needs to develop a Borrow and Quarry area management plan providing at least the following details:

- Name, location and ownership of the borrow or quarry area;
- Existing land use of the area (including the access road to be developed) to be quarried;
- Approximate quantity of the material available;
- The number of trees and the species of the trees to be removed;
- Total area involved;
- Arrangement with the owner;
- Whether purchased or leased;
- A statement from the owner saying the actual arrangement (not in terms of exact monitory compensation) with him is agreeable for him;
- The exact restoration plan indicating the number of trees that will be planted;
- The action plan for levelling and landscaping in order to bring the area in conformity to the neighboring land uses; and
- The access roads rehabilitation.
- Compliance certificate of tax, levy, royalty, etc. provisions.

The objective of the rehabilitation programme is to reinstate the quarry /borrow pit sites to a safe and secure area, which the general public should be able to safely enter and enjoy. Securing borrows pits /quarry sites in a stable condition should be a fundamental requirement of the rehabilitation process. This could be achieved by filling the quarry/ borrow pit with suitable materials to approximately the access road level.

Quarries and borrow pits may be backfilled with rejected construction wastes and will be given a vegetative cover. If this is not possible, then excavation slopes will be smoothed and depression will be filled in such a way that it looks more or less like the original ground surface.

During works execution, the contractor shall ensure preservation of trees during piling of materials; spreading of stripping material to facilitate water percolation and allow natural vegetation growth; re-establishment of previous natural drainage flows; improvement of site appearance; digging of ditches to collect runoff; and maintenance of roadways where a pit or quarry is declared useable water source for livestock or people nearby. Once the works are completed, the contractor shall restore the environment his own expense around the work site to its original splits.

8.2.4 Guidelines for Sanitation and House Keeping at the Construction Labour Camps

(1) Site Selection

- The construction camps will be located at least 200 500 m away from habitations at identified sites. The living accommodation and ancillary facilities for labour shall be erected and maintained to standards and scales approved by the resident engineer.
- All sites used for camps must be adequately drained. They must not be subject to periodic flooding, nor located within 200 feet of swamps, pools, sink holes or other surface collections of water unless such water surface can be subjected to mosquito control measures.
- The camps must be located such that the drainage from and through the camps will not endanger any domestic or public water supply.
- All sites must be graded, ditched and rendered free from depressions such that water may get stagnant and become a nuisance.

(2) Water Supply

- An adequate and convenient water supply, approved by the appropriate health authority, must be provided in each camp for drinking, cooking, bathing and laundry purposes.
- Potable water supply systems for labour camps occupants shall be as per the design approved by the Local Public Health Engineering Department and meet the water quality standards as prescribed by the State Pollution Control Board. In addition, the design of water system facilities shall be based on the suppliers Engineer's estimates of water demands.
- The drinking water system must be monitored in accordance with the water quality parameters as prescribed by the State Pollution Control Board. The water supply system used for cooking purposes that is drained seasonally must be cleaned, flushed, and disinfected prior to use. Furthermore, a water sample of satisfactory bacteriologic quality, i.e. a sample showing not more than one coliform bacteria per 100 ml sample must be obtained before being placed into service.
- At all construction camps and other workplace, good and sufficient water supply shall be maintained to eliminate chances of waterborne/water-related/water-based diseases to ensure the health and hygiene of the workers.

(3) Toilet Facilities and Hygiene

- There shall be adequate supply of water, close to latrines and urinals.
- Within the precincts of every workplace, latrines and urinals shall be provided in an accessible place, and the accommodation, separately for each of these, as per standards set by the Building and other Construction Workers (regulation of Employment and Conditions of Service) Act, 1996. Except in workplaces provided with water-flushed latrines connected with a water borne sewage system, all latrines shall be provided with dry-earth system

(receptacles) which shall be cleaned at least four times daily and at least twice during working hours and kept in a strict sanitary condition. Receptacles shall be tarred inside and outside at least once a year.

- Toilet facilities adequate for the capacity of the camp must be provided. Each toilet room must be located so as to be accessible, without any individual passing through any sleeping room.
- A toilet room must be located within 200 feet of the door of each sleeping room. No toilet may be closer than 100 feet to any sleeping room, lunch area or kitchen.
- Where the toilet rooms are shared, such as in multifamily shelters and in barracks type facilities; separate toilet rooms must be provided for male & female. These rooms must be distinctly marked "for men" and "for women" by signs printed in the native language of the persons occupying the camp, or marked with easily understood pictures or symbols. If the facilities for each sex are in the same building, they must be separated by solid walls or partitions; extending from the floor to the roof or ceiling.
- Urinals must be provided on the basis of one unit or 2 linear feet of urinal trough for each 25 men. The floor from the wall and for a distance not less than 15 inches measured from the outward edge of the urinals must be constructed of materials impervious to moisture. Where water under pressure is available, urinals must be provided with an adequate water flush. Urinals troughs in privies must drain freely into the pit or vault, and the construction of this drain must be such as to exclude flies and rodents from the pit.

(4) Waste Disposal

- The sewage system for the camp must be designed, built and operated to the satisfaction of the concerned local State Govt. Department so that no health hazard occurs and no pollution to the air, ground or adjacent watercourse takes place. Compliance with the relevant legislation must be strictly adhered to.
- Garbage bins must be provided in the camps and regularly emptied and the garbage disposed off in a hygienic manner to the satisfaction of relevant norms.
- Unless otherwise arranged for by the local sanitary authority, arrangement for disposal of excreta by incineration at the workplace shall be made by means of a suitable incinerator approved by the local medical health or municipal authorities. Alternatively, excreta may be disposed off by putting a layer of night soils at the bottom of permanent tank prepared for the purpose and covering it with 15 cm layer of waste or refuse and then covering it with a layer of earth for a fortnight (by then it will turn into manure).
- On completion of the works, all such temporary structures shall be cleared away, all rubbish burnt, excreta tank and other disposal pits or trenches filled in and effectively sealed off and the outline site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the engineer.

(5) Maintenance

- All buildings, rooms and equipment and the grounds surrounding them shall be maintained in a clean and operable condition and be protected from rubbish accumulation.
- All necessary means shall be employed to eliminate and control any infestations of insects and rodents within all parts of any labor camp. This shall include approved screening or other control of outside openings in structures intended for occupancy or food service facilities.
- Each structure made available for occupancy shall be of sound construction, shall assure adequate protection against weather, and shall include essential facilities to permit maintenance in a clean and operable condition. Comfort and safety of occupants shall be

provided by adequate heating, lighting, ventilation or insulation when necessary, to reduce excessive heat.

- Each structure made available for occupancy shall comply with the requirements of the Uniform Building Code. This shall not apply to tent camps.

8.2.5 Procedures for Storage, Handling & Emergency Response for Hazardous Chemical

Refuelling/Maintenance Procedure

- Truck or suitable containers will bring in all fuel and fluids. There will be no storage of fuel, oil or fluids within 100 m of any surface water body.
- Prior to re-fuelling or maintenance, drip pans and containment pans will be placed under the equipment. Absorbent blankets may also be required to be placed under the equipment and hoses where there is a possibility of spillage to occur.
- All used oils or fluids will be properly contained and transported to appropriately licensed (authorized) disposal sites.

Spill Procedure (inside the stream, river or pond /open surface)

In the case of an accidental spill, overflow or release of fluid occurs into the stream, river, pond /open surface, the following steps will be followed:

- 1) Stop the follow
- Stop the release into the stream waterway
- Shut down the equipment
- Close valves and pumps
- Plug hoses
- 2) Remove Ignition Sources
- Shut down the vehicles and other engines
- Do not allow tiger torches, vehicles, smoking or other sources of ignition near the area. Keep a fire extinguisher on hand but keep it a safe distance away from the potential ignition source (if a fire starts, the extinguisher must be easily accessible)
- 3) Contact the Environmental Officer and initiate emergency response
- Notify the site supervisor and the Contractor's Environmental Officer as soon as possible
- The Environmental Officer will review the situation and decide if Emergency Services (like Fire Brigade) are required or not.
- Appropriate parties to be informed:
 - The Contractor's Project Manager
 - The Site Engineer of SC through his designated Environmental Officer
 - The Client
 - Regulatory Agencies like Pollution Control Board, Municipal Authorities, as applicable
 - Site Safety Officer

- 4) Cleanup and Disposal
 - Emergency Services will be engaged for the cleanup and disposal of contaminants released into the environment.
- 5) Reporting
 - The Contractor's Environmental Officer will document the event and submit the reports to the Client and appropriate regulatory agencies like the State Pollution Control Board etc.
- 6) Procedure Review
 - The Site Engineer of SC will review the report, determine if changes are required to the procedures and will recommend to implement all required changes.

8.3 STAGE WISE ENVIRONMENTAL MANAGEMENT MEASURES AND RESPONSIBILITIES

8.3.1 Pre-construction Stage

SI.	Environmental		Respon	sibility
No.	Issues Management Measures	Management Measures	Planning and Execution	Supervision/ Monitoring
PI.	Land Acquisition	The acquisition of land and private properties will be carried out in accordance with the RAP and entitlement framework for the project. 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.	Unit, EMU, Revenue Dept., NGOs	Revenue Dept, DFCCIL
P 2.	Preservation of Trees	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.	Department	DFCCIL

Table 8-2 Environmental Management Measures and Responsibilities in Pre-construction Stage

SI.	Environmental		Respon	-
No.	Issues	Management Measures	Planning and Execution	Supervision/ Monitoring
		the trees cut and those saved will be maintained by the EMU.		
P3.	Relocation of Common Property Resources	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.	EMU	DFCCIL
P4.	Field verification and M	Iodification of the Contract Documents		•
P.4.1	Joint Field Verification	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 Contractor & EMU	DFCCIL
		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.		
P.4.2		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 Contractor	Environmental Expert of EMU

SI.	Environmental		Respon	-
51. No.	Issues	Management Measures	Planning and Execution	Supervision/ Monitoring
		 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. 		
P.5	Borrow Areas	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 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 (Form P.1 of Annex-5) 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.		Environmental Expert of SC and EMU
P.6	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		Environmental Expert of SC and EMU

Sl.	Environmental		Respon	sibility
51. No.	Issues	Management Measures	Planning and Execution	Supervision/ Monitoring
		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.		
P.7	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.		Environmental Expert of SC and EMU
P.8		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
P.9	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
P.10	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	The Contractor	Environmental Expert of SC and EMU

CI	Environmental		Respon	sibility
Sl. No.	Issues	Management Measures	Planning and	Supervision/
110.	155005		Execution	Monitoring
		handling 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		
		-		

8.3.2 Construction Stage

Table 8-3 Environmental Management Measures and Responsibilitiesin Construction Stage

SI.	Environmental		Respor	sibility
51. No.	Issues	Management Measures	Execution/ Civil Work	Supervision/ Monitoring
Activit	ies to be carried out by t	the Contractor		Monitoring
	te Clearance			
C.1.1	Clearing & Grubbing	Vegetation will be removed from the	The Contractor	Environmental
0.111	crowing or cruccing	construction zone before commencement of		Expert of SC
		construction. All works will be carried out		and EMU
		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 Gujarat after the		
		receipt of written permission from EMU.		
		Form C.1 (given in Annex-8.1) shall be		
		used as target sheet for tree cutting		
C.1.2	Stripping, stocking and	The topsoil from all areas of cutting and all	The Contractor	Environmental
	preservation of top soil	areas to be permanently covered will be		Expert of SC
		stripped to a specified depth of 150 mm and		and EMU
		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		

SI.	Environmental		_	sibility
No.	Issues	Management Measures	Execution/ Civil Work	Supervision/ Monitoring
		preserve them till they are used:		8
		(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 (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. Such stockpiled topsoil will be utilized for -		
		 covering all disturbed areas including borrow areas (not those in barren areas) top dressing of the embankment and fill slopes in the agricultural fields of farmers, acquired temporarily. 		
		Residual topsoil, if there is any will be utilized for the plantation.		
	ocurement of Construct	•		
C.2.1		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.	The Contractor	Environmental Expert of SC and EMU
		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.		
C.2.2	Quarry operation	The Contractor will develop a Comprehensive Quarry Redevelopment Plan as per the Mining Rules of Gujarat & 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.	The Contractor	Environmental Expert of SC and EMU
C.2.3	Construction water	The Contractor will arrange adequate supply and storage of water for the whole construction period at his own costs. The	The Contractor	Environmental Expert of SC and EMU

SI.	Environmental		_	nsibility
No.	Issues	Management Measures	Execution/ Civil Work	Supervision/ Monitoring
		Contractor will submit a list of source/s from where water will be used for the project to SC and EMU.		
		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.		
		The Contractor will take all precaution to minimize the wastage of water in the construction process/ operation. Form C.2 (given in Annex-8.1) shall be used for reporting.		
C.3 Co	nstruction Work			
C.3.1	Drainage & Flood Control	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. 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	The Contractor	Environmental Expert of SC and EMU
		permanent flooding of the site or any adjacent area, if any.		
C.3.3		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.	The Contractor	Environmental Expert of SC and EMU
		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 Contractor will ensure the following safeguards:		
		 During construction activities on embankment, the side slopes of all cut and fill areas will be graded and 		

Sl.	Environmental		Respor	nsibility
No.	Issues	Management Measures	Execution/ Civil Work	Supervision/ Monitoring
		 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. 		
C.4 Pol	lution			
	Vater Pollution			
	construction wastes	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. 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.		Environmental Expert of SC and EMU
C.4.1.2	Water pollution from fuel and lubricants	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. 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. All location and lay-out plans of such sites will be submitted by the Contractor prior to	The Contractor	Environmental Expert of SC and EMU

SI.	Environmental		Respor	sibility
No.	Issues	Management Measures	Execution/ Civil Work	Supervision/ Monitoring
		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.		
C.4.2	Air Pollution			
C.4.2.1		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.	The Contractor	Environmental Expert of SC and EMU
		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. Form C.3 (given in Annex-8.1) shall be used for reporting to SC.		
C.4.2.2	construction vehicles,	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).	The Contractor	Environmental Expert of SC and EMU
		The Contractor will submit PUC certificates for all vehicles/ equipment/ machinery used for the project and 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 N	loise Pollution			
	Noise from vehicles, equipments and machineries	 The Contractor will confirm the following: All plants and equipments used in construction shall strictly conform to 	The Contractor	Environmental Expert of SC and EMU

Sl.	Environmental		-	sibility
No.	Issues	Management Measures	Execution/ Civil Work	Supervision/ Monitoring
		 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. 		
		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.		
		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. 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.		
		Form C.4 (given in Annex-8.1) shall be used for pollution monitoring during construction.		
C.5 Sat	•			
C.5.1	Personal safety measures for labour	 The Contractor will provide: Protective footwear and protective goggles to all workers employed on mixing asphalt materials, cement, concrete etc. 	The Contractor	Environmental Expert of SC and EMU
		 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 		

SI.	Environmental		_	sibility
No.	Issues	Management Measures	Execution/ Civil Work	Supervision/ Monitoring
		 operation. Adequate safety measures for workers during handling of materials at site. 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. 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. 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. 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 	Execution/ Civil Work	Supervision/ Monitoring
C.5.2	Risk from electrical	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.	The Contractor	Environmental
0.3.2	equipments	 No material will is so stacked or placed as to cause danger or inconvenience to any person or the public. All necessary fencing and lights is provided to protect the public in construction zones. 		Environmental Expert of SC and EMU

SI.	Environmental		Responsibility		
No.	Issues	Management Measures	Execution/ Civil Work	Supervision/ Monitoring	
		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.			
C.5.3	First aid	 The Contractor will arrange for – 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 La	bour Camp Managem	ent			
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	 The Contractor will also guarantee the following: 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 	The Contractor	Environmental Expert of SC and EMU	

SI.	Environmental		Responsibility		
No.	Issues	Management Measures	Execution/ Civil Work	Supervision/ Monitoring	
		 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. Environmental Expert will be required to inspect the labour camp once in a week to ensure the compliance of the EMP. 			
C.6.3	Sanitation and sewage system	 The Contractor will ensure that - 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. 		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. 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. Form C.5 (given in Annex-8.1) shall be used for hygiene reporting of construction/labour camps.		Environmental Expert of SC and EMU	

SI.	Environmental		Respor	nsibility
No.	Issues	Management Measures	Execution/	Supervision/
110.	155005		Civil Work	Monitoring
C.7 Co	ntractor's Demobilizati	on		
C.7.1		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,		Environmental Expert of SC and EMU
		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. Form C.6 (given in Annex-8.1) shall be used for reporting to SC.		

8.3.3 Operation Stage

Table 8-4 Environmental Management Measures and Responsibilities in OperationStage

SI.	Environmental		Respo	nsibility
No.	Issues	Management Measures	Execution/	Supervision/
110.	155005		Civil Work	Monitoring
0.1	Monitoring Operation Performance	The EMU will monitor the operational performance of the various mitigation/ enhancement measures carried out as a part of the project. The indicators selected for monitoring include the survival rate of trees; utility of enhancement provision for relocated utilities, hand pumps and other relocated structures if any; status of rehabilitation of borrow areas; and noise barriers, which are proposed at different locations.		DFCCIL
0.2	Pollution Monitoring	The periodic monitoring of the ambient air quality, noise level, water (both ground and surface water) quality, soil pollution/contamination in the selected locations as suggested in pollution monitoring plan will be the responsibility of EMU.	Monitoring	DFCCIL

SI.	Environmental		Responsibility	
No.	Issues	Management Measures	Execution/ Civil Work	Supervision/ Monitoring
		<i>EMU will appoint SPCB approved pollution monitoring agency for this purpose.</i> Form 0.1 (given in Annex-8.1) shall be used for pollution monitoring.		

CHAPTER 9 RESETTLEMENT AND REHABILITATION PLAN

Resettlement and Rehabilitation Policy including "RRP Frame Work" is under consideration with Government of India and will be disclosed as a separate process.

CHAPTER 10 ENVIRONMENTAL MONITORING PLAN

10.1 ENVIRONMENTAL MONITORING PLAN FOR NATURAL AND SOCIAL ENVIRONMENT

10.1.1 Introduction

The purpose of the environmental monitoring plan is to ensure that the envisaged purpose of the project is achieved and results in desired benefits to the target population. To ensure the effective implementation of the EMP, it is essential that an effective monitoring plan be designed and carried out. The broad objectives are:

- To evaluate the performance of mitigation measures proposed in the EMP
- To suggest improvements in management plan, if required
- To enhance environmental quality
- To satisfy the legal and community obligations

The environmental monitoring plan contains:

- All performance indicators
- Environmental monitoring programme
- Reporting formats

10.1.2 Performance Indicators

The natural and social components identified to be particularly significant in affecting the environment at critical locations have been suggested as Performance Indicators (Pls). The Performance Indicators shall be evaluated under three heads as:

- a) Environmental condition indicators to determine efficiency of environmental management measures in control of air, noise, water and soil pollution
- b) Environmental & social management indicators to determine compliance with the suggested environmental & social management measures
- c) Operational performance indicators that have been devised to determine efficiency and utility of the proposed mitigation measures

The Performance Indicators and monitoring plans prepared are presented in Table10-1.

S.N.	Details	Indicators	Stage	Responsibility			
А.	Pre-Construction Stage: Environmental & Social Management Indicators and Monitoring Plan						
1.	Land acquisition to be carried out in accordance with the RAP and entitlement framework for the project approved by DFCCI.	Acquisition	Pre- construction	Land Acquisition Unit, EMU, Contractor			
2.	Locations for dumping of wastes have to be identified and parameters indicative of environment in the area has to be reported	Dumping locations	Pre- construction	Contractor			
3.	Location of construction camps have to be identified and parameters indicative of environment in the area has to be reported	Construction camps	Pre- construction	Contractor			
4.	Location of borrow areas have to be finalized from identified lists and parameters	Borrow areas	Pre- construction	Contractor			

 Table 10-1
 Performance Indicators

S.N.	Details	Indicators	Stage	Responsibility
	indicative of environment in the area has to be reported			
5.	Progress of tree removal marked for cutting	Site clearing	Pre-	Contractor
0.	is to be reported	Site ciculing	construction	Contractor
B.	Construction Stage: Environmental & Soc	ial Condition I		L Monitoring Plan
1.	The parameters to be monitored as per	Air quality	Construction	Contractor through
1.	frequency, duration & locations of monitoring specified in the Environmental		Construction	approved monitoring agency
	Monitoring Programme prepared	Noise &	Construction	Contractor through
		vibration level		approved monitoring agency
		Water quality	Construction	Contractor through approved monitoring agency
		Sediment quality	Construction	Contractor through approved monitoring agency
2.	Progress of measures suggested as part of	Tree	Construction	Contractor through
	the strategy is to be reported	plantation		approved monitoring agency
3.	Contractor shall report implementation of the measures suggested for topsoil preservation to environmental expert, supervision consultant	Top soil	Construction	Contractor
4.	 The Contractor will provide: A readily available first aid unit, suitable transport facility, equipment and trained nursing staff at construction camp Supply of sufficient quantity of potable water Proper sanitation & sewage system in the camp Separate toilets/bathrooms for men and women Waste disposal facility 		Construction	Contractor
C.	Operation Stage: Management & Operatio	nal Performan	ce Indicators	
1.	The number of trees surviving during each	Survival rates	Operation	Environmental Expert of
1.	visit will be compared with the number of saplings planted	of trees	operation	Supervision Consultants up to construction period, and then EMU of DFCCIL over a period of 5 years
2.	The Environmental Specialist of Supervision	Rehabilitation	Operation	Environmental Expert of
	Consultants and EMU will undertake site visit to determine how many borrow areas have been rehabilitated in line with the landowners request and to their full satisfaction	of borrow areas		Supervision Consultants up to construction period, and then EMU of DFCCIL over a period of 5 years
3.	The EMU will visit sensitive locations along	Utility of	Operation	Environmental Expert of
		noise barriers	- Permion	Supervision Consultants up

S.N.	Details	Indicators	Stage	Responsibility
	vibration levels during operation stage) to	receptors		then EMU of DFCCIL
	check the efficiency of the noise barriers			over a period of 5 years

10.1.3 Environmental Monitoring Programme

The detail monitoring programmer during construction and operation stages are presented in **Table 10-2**. For each of the environmental condition indicator, the monitoring programme specifies:

- Parameters to be monitored
- Location of the monitoring sites
- Frequency and duration of monitoring
- Institutional responsibilities for implementation and supervision

Environment	Project	Environmental Monitoring Programme			Institutional Re	sponsibility
Component	Stage	Parameters	Location	Frequency	Implementation	Supervision
Air Quality	Construction	SPM, RSPM,	Wherever the	Continuous 1	Contractor	EMU/
		SO ₂ , NOx	contractor decides to	working day, once	through	Supervision
			locate the batch mix	in every season	approved	Consultants
			plant	except monsoon	monitoring	
					agency	
		SPM, RSPM,	At junction stations		Contractor	EMU/
		SO ₂ , NOx	and DFC line near	working day, once	through	Supervision
			the settlement	in every season	approved	Consultants
				except monsoon	monitoring	
					agency	
	Operation	SPM, RSPM,	Other junction	Continuous 1	EMU	DFCCIL
		SO ₂ , NOx	stations	working day, once		
				in every season		
				except monsoon		
				season for once in		
				every three years		
Water Quality	Construction	See Note		4 times a year		EMU/
			Balaram river, Banas	ч ў	e	Supervision
			river;	season)	approved	Consultants
			Ground water (Tube		monitoring	
			well) from		agency	
			settlement area			
	Operation	See Note	Balaram river, Banas		EMU	DFCCIL
			river	post-monsoon,		
				once in every		
				three years		
	Construction	Noise &	At equipment yard	4 times a year		EMU/
vibration		vibration level		(preferably in each	•	Supervision
Level				season)	approved	Consultants
					monitoring	
					agency	
		Noise level	at junction stations,	4 times a year	Contractor	EMU/

Table 10-2 Environmental Monitoring Programme

Environment	Project	Enviro	nmental Monitoring I	Programme	Institutional Responsibility	
Component Stage		Parameters	Location	Frequency	Implementation	Supervision
			settlement areas	(preferably in each season)	approved	Supervision Consultants
					monitoring agency	
	Operation	Noise & vibration level in dB(A)	At 2 junction station	Once in every three years.	EMU	DFCCIL
Soil Erosion	Construction	Visual observation & turbidity		Pre-monsoon and post-monsoon season	Environmental Specialist, Hydrologist, and Material Specialist of Supervision Consultants	EMU/ Supervision Consultants
Plantation	Construction	No. of railway side plantation	Along the side of the track	Comparison should be done for every six months	Environmental Specialist of Supervision Consultants	EMU/ Supervision Consultants
	Operation		Along the side of the track	Assess growth every year for initial five years	EMU	DFCCIL
Flora & Fauna	Construction	Aquatic ecosystem	All crossings of surface water bodies	Once a month during	Environmental Specialist of Supervision Consultants	EMU/ Supervision Consultants
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

10.1.4 Key Players in the Implementation of EMP

The responsibility for implementation and supervision of EMP's is vested with four agencies, namely Contractors, Environmental Monitoring Unit (EMU), DFCCIL and Engineers. The "**Contractors**" herein mean the agency hired for execution of the construction works for the respective packages. DFCCIL would be the implementation agency at to levels, one at the centre referred to as "**DFCCIL**" and the other at project level named as "**EMU**" in the EMP. The term engineer refers to the "**Supervision Consultant**".

10.1.5 Institutional Framework

The DFCCIL is responsible for implementation of all the mitigation and management measures suggested in EMP & RAP. To effectively oversee the project preparation and to ensure the timely implementation of the EMP, a Environmental Management Unit (EMU) is proposed under the DFCCI. The implementation of the EMP & RAP would be the responsibility of the EMU. The Environmental Engineer of EMU will assist the PD and will interact with State Pollution Control Board (SPCB), Forest Dept. & NGO for addressal of

environmental issues, and with Revenue Dept., NGO & various Committees for R&R issues. The Environmental Expert of the Supervision Consultants and the Contractor will assist the EMU for successful implementation of the EMP. The institutional/implementation arrangements have been shown in **Figure10-1**.

10.1.6 Progress Monitoring and Reporting Arrangements

The monitoring and evaluation of the management measures envisaged are critical activities in implementation of the Project. Monitoring involves periodic checking to ascertain whether activities are going according to the plans. It provides the necessary feedback for project management to keep the program on schedule. The rational for a reporting system is based on accountability to ensure that the measures proposed as part of the EMP get implemented in the project.

The reporting system will operate linearly with the contractor who is at the lowest rank of the implementation system reporting to the Supervision Consultant, who in turn shall report to the EMU. All subsequent reporting by the contractor shall be monitored as per the targets set by the EMU before the contractors move on to the site. The reporting by the Contractor will be monthly report like report of progress on construction and will form the basis for monitoring by the EMU, either by its own Manager (Environment) or the Environmental Specialist hired by the Supervision Consultant.

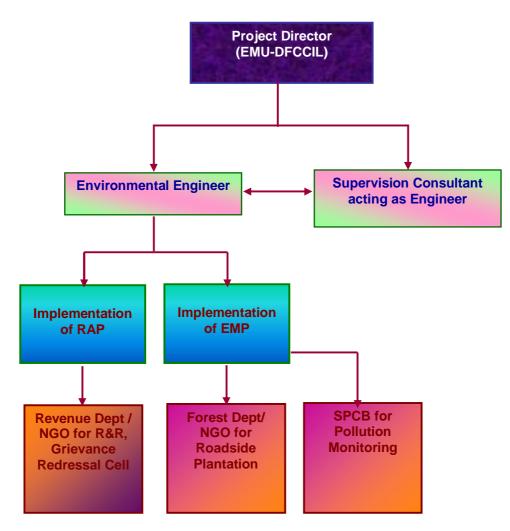


Figure10-1 Implementation Arrangement

10.1.7 Training

Training Need: The Environmental Manager, the Managers (Technical) of Environmental Unit at the DFCCIL headquarters and the EMUs, the personal of the construction Supervision Consultants and the Contractor, who would be responsible for the implementation of the EMP, need to be trained on environmental issues of railway project. To ensure the success of the implementation set up proposed, there is a requirement of training and skill up-gradation.

Training Components: The environmental training should encompass the following:

Understanding of the relevant environmental regulations and their application to the project;

- Main impacts of the project on the environment
- Mitigation measures as given in the EMP and their implementation
- Duties and responsibilities of the Contractors, Supervision Consultants and staff of DFCCIL involved in the project
- Public/community consultation and its role during the implementation of the project
- Liaison with the other departments and relevant agencies (such as Forest Deptt, SPCB etc.)
- Supervision of the implementation of the EMP and environmental issues during construction and operation. Resolution of environmental and social issues and their reporting
- Monitoring during construction and operation;
- Weekly, monthly and quarterly report preparations and submission

Training Programme: A training programme needs to be worked out incorporating the project needs as well as the intermediate-term capacity building needs of the DFCCIL. The programme should consist of a number of training modules specific to target groups. The training would cover the basic principles and postulates of environmental assessment, mitigation plans and programmes implementation techniques, monitoring and management methods and tools. Looking into the potential requirements of each of the target groups, several training modules had been suggested. The training modules are given in **Table 10-3**.

			Environmental Aspects to	Training
Sl. No.	Training Recipients	Mode of Training	be covered in training	Conducting
			modules	Agency
SESSION-I				
Module-I	Environmental staff of DFCCIL	Lecture Sessions,	Environmental overview	External
	involved in the project, staff of	Workshops &	and Environmental	trainers,
			Regulations & Acts	Environmental
	consultant, contractor, and			specialist,
	collaborating Government			
	agencies			
Module-II	Environmental staff of DFCCIL	Lecture Sessions,	Environmental Impact	External
	involved in the project, staff of	Workshops &	Assessment: Railway	Trainers;
	construction supervision	Presentation	Projects & Environmental	Environmental
	consultant and contractor		Issues	Specialist,

Table 10-3 Training modules for Environmental Management

Sl. No.	Training Recipients	Mode of Training	Environmental Aspects to be covered in training modules	Training Conducting Agency
Module-III	Environmental staff of DFCCIL		•	-
	involved in the project, staff of	-	Plan for Railway Projects	Trainers; Environmental
	construction supervision consultant	Presentation		Specialist
SESSION -I	I			
Module-IV	Environmental staff of DFCCIL involved in the project, staff of construction supervision	· 1	Environmental Issues in the Project	External agency
	consultant, contractor, and collaborating Government agencies			
Module-V	Environmental staff of DFCCIL involved in the project, staff of construction supervision consultant and contractor	Demonstration	Construction Management	External Agency
Module-VI	Environmental staff of DFCCIL involved in the project	Lectures; Group Discussions	Planning for Environmentally Sustainable Operation of Railway	External Agency
Module-VII	Environmental staff of DFCCIL involved in the project	Demonstration	Long Term Environmental Issues in Railway Management	External Agency

10.2 ENVIRONMENTAL MONITORING PLAN FOR RESETTLEMENT AND REHABILITATION PLAN (RRP)

Monitoring and evaluation are critical activities toward the finalization of the process of resettlement and rehabilitation. Monitoring involves periodic checking to ascertain whether the resettlement and rehabilitation activities are in progress in helping PAFs taking roots into the new resettlement areas. Evaluation is essentially a summing up of the progress of resettlement and rehabilitation at the end of the Project assessing the actual achievement in comparison to those aimed at during the implementation period.

DFCCI will be responsible for internal monitoring through their Project Implementation Unit, Chief Resettlement Office, and NGOs. It should prepare quarterly reports on the progress of the implementation of resettlement and rehabilitation plan.

Independent monitoring agency or a local consulting firm or a local NGO will carry out an external monitoring of the implementation of resettlement and rehabilitation plan. It will report on a half yearly basis to DFCCI and funding agency. DFCCI should select and hire these consulting firm/ NGO.

10.2.1 Internal Monitoring

The resettlement and rehabilitation plan includes indicators and bench marks for achievement of the objectives, which includes as follows:

Process Indicators

- Process of the resettlement and rehabilitation which includes project inputs, expenditures, staff deployments, etc will be monitored by DFCCI and its project office. DFCCI should collect the information from the project site and assimilate in the form of quarterly progress report to assess the progress and results of the implementation of resettlement and rehabilitation plan. In case there was a delay or any obstacles on the implementation works, adjust the work programme. The following is major items of monitoring for process indicators;
 - Information campaign and consultation with PAFs;
 - Status of land acquisition and payments on land compensation;
 - Resettlement of PAFs;

Output Indicators

Output indicators are as follows:

- The results in terms of numbers of affected persons compensated and resettle; and
- Incomes restored; and
- Additional assistance provides

Impact Assessment Indicators

Impact indicators are the factors related to the long-term effect of the project not only on PAFs but also on those people in the project affected area as a whole. Field level monitoring will be carried out as follows:

- Review of census information for all PAFs;
- Consultation and informal interviews with PAFs on the up-to-date feeling of them on their life in the resettlement areas;
- In-depth case studies if there were any particular case worth paying special attention;
- Informal sample survey of PAFs;
- Key informant interviews and
- Holding a number of community meetings at the resettlement site as well as the site directly affected by the Project.

10.2.2 External Monitoring

External monitoring consultants/NGO will be hired for the monitoring works. They should identify and select impact indicators, impact assessment through formal and informal surveys with the PAFs, consultation with local government officials and community leaders, assess efficiency of the process of rehabilitation procedures in terms of effectiveness, sustainability of the lives of PAFs, draw attentions for the lessons learned during the period since resettlement and rehabilitation activities commenced and formulate the future rehabilitation policy and planning method.

Major items of monitoring would be as follows:

- Review and verification of the internal monitoring reports prepared by Project Implementation Unit and the field offices;
- Review of the socio-economic baseline census information of the PAFs;
- Socio-economic conditions of the PAFs in the post-resettlement period;

- Opinions of the PAFs on the entitlements, compensations, general assistance, alternative development programmes to livelihood restoration programmes and their timetable;
- Actual changes of the conditions of housing and income levels of the post-resettlement period;
- Livelihood rehabilitation of non-title settlers; and
- Grievance procedures.

After the project implementation, NGOs assisting chief resettlement officer will conduct information and community consultation programme (ICCP) in the project area in respect of resettlement and rehabilitation plan. It is a part of social environment monitoring plan of the resettlement and rehabilitation of PAFs. The following is the tasks of NGOs:

- a) Assist chief resettlement officer in implementation of resettlement and rehabilitation plan including mitigation measures for avoiding adverse effects imposed on PAFs by the Project;
- b) Prepare information materials in local language explaining resettlement and rehabilitation plan such as project brochures and pamphlets to be used for disclosure of information regarding the project objectives, entitlement, compensation principles and procedures, and implementation schedules;
- c) Advise and assist chief resettlement office in the provisions of implementation of resettlement and rehabilitation plan concerning livelihood and income restoration programmes;
- d) Work in close cooperation with relevant state and central government departments and district administration involved in the valuation of assets acquired and payment of compensation;
- e) Educate the PAFs on their right to entitlements and obligations;
- f) Ensure that the PAFs are paid their full entitlements due to them;
- g) Facilitate and organize training programmes and provide support and gather information to PAFs for income restoration programme;
- h) Assist the PAFs in redressing of their grievances through the grievance redress mechanism set up for the Project;
- i) Disseminate information for all the PAFs about the functional aspects of the various district level committees set up for the Project and assist the PAFs in benefiting from such institutional mechanism;
- Assist the Project Implementation Unit of DFCCI in ensuring social responsibilities of the Project, such as compliance with the labour laws, safety regulations, prohibition of child labour, HIV/AIDS and gender issues; and Participate in monitoring system and prepare progress reports

ANNEX - 4.1

RESULTS OF 'T' TEST & 'ANOVA'

T TEST

Confidence Intervals

 Variable
 N
 Mean
 StDev
 SE Mean
 95.0 % CI

 TREES
 20
 7.950
 1.877
 0.420 (7.071, 8.829)

T-Test of the Mean

Test of mu = 0.000 vs mu not = 0.000

VariableNMeanStDevSE MeanTPTREES207.9501.8770.42018.940.0000

Confidence Intervals (no of trees) T TEST

Variable	Ν	Mean	StDev	SE Mean		95.0 %	CI
PLOT	20	10.50	5.92	1.32	(7.73,	13.27)
NO	20	2.350	0.988	0.221	(1.888,	2.812)

F TEST

PLOT VS HEIGHT

One-Way Analysis of Variance

Analysis of Variance for PLOT Source DF SS MS F P HT 22 1376.5 62.6 2.07 0.006 Total 158 5493.7

Individual 95% CIs For Mean Based on Pooled StDev

Level	Ν	Mean	StDev	+++
0.5	12	11.417	2.193	(*-)
1.0	1	11.000	0.000	()
1.5	1	14.000	0.000	()
2.0	9	13.333	3.708	(*)
2.5	2	13.000	1.414	()

3.0	12	12.667	4.271	(*-)			
4.0	17	9.882	6.133	(-*-)			
4.5	1	2.000	0.000	()			
5.0	24	12.083	6.351	(-*-)			
6.0	10	8.800	7.510	(*)			
7.0	9	9.000	8.689	(*)			
8.0	7	15.286	5.736	(*)			
9.0	5	15.000	5.050	(*)			
10.0	19	8.947	5.307	(-*)			
11.0	1	18.000	0.000	(*)			
12.0	7	3.286	0.756	(*)			
14.0	2	12.500	0.707	(*)			
15.0	10	7.100	5.259	(*)			
16.0	1	4.000	0.000	()			
20.0	5	6.600	3.578	(*)			
25.0	2	15.000	0.000	()			
30.0	1	9.000	0.000	()			
40.0	1	14.000	0.000	()			
				+++			
Pooled	StDe	ev = 5.5	502	0 12 24			

PLOT VS GIRTH CLASS

One-Way Analysis of Variance

Analysis of Variance for PLOT							
Source	DF	F SS	MS	F	Р		
GC	5	181.1	36.2	1.04	0.395		
Total	158	5493.7					

Individual 95% CIs For Mean								
	Based on Pooled StDev							
Level	N	Mean	n StDev++++++					
1	32	11.500	4.056 (*)					
2	59	10.712	5.910 (*)					
3	39	8.897	6.361 (*)					
4	19	10.316	7.980 (*)					
5	8	12.125	3.643 (*)					
6	2	14.000	0.000 ()					
			+++					
Pooled	StD	ev = 5.8	893 10.0 15.0 20.0					

.

										A	NNE	X 5.
		Sun	ımary of	Socio-econ	omic Sı	urvey She	eet					
State:												
Distri	ct:											
		Sub-District										
		Item Name of Village										
		vith Titles										
1)	Туре о	f Settlement										
	a	Urban- City										
	b	Urban- Small Town										
	a	Regular Village										
	b	SC * Village										
•	с	ST** Village										
2)		f Current Land Use Pattern										
	a 1	Industrial Land										
	b	Residential Land										
	c d	Commercial Land Agricultural Land								<u> </u>	<u> </u>	
	a e	Waste Land										
	f	Water Bodies (Lake / River/ Pond/ etc)										
3)	No. of	Affected "Titled" Structures										
	a	House (Own/Rented)										
	b	Shop (Own/ Rented)										
	c	Office (Own/ Rented)										
	d	Factory (Own/ Rented)										
	e	Storage (Own/ Rented)										
	f	Others										
4)	No. of	Affected People of the "Titled" Structures										
	a	Number of PAPs										
	b	Number of Squatters										
	с	Number of Encroachers										
	d	Number of Families Below Poverty Line										
5)	Numbe	er of Affected Public Facilitites/ Common F	roperties									
	a	Temple/ Mosque/ Church										
	b	Graveyard/ Crematorium										
	с	Well/ Hand Pump										
	d	Community Building										
	e	Police Station/ Govt .Offices										
	f	Health Facilities										
	g 1	Schools/ Educational Institute										
0	h	Others										
		nt Price of Land Market Price (Per Sq m)										
	a b	Govt. Price/ Circle Rate (Per Sq m)										
		ication of PAPs without Titles/Squatters										
	a	Station-oriented Occupation										
	a b	Shops/Kiosks										
	c	Seasonal labour										
	-	i. Agricultural labour								1	1	
		ii. Industrial labour										
	d	Railway-related gangman						1	İ	İ 👘	1	l –
	e	Migrating tribal people							İ	1	1	
	f	Health Facilities				1			1	1	1	i
	Featur	es of Natural Environment								1	1	
		fe Sanctuary/Forest Area										
	a	Protected Forest										
	b	Reserved Forest										
	с	Wildlife Sancatuary										
ļ	Others											
Note:		* SC Village										
		** ST Village										

ANNEX-5.2

SOCIO-ECONOMIC SURVEY QUESTIONNAIRE

101	ROW – 1; ROB-2; Squatter-3	
101	Date of Interview :	
102	Place of Interview :	
103	Name of Interviewer :	
104		
105	Checked by Supervisor : What is the type of house likely to be affected?	
100	Single detached one-storey (1)	
	Single detached two-storey (2)	
	Single detached three-storey or more (3)	
	Apartment/Row house duplex (4)	
	Shanties connected to each other (5)	
	Tents or tentative simple hut (6)	
107	Please write the description of the house appearance/housing.	
107	Trease write the description of the house appearance housing.	
	Roof (G.I. sheets-2; Tiles-2; Nipa or other natural materials – 3; Concrete - 4; Others - 4)	
	Walls (All concrete -1; Concrete and wood-2; All wood -3; Nipa or other natural materials-4; Others-5)	
108	What is the tenure status of land and house? (Own land and house-1; Rent land and own house-2; Rent land and house-3; Illegal occupancy of land and own house-4; Others-5)	
109	What is the Land status? (Privately own land-1; Public land-2)	
110	BASIC PROFILE OF PAP	
	A. Name of Interviewee (only adult members):	
	B. Administrative Location:	
	i State :	
	ii District :	
	iii Panchayat:	
	Iv Village :	
	C Location	
	C.1 Type of Location	
	Parallel to railways - 1	
	Near Diversion - 2	
	Near ROB - 3 (for ROB only)	
	Others - 4	
	C.2 Specific Location:	
	If parallel, specify the given section No.	
	If diversion, specify the given section No.	

(for ROB only)
If ROB, specify nearest station name(s) where ROB are located
Right-hand side/Left-hand side from Mumbai (Western Corridor)/Delhi (Eastern Corridor)
D Relation to Head of Family :
E How long have you been living here? Please provide approx. no. of years
F How long are you planning to live here (in years)? (for Squatters only)
G Profile of Head of Family:
H Head of Family (Name)
Sex
Age
Marital Status
Occupation (If he/she is unemployed, please describe as "unemployment")
Use code - 1.Govt. Service; 2.Private Service; 3.Business; 4.Wage Employee; 5.Agriculture; 6.Daily wage labour; 7.Unemplyed; 8.Others (specify)
Attainment Level of Education Use code - 1.Illiterate; 2.Can Read only; 3.3. Can read and write both; 4.Upto Class 5 5.Upto Class 12 or Plus 2; 6.Graduate & above; 7.ITI, Diploma/Degree, CA, ICWA, MBA, etc; 8.Others (specify)
Religion
Use code - 1.Hindu; 2.Muslim; 3.Christian; 4.Jain; 5.Sikh; 6. Boudh; Other (specify)
Social Category
Code – 1. General; 2. SC; 3. ST; 4. OBC
Total number of family members (including infants and children)

111) HOUSEHOLD BUDGET

A) <u>Income</u>

Source of Income of from	Average Income in (Rs.)						
various sources	Daily	Monthly	Yearly				
a. Agriculture							
b. Wage Labour							
c. Business/Trading							
d. Service							
e. Livestock & Animal Husbandry							
f. Fishing & Aquaculture							
g. Cottage Craft							

Source of Income of from	Average Income in (Rs.)					
various sources	Daily	Monthly	Yearly			
h. Forestry						
i. Other (specify)						
Total Income						

B) Assets

Livestock holding of the family (Write the unit in nos.)	No.
1. Cow	
2. Ox	
3. Buffalo	
4. Sheep	
5. Goat	
6. Camel	
7. Donkey	
8. Horse	
9. Pig	
10. Chicken	
11. Duck	
12. Others livestock (specify)	

C) Agricultural Implements

Agricultural implements owned by the family	Yes	No
1. Tarctor	1	2
2. Power Triller	1	2
3. Thresher	1	2
4. Harvester	1	2
5. Genset Sprayer	1	2
6. Pump Set	1	2
7. Electric Pump	1	2
8. Others Specify	1	2

D) Household Items

Household items owned by the family	Yes	No
1. TV	1	2
2. Fridge	1	2
3. Mixer	1	2
4. Electric Cooker	1	2

5. Geyser	1	2
6. Electric Fan	1	2
7. OTG	1	2
8. Toaster	1	2
9. Microwave	1	2
10. Radio	1	2
11. Others Specify	1	2

E) Other Assets of Family

Other assets owned by the family	Yes	No
1. Scooter/Motorcycle	1	2
2. Jeep/Car	1	2
3. Truck	1	2
4. Bus	1	2
5. Bullock/Camel Cart	1	2
6. Others Specify	1	2

F) Total Annual Saving: ----- (Rs.)

G) Loan

a. Have you taken any loan? 1. Yes, 2. No, 3. Don't Knowb. If yes, then please tell us the following:

Na	me of the loan provider	Amount (in Rs.)	Re-paid (in Rs.)	Balance (in Rs.)
1.	Bank			
2.	Relative/Friend			
3.	Mahajan			
4.	Other (specify)			

112 PRODUCTION AND EMPLOYMENT

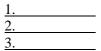
A-1	Land Title	Response
	Own with Title (1)	
	Own without Title (2)	
A-2	Tenure Status: If Own with Title, please select one or	
	more:	
	Borrow at No Charge (1)	
	Rent from Authorities (2)	
	Rent from Individuals (3)	
	Other Status (4)	

B) Area of Land: If Own with Title, please answer the questions below: (for Non-Squatters)

- B.1) Do you have agricultural land? a. Yes b. No
- B.2) If Yes, please tell us the total land owned by you (in local unit).

Type of Land	Area			
	Sqm.	Bigha	Biswa	Hectare
1. Agricultural land				
2. Orchard				
3. Others (specify)				
Total Land				

C) In case of farmers, list names of your 3 major products (for Non-Squatters)



D-1) In case of other occupations, specify main income source?

D-2) Select the observed type of squatters (for Squatters)

Category of squatter	Please write response
Illegal residents with station-related occupation (1)	
Shops of illegal occupancy (2)	
Seasonal labour (Agriculture) (3)	
Seasonal labour - Factory/Construction (4)	
Gangmen's colony (5)	
Migrant Tribe (6)	

E) What is the most serious problem on your livelihood?

113 ACCESSIBILITIES

A) Accessibilities in Normal Conditions

		Distance			
	Average	Frequency	Frequency to cross	Mode	(km)
	Time per	1: 1 Day	the level crossing	1: Foot	
	Trip	2: 2-3 days	per day. Specify	2: Bicycle	
	(minutes)	3: 1 Week	the number	3: Ox Cart	
Destination			(e.g. 3 times/day).	4: Horse Cart	
		5: 1 Month		5: Camel Cart	
		6: 2 Months		7: Motor Bike	
		7. 6 Months		8: Car	
		8: 1 Year		9. Bus	
				10. Others	
District Center					
Large Market					
Small Market					
High School					
Secondary					
School					
Primary School					
Farming Land					
Health Clinic					
Hospital					
Religious					
Center					

B) How often do you cross ROBs? Specify the number (e.g. 3 times/day). (Only for ROBs)

C) How often do you cross ROBs with Non-motorized Vehicles (NMVs)? Specify the number (e.g. 3 times/day). (Only for ROBs)

114 UTILITIES

A) Access to Potable Water

Please check the status of access to potable water.

Kind of Facilities		Please check.
Dig Well (Private)		
Dig Well (Common)		
Pump Well (Private)		
Pump Well (Common)		
Bought from Water Vendors		
Other Facilities ()		
Other Natural Water Sources ()	

B) Access to Toilet Facilities

Please check the status of access to toilet facilities.

Kind of Facilities	Please check.
In-door Toilet	
Out-door Toilet (Private)	
Out-door Toilet (Common)	
Not Available	

C) Access to Electricity <u>Please check the status of access to electricity.</u>

Kind of Facilities	Please check.
Power line	
Generator (Private)	
Generator (Common)	
Car Battery	
Not Available	

COMMENTS ON RESETTLEMENT & REHABILITATION 115

Questions	Response
A. Are you aware that Govt. of India has initiated Dedicated Freight Corridor Project in which a separate railway line will be laid for transportation of goods between Mumbai, Delhi and Howrah?	 Yes No (If No, go to C).
B. If Yes , what has been your source of information for DFC Project?	 TV Radio News Paper Word of Mouth Friend/Relative Others (specify)
C. Do you think the project will provide economic benefit in the area?	 Yes No No comment
D. In your opinion what kind of economic benefit would take place?	 Wage employment Business opportunity Industry establishment Others (specify)
E. In case you are to be displaced by the project what would be your choice?	 Self relocation or voluntary relocation Protest displacement Conditional Can't say now Others (specify)
F. As regards resettlement and rehabilitation what would be your request to the Project Implementing Authority or Project Owner?	1. Compensation2. Resettlementand

Rehabilitation
3. Compensation & R&R both
4. Other (specify

ANNEX – 6.1

RELEVANT INDIAN STANDARDS

an.	Tolerance Limits for Inland Surface Waters (as per IS:2296)					
SN	Parameter and Unit	Class-A	Class-B	Class-C	Class-D	Class-E
1.	Colour (Hazen Units)	10	300	300	-	-
2.	Odour	Unobject	-	-	-	-
3.	Taste	Tasteless	-	-	-	-
4.	pH (max) (min:6.5)	8.5	8.5	8.5	8.5	8.5
5.	Conductivity (25°C) (µmhos/cm)	-	-	-	1000	2250
6.	DO (mg/L)(min)	6	5	4	4	-
7.	BOD (3 days at 27°C) (mg/L)	2	3	3	-	-
8.	Total Coliforms (MPN/100 mL)	50	500	5000	-	-
9.	TDS (mg/L)	500	-	1500	-	2100
10.	Oil and Grease (mg/L)	-	-	0.1	0.1	-
11.	Mineral Oil (mg/L)	0.01	-	-	-	-
12.	Free Carbon Dioxide (mg/L CO ₂)	-	-	-	6	-
13.	Free Ammonia (mg/L as N)	-	-	-	1.2	-
14.	Cyanide (mg/L as CN)	0.05	0.05	0.05	-	-
15.	Phenol (mg/L C ₆ H ₅ OH)	0.002	0.005	0.005	-	-
16.	Total Hardness (mg/L as CaCO ₃)	300	-	-	-	-
17.	Chloride (mg/L as Cl)	250	-	600	-	600
18.	Sulphate (mg/L as SO ₄)	400	-	400	-	1000
19.	Nitrate (mg/L as NO ₃)	20	-	50	-	-
20.	Fluoride (mg/L as F)	1.5	1.5	1.5	-	-
21.	Calcium (mg/L as Ca)	80	-	-	-	-
22.	Magnesium (mg/L as Mg)	24.4	-	-	-	-
23.	Copper (mg/L as Cu)	1.5	-	1.5	-	-
24.	Iron (mg/L as Fe)	0.3	-	50	-	-
25.	Manganese (mg/L as Mn)	0.5	-	-	-	-
26.	Zinc (mg/L as Zn)	15	-	15	-	-
27.	Boron (mg/L as B)	-	-	-	-	2
28.	Barium (mg/L as Ba)	1	-	-	-	-
29.	Silver (mg/L as Ag)	0.05	-	-	-	-
30.	Arsenic (mg/L as As)	0.05	0.2	0.2	-	-
31.	Mercury (mg/L as Hg)	0.001	-	-	-	-
32.	Lead (mg/L as Pb)	0.1	-	0.1	-	-
33.	Cadmium (mg/L as Cd)	0.01	-	0.01	-	-
34.	Chromium (VI) (mg/L as Cr)	0.05	0.05	0.05	-	-
35.	Selenium (mg/L as Se)	0.01	-	0.05	-	-
36.	Anionic Detergents (mg/L MBAS)	0.2	1	1	-	-
37.	PAH (mg/L)	0.2	-	-	-	-
38.	Pesticides (µg/L)	Absent	-	-	-	-
39.	Insecticides (mg/L)	-	-	Absent	-	-
40.	Alpha Emitters $(10^{-6} \mu c/mL)$	0.001	0.001	0.001	0.001	0.001
41.	Beta Emitters ($10^{-6}\mu c/mL$)	0.01	0.01	0.01	0.01	0.01
42.	Percent Sodium (%)			-	-	60
43.	Sodium Absorption Ratio	-		-	-	26
	Drinking water source without con		-	-	-	20

Tolerance Limits for Inland Surface Waters (as per IS:2296)

Class-A: Drinking water source without conventional treatment but after disinfection.

Class-B: Outdoor bathing.

Class-C: Drinking water source with conventional treatment followed by disinfection.

Class-D: Fish culture and wild life propagation.

Class-E: Irrigation, industrial cooling and controlled waste disposal.

Sl.	Parameter and Unit	Desirable Limit	Permissible Limit
No.			in Absence of
			Alternate Source
1.	Colour (Hazen units)	5	25
2.	Odour	Unobjectionable	-
3.	Taste	Agreeable	-
4.	Turbidity (NTU)	5	10
5.	pH	5-8.5	No relaxation
6.	Total Coliforms (MPN/100 mL)	nil	-
7.	Pathogenic Organisms or Virus	nil	-
8.	TDS (mg/L)	500	2000
9.	Mineral Oil (mg/L)	0.01	0.03
10.	Free Residual Chlorine (mg/L)	0.2	-
11.	Cyanide (mg/L as CN)	0.05	No relaxation
12.	Phenol (mg/L C_6H_5OH)	0.001	0.002
13.	Total Hardness (mg/L as CaCO ₃)	300	600
14.	Total Alkalinity (mg/L as CaCO ₃)	200	600
15.	Chloride (mg/L as Cl)	250	1000
16.	Sulphate (mg/L as SO ₄)	200	400
17.	Nitrate (mg/L as NO ₃)	45	100
18.	Fluoride (mg/L as F)	1	1.5
19.	Calcium (mg/L as Ca)	75	200
20.	Magnesium (mg/L as Mg)	30	100
21.	Copper (mg/L as Cu)	0.05	1.5
22.	Iron (mg/L as Fe)	0.3	1
23.	Manganese (mg/L as Mn)	0.1	0.3
24.	Zinc (mg/L as Zn)	5	15
25.	Boron (mg/L as B)	1	5
26.	Aluminium (mg/L as AL)	0.03	0.2
27.	Arsenic (mg/L as As)	0.05	No relaxation
28.	Mercury (mg/L as Hg)	0.001	No relaxation
29.	Lead (mg/L as Pb)	0.05	No relaxation
30.	Cadmium (mg/L as Cd)	0.01	No relaxation
31.	Chromium (VI) (mg/L as Cr)	0.05	No relaxation
32.	Selenium (mg/L as Se)	0.01	No relaxation
33.	Anionic Detergents (mg/L MBAS)	0.2	1
34.	PAH (mg/L)	nil	-
35.	Pesticides (µg/L)	Absent	0.001
36.	Alpha Emitters (10 ⁻⁶ µc/mL)	nil	0.0001
37.	Beta Emitters $(10^{-6} \mu c/mL)$	nil	0.001

Drinking Water Quality Standards (as per IS:10500)

Sl.	Parameter and Unit	Inland	Public	Land for	Marine
No.		Surface	Sewers	Irrigation	Coastal
		Water		-	Water
1.	Temperature (°C)	#	-	-	#
2.	Colour and Odour	\$	-	\$	\$
3.	pH	5.5-9.0	5.5-9.0	5.5-9.0	5.5-9.0
4.	BOD (3 days at 27°C) (mg/L)	30	350	100	100
5.	COD (mg/L)	250	-	-	250
6.	Bio-assey (% 96-hrs Survival)	@	@	@	@
7.	TSS (mg/L)	100	600	200	100*
8.	SS Particlesize(pass IS Sieve)	850	-	-	&
9.	Oil and Grease (mg/L)	10	20	10	20
10.	Total Residual Chlorine (mg/L)	1	-	-	1
11.	Nitrate Nitrogen (mg/L as N)	10	-	-	20
12.	Ammonia Nitrogen (mg/L N)	50	50	-	50
13.	Kjeldahl Nitrogen (mg/L as N)	100	-	-	100
14.	Free Ammonia (mg/L as N)	5	-	-	5
15.	Cyanide (mg/L as CN)	0.2	2	0.2	0.2
16.	Phenol (mg/L C_6H_5OH)	1	5	-	5
17.	Fluoride (mg/L as F)	2	15	-	15
18.	Sulphide (mg/L as S)	2	-	-	5
19.	Dissolved Phosphate (mg/L P)	5	-	-	-
20.	Copper (mg/L as Cu)	3	3	-	3
21.	Iron (mg/L as Fe)	3	3	-	3
22.	Manganese (mg/L as Mn)	2	2	-	2
23.	Zinc (mg/L as Zn)	5	15	-	15
24.	Nickel (mg/L as Ni)	3	3	-	5
25.	Vanadium (mg/L as V)	0.2	0.2	-	0.2
26.	Arsenic (mg/L as As)	0.2	0.2	0.2	0.2
27.	Mercury (mg/L as Hg)	0.01	0.01	-	0.01
28.	Lead (mg/L as Pb)	0.1	1	-	1
29.	Cadmium (mg/L as Cd)	2	1	-	2
30.	Chromium (VI) (mg/L as Cr)	0.1	2	-	1
31.	Chromium (Total) (mg/L as Cr)	2	2	-	2
32.	Selenium (mg/L as Se)	0.05	0.05	-	0.05
33.	Alpha Emitters (10 ⁻⁶ µc/mL)	0.1	0.1	0.01	0.1
34.	Beta Emitters (10 ⁻⁶ µc/mL)	1	1	0.1	1

General Standards for Discharge of Effluents [as per Environment (Protection) Rules, 1986]

Shall not exceed 5° C above the receiving water temperature.

\$ All efforts should be made to remove colour and unpleasant odour as far as practicable.

@ 90% survival of fish after 96 hours in 100% effluent.

* For cooling water effluent 10% above TSS of influent.

& (a) Floatable solids 3 mm, (b) Settleable solids 850 micron.

General Emission Standards

[as per Environment (Protection) Rules, 1986]

I.	Concentration	Based	Standards

SN	Parameter	Standard (mg/Nm ³)
1.	Particulate Matter (PM)	150
2.	Total Fluoride	25
3.	Asbestos	Fibres: 4 nos/cc, Dust: 2 mg/Nm ³
4.	Mercury	0.2
5.	Chlorine	15
6.	Hydrochloric acid vapour and mist	35
7.	Sulphuric acid mist	50
8.	Carbon Monoxide	1% max (v/v)
9.	Lead	10

II. Equipment Based Standards

(For dispersal of sulphur dioxide, minimum stack height limit is accordingly prescribed below)

Power Generation Capacity (MW)	Steam Generation Capacity (T/h)	Coal Consumption (MT/day)	Minimum Stack Height Limit (m)
≥ 500			275
\geq 200/210 and < 500			220
< 200/210			$H = 14 Q^{0.3}$
	< 2	< 8.5	9
	2 to 5	8.5 to 21	12
	5 to 10	21 to 42	15
	10 to 15	42 to 64	18
	15 to 20	64 to 84	21
	20 to 25	84 to 105	24
	25 to 30	105 to 126	27
	> 30	> 126	30 or using $H = 14 Q^{0.3}$

Note: H = Physical height of the stack in metre,

 $Q = Emission rate of SO_2 in kg/hr$

National Ambient Air Quality Stand	lards
[as per Environment (Protection) Rules	19861

Pollutant	Time	Concentration (µg/m ³) in Ambient Air		
	Weighted	Industrial	Residential, Rural	Sensitive
	Average	Area	and Other Areas	Area
Sulphur Dioxide (SO ₂)	Annual*	80	60	15
	24 Hours**	120	80	30
Oxides of Nitrogen (as NO ₂)	Annual*	80	60	15
	24 Hours**	120	80	30
Suspended Particulate Matter (SPM)	Annual*	360	140	70
	24 Hours**	500	200	100
Respirable Particulate Matter (RPM)	Annual*	120	60	50
(size less than 10 µm)	24 Hours**	150	100	75
Lead (Pb)	Annual*	1	0.75	0.5
	24 Hours**	1.5	1	0.75
Ammonia	Annual*	100	100	100
	24 Hours**	400	400	400
Carbon Monoxide (CO)	8 Hours**	5000	2000	1000
	1 Hour	10000	4000	2000

* Annual arithmetic mean of minimum 104 measurements in a year taken twice a week 24-hourly at uniform interval.

** 24-hourly/8-hourly values should be met 98% of the time in a year. However, 2% of the time, it may exceed but not on two consecutive days.

Area	Category of Area	Limits in dB L _{Aeq} *	
Code		Day Time	Night Time
А	Industrial Area	75	70
В	Commercial Area	65	55
С	Residential Area	55	45
D	Silence Zone	50	40

Ambient Air Quality Standards in respect of Noise [as per Noise Pollution (Regulation and Control) Rules, 2000]

Notes: 1. Day time shall mean from 6.00 a.m. to 10.00 p.m.

- 2. Night time shall mean from 10.00 p.m. to 6.00 a.m.
- 3. Silence zone is defined as an area comprising not less than 100 metres around hospitals, educational institutions and courts. The silence zones are zones which are declared as such by the competent authority.
- 4. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.
- * $dB(A) L_{eq}$ denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.

Permissible Exposure Levels of Impulse or Impact Noise for Work Zone Area [as per Model Rules of Factories Act, 1948]

Peak Sound Pressure Level in dB	Permitted Number of Impulses or Impacts/day
140	100
135	315
130	1,000
125	3,160
120	10,000

Notes: 1. No exposure in excess of 140 dB peak sound pressure level is permitted.

2. For any peak sound pressure level falling in between any figure and the next higher or lower figure as indicated in column 1, the permitted number of impulses or impacts per day is to be determined by extrapolation on a proportionate basis.

Permissible Exposure in Case of Continuous Noise for Work Zone Area [as per Model Rules of Factories Act, 1948]

Total Time of Exposure (continuous or a number of short term exposures) per day, in hr	Permissible Sound Pressure Level in dB
8	90
6	92
4	95
3	97
2	100
1	102
1&1/2	105
1/2	107
1/4	110
1/8	115

Notes: 1. No exposure in excess of 115 dB(A) is to be permitted.

2. For any period of exposure falling in between any figure and the next higher or lower figure as indicated in column 1, the permissible sound pressure level is to be determined by extrapolation on a proportionate basis.

ANNEX – 6.2

QUESTIONNAIRE FOR NOISE & VIBRATION SURVEY

I. Characteristics of the Interviewee

- 1. Gender: a. man, b. female
- 2. Age: young, adult, aged
- 3. Occupation: worker, student, housewife, others

II. Characteristics of the Survey Area

- 1. Location of the Survey Area
- State, District, Village:
- 2. Description of Area
 - a. urban b. rural
- 3. Distance of the interview point to the railway
 - a. next to railway, b. 10-25m, c. 25-50m, d. 50-100m, e. More than 100m
- 4. Conditions of the Interview Survey Area
 - 1) Open area to railway
 - 2) Rural road between road between railway to the interview area
 - 3) Urban road between railway to the interview area
 - 4) Small buildings/house between railway to the interview area
 - 5) Large building(s) between railway to the interview area
 - 6) Forest area to railway
 - 7) Other conditions: ()

III Question on Pollution Problem

- 1. What kind of pollution problem do you have?
 - a. Air pollution, b. Water pollution, c. Solid waste, d. Noise, e. Vibration, f. Others () g. Nothing
- 2. If yes, select the worst three pollution items
 - (1)Worst one: (2) Second worst: (3) Third worst:

IV Questions on Noise from Railway

- 1. Does noise from railway annoy your life?
 - a) Yes b) No
- 2. If yes, how?
 - a. When freight train passes by
 - b. When passenger train passes by
 - c. Because of railway station
 - d. Others: ()
- 3. Does other noise annoys your life?
 - a. road traffic, b. factory works, c. construction works, d. others (
- 4. What is your opinion/idea for reducing the present noise problem that annoys you?

Please describe:

V Questions on Vibration from Railway

1. Does vibration from railway annoy your life?

a) Yes b) No

- 2. If yes, how?
 - a. When freight train passes by
 - b. When passenger train passes by
 - c. Because of railway station
 - d. Others: ()
- 3. Does other vibration annoys your life ?

a. road traffic, b. factory works, c. construction works, d. others ()

4. What is your opinion/idea fro reducing the present vibration that annoys you?

Please describe: End of questionnaire

)

Questionnaire Survey Methodology Parallel to the noise and vibration measurement, the questionnaire survey was conducted among the local people residing around the Sensitive receptor point. They were asked to answer a few questions related to their perceptions over the disturbances and annoyance caused by railway noise and vibration due to existing railway track. 10 respondents were chosen randomly from each of the sampling sites and interviewed only after making them understand the purpose of the survey.

NOISE & VIBRATION

MEASUREMENT, PREDICTION & EVALUATION

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.

New Construction of	Daytime (7:00 - 22:00): 60 dB (L _{Aeq}) or less	
New Construction of Railway	Night time (22:00 - 7:00): 55 dB (L _{Aeq}) or less	
Kallway	Minimise the railway noise in the residential area as much as possible	
Large-Scale		
Improvement of Existing	Improve the railway noise level less before the construction	
Railway		
Note: Pailway other than Shinkansan Express Pailway (hullet train)		

Table-1	Recommended	Standard	Level of	Railway	Noise in Japan
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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-2 Guideline Value of Vibration from Shinkansen Superexpress Railway in Japan

70 or less	Corrected Acceleration Level	dB (LA _{MAX})
	Confected Acceleration Level	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 (LA_{MAX}) 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.

Area Coda	Catagory of Area Zona	Limits	in dB(L _{Aeq})
Area Code	Category of Area Zone	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

Five (5) survey sites including the plain routes and the railway bridges were selected in the field survey.

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-4**.

	Totogomy		Specifi	ication		
,	Category	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	

Table-4 Train Type Categories

- 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 NoiseVibration Level) of Japan was used for noise measurement.
- (iii) Railway Vibration
- As for railway vibration levels, peak level (LA_{MAX}) 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.

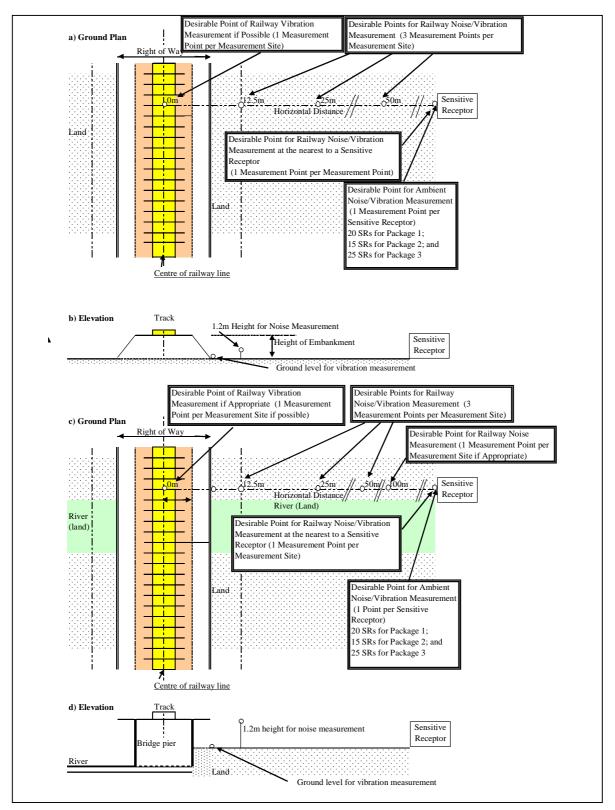


Figure-1 Schematic Layout of Noise and Vibration Measurement Sites

2) Results of Railway Noise and Vibration Survey

Railway noise and vibration survey was carried out at 5 sites of which 3 fall outside the area of the present report.

Results of railway noise and vibration measurement are shown in Table-5

		Location of DR site					Railway Noise Level						Railway Vibration Level		
DR Site	Type of		Category	Number	Passage Time	Running Speed					LEA (dB)		Leak (dB)		
No.	Track	(District, State)	of trains	of trains	(sec)	(km/hr)	12.5m	25m	50m	12.5m	25m	50m	12.5m	25m	50m
			PEA	21	110	72	84	79	74	97	95	92	78	65	56
P1-DRP-1			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
	Plain Route	Near Biltmore Station	FE1A	47	30	96	87	84	79	102	98	97	79	71	57
		(Navarre, Gujarat)	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
			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
P1-DRP-2	Plain Route		PEA	19	24	83	82	78	73	96	92	87	63	52	44
		Malinger (Ahmedabad, Gujarat)	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
			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
	Railway Bridge	Ambica River Bridge (Navsari, Gujarat)	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
P1-DRB-1			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
			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
P1-DRB-2	Railway	Narmada River Bridge	PEB	13	48	22	63	64	63	70	71	70	68	55	53
	Bridge	(Bharuch, Gujarat)	PEB	14	40	29	65	66	65	72	73	72	65	55	53
	81	(=,j)	PEB	20	42	39	62	75	67	69	82	74	68	56	56
			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
	Railway	Sabarmati Bridge	PDB	18	25	60	87	82	78	103	97	93	56	53	53
P1-DRB-3	Bridge	(Ahmedabad, Gujarat)	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

Table-5 Result of Railway Noise and Vibration Measurement (including 3 sites outside the study area)

Note: "Category of Trains" consisting of 16 freight and passenger train types in Table-6.4.4 were applied.

3) Overall Findings of Railway Noise and Vibration Survey

Figure 10-4 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.

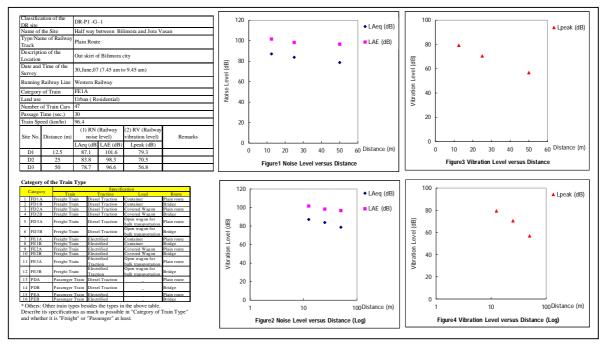


Figure-2 Typical Attenuation Pattern with the Distance

- 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.

Noise and Vibration Survey at Sensitive Receptor (SR) Sites

(3) 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, 20 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.

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 LA_{MAX} 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 LA_{MAX} , respectively.

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

(4) **Results of Noise and Vibration Measurement at SR Sites**

Table-6 show both results of ambient noise and vibration measurement at SR sites and results of railway noise and vibration measurement at SR sites

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.

Serial No. (1)	Type of SR	Location of SR site	District)	Type of Railway Line	Duration of measurement (hr)	Distance (m)	Ambient Noise Level (dB)	Ambient Vi Level (d	
1101(1)				(E, P, D) (2)	measurement (m)	(3)	L _{Aeq}	LA _{MAX}	L ₁₀
P1-5	Hindu temple	HinduTemple, Near Miyagam Karjan RS	Kheda	Е	4	115	72	66	73
P1-6	Hospital	Shree Mahalaxmi Mahilaji Hospital, Near Vishvamitri RS	Vadodara	Е	4	125	68	54	40
P1-7	Hospital	Darbar Shri Gopaldas Desai TB Hospital, Near Anand RS	Anand	Е	4	55	73	99	65
P1-8	Farmland	Diversion, village Kashindra (Ahmedabad)	Ahmedabad	D	4	0	58	56	30
P1-9	Minaret	Shaking minaret-2, Near Ahmedabad Junction	Ahmedabad	Е	4	15	72	90	45
P1-10	Hospital	Gujarat State Police Hospital, near Madhupura Crossing	Ahmedabad	Е	3	15	76	110	49
P1-11	Hindu temple	Hindu Temple, near Sabarmati Railway bridge	Ahmedabad	Е	2	15	75	106	50
P1-12	Hindu temple	Hindu Temple, Near Sabarmati RS	Ahmedabad	Е	4	65	69	60	39
P1-13	Hindu Temple	Hindu Temple near Central Jail, (Sabarmati)	Ahmedabad	Е	4	55	77	110	49
P1-14	Hospital	Kuldeep Hospital, Near Kalol RS	Mahesana	E	4	45	71	64	44
P1-15	Hospital	Hospital, Near Siddhapur RS	Mahesana	Р	4	35	66	110	38

Table-6 Result of Ambient Noise and Vibration at SR Sites

Note 1: Same numbering as corresponding SR site

Note 2: E - Existing railway line but out of DFC alignment, P - Paralleling railway line to existing one, D - Alongside planned Detour

Note 3: Horizontal distance of measuring point from centre of the nearest track (m)

(5) 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-7**. Major findings are also provided below.

Area	No of Persons Interviewed	Noise from 1	Railway ann life?	oys your		rom Railway your life?	annoys
		Yes	No	NA	Yes	No	NA
Urban	110	107	3	0	79	31	0
Rural	90	57	33	0	44	46	0
Total	200	164	36	0	123	77	0

Table-7 Summary of Pollution Interview Survey (Gujarat and Maharashtra)

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.

Prediction and Evaluation of Railway Noise and Vibration

(6) **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-3**.

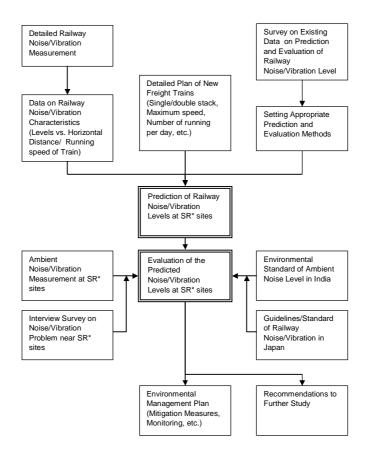


Figure-3 Procedure for Prediction and Evaluation of Noise and Vibration Levels

(7) 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.

$L_{AE1} = A_1 + B_1 Log10 (D)$	(1-1)
$L_{Aeq1} = L_{AE1} + 10 \text{ Log10 (N/T)}$	(1-2)

I	Trains	Catagory	٨	D	Ra	ailway Noise	E Level (LAF	L & Laeq (dE	8))	Noise Level
	Trailis	Category	A	D	12.5 m	25 m	50 m	100 m	200 m	Noise Level
	Freight Electric	FEP	110.59	-8.89	101.0	98.2	95.5	92.8	90.1	LAE
Freight Electric	FEP II	110.59	-0.89	76.1	73 3	70.6	67.9	65.2	I Aea	

Table-8 Predicted Railway Noise Level by Distance

Note 1: Electrified Freight Train (Plain Route) Running at 100 km/h. Note 2: LAE=A+BLog10(D), Laeq=LAE-10Long10(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 (LA_{MAX}), 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.

$LA_{MAX 2} = A_2 + B_2 Log10 (D)$	(2)
------------------------------------	-----

Trains	Cotogory	٨	D]	Railway Vib	ration Level	(Lpeak (dB))
Trains	Category	A	Б	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

Table-9 Predicted Railway Vibration Level by Distance

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

Note 2: Lpeak = A + B Log10(D)

Note 3: Number of Sample: 6 data, $r^2=0.973$

(8) 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 minutes)
- 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.

(9) **Prediction and Evaluation Results**

1) Prediction of Railway Noise Levels

Estimated noise levels (L_{Aeq}) due to additional new freight trains are shown in **Table-10**. 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 61-75 dB, and all the predicted noise levels exceed the ambient noise standard of India. However, it should be mentioned that the existing noise levels are between 52-77 dB and exceed the ambient noise standard of India.

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 (61-75 dB) are in the same range of the existing ambient noise levels (52-77 dB). However,

depending on the measurement site, the differences between the predicted noise levels and the existing noise levels are between -9 dB and 2 dB.

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 Deign stage.

S.N.	Type of SR	Location of SR	District	Predicted	Standard	Present	Present
				Noise Level	Noise Level	Ambient	Railway
				(dB)	(dB)	Noise Level	Noise Level
						(dB)	(dB)
				L _{Aeq}	L _{Aeq}	L _{Aeq}	L _{Aeq}
1.	Hindu Temple	Near Miyagam Karjan	Kheda	67	50	72	-
		railway station					
2.	Hospital	Shri Mahalakshmi Mahilaji	Vadodara	67	50	68	68
		Hospital, near Vishyamitri					
		railway station					
3.	Hospital	Darbar Shri Gopaldas Desai	Anand	70	50	73	73
		Hospital, near Anand railway					
		station					
4.	Minaret	Shaking minaret-2, near	Ahmedabad	75	50	72	-
		Ahmedabad Junction					
5.	Hospital	Gujarat State Police Hospital,	Ahmedabad	75	50	76	-
		near Madhupura crossing					
6.	Hindu Temple	Near Sabarmati railway	Ahmedabad	75	50	75	81
		bridge					
7.	Hindu Temple	Near Sabarmati railway	Ahmedabad	69	50	69	-
		station					
8.	Hindu Temple	Near Central Jail, Sabarmati	Ahmedabad	70	50	77	79
9.	Hospital	Kuldeep Hospital near Kakol	Gandhinagar	71	50	71	71
		railway station					
10.	Hospital	Hospital near Siddhpur	Patan	72	50	66	-
		railway station					
		Maxim	um Noise Level	75	-	77	81
		Minim	um Noise Level	67	-	66	68

Table-10 Predicted Results of Railway Noise

2) Prediction of Railway Vibration Levels

Estimated vibration levels (LA_{MAX}) due to additional new freight trains are shown in **Table-11**. Estimated vibration levels (LA_{MAX}) 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.

Compared to the existing ambient vibration levels, which are in the rage of 47-110 dB, the predicted railway vibration levels are also in the similar range of 18-76 dB. However, the differences between the predicted levels and existing levels are between -29-34 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.

S.N.	Type of SR	Location of SR	State-District	Predicted Vibration Level (dB)	Ambient Vib (dl	3)	Railway Vibration Level (dB)
				LA _{MAX}	LA _{MAX}	L 10	LA _{MAX}
1.	Hindu Temple	Near Miyagam Karjan railway station	Kheda	42	66	73	-
2.	Hospital	Shri Mahalakshmi Mahilaji Hospital, near Vishyamitri railway station	Vadodara	41	54	40	57
3.	Hospital	Darbar Shri Gopaldas Desai Hospital, near Anand railway station	Anand	54	99	65	52
4.	Minaret	Shaking minaret-2, near Ahmedabad Junction	Ahmedabad	76	90	45	-
5.	Hospital	Gujarat State Police Hospital, near Madhupura crossing	Ahmedabad	76	110	49	-
6.	Hindu Temple	Near Sabarmati railway bridge	Ahmedabad	76	106	50	63
7.	Hindu Temple	Near Sabarmati railway station	Ahmedabad	52	60	39	-
8.	Hindu Temple	Near Central Jail, Sabarmati	Ahmedabad	54	110	49	59
9.	Hospital	Kuldeep Hospital near Kakol railway station	Gandhinagar	58	64	44	48
		Maximum	Vibration Level	76	110	73	63
		Minimum	Vibration Level	41	54	39	48

Table-11 Predicted Results of Railway Vibration

Overall Findings and Recommendations

(10) 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,s and establishing soundproof walls in the Detailed Deign stage.

(11) 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.

(12) 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.

(13) 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.

FORMS FOR ENVIRONMENTAL MANAGEMENT PLAN

FORM P.1 - BORROW AREAS IDENTIFICATION

(Reporting by Contractor to Environmental Expert)

Site Layout of Borrow Area and Proposed Borrow Area Redevelopment Plan to be attached with format.

Borrow Area No.

Location of Borrow Area (km) Package.....

S. N.	Item	Unit	Details	Remarks by SC
1.	Date of borrow Area becoming operational dd/mm/yy			
2.	Current Land use			
3.	No of settlements within 500m of Borrow Area	Nos.		
4.	Total Capacity	Cum		
5.	No. of Trees with girth more than 30 cm	Nos.		
6.	Length of Haul Road	Km		
7.	Width of Haul road	М		
8.	Type of Haul road	Metal / dirt		
9.	No. of settlements within 200m of Haul Road	Nos.		
10.	Size of Borrow Area	Sq km		
11.	Area of Borrow Area	Km x km		
12.	Quantity Available	Cum		
13.	Dist of Nearest Water Source	Type/Size/Cap- acity/Present Use/ Ownership		
14.	Quantity of top soil removed	Cum		
15.	Details of storage of topsoil			

Certified that the furnished information is correct and all relevant information as required is attached.

Environmental Specialist (Supervision Consultant)

FORM P.2-TEMPORARY ACQUISITION OF LAND

SI.	Item	Target date for		Present	Size	Existing	Dist. From	Dist.	Remarks
No.		Establishment	(CH)	Land	(m×m)	Trees	nearest	From	by SC, if
				use		>30 cm	Settlement	nearest	any
						girth		water	
								source	
1.	Borrow Areas								
	BA 1								
	BA 2								
	BA 3								
	BA 4								
2.	Workers Camps								
	WC 1								
	WC 2								
3.	Site for								
	Construction								
	Equipment								
	CE 1								
	CE 2								
4.	Stock Yard								
	SY 1								
	SY 2								

(Site Layout of all locations to be attached with format)

Certified that the furnished information is correct and all relevant information as required is attached.

Environmental Specialist (Supervision Consultant)

FORM P.3 SITE IDENTIFICATION AND SETTING UP OF WORKERS CAMP AND CONSTRUCTION EQUIPMENT

(Reporting by Contractor to PIU after certification by Environmental Expert)

(Site layout of Construction camp and working drawings of dwelling units with allied facilities to be attached with format)

Format to be submitted before target date (decided by PD) of establishing camps as Camp no. WC

Location of Camp (km _____ package_____)

S. N.	Item	Unit	Details	Remarks by SC, if any
	Detail of item camp	m x m		
1.	Size of Camp	Sq.m		
2.	Area of Camp			
3.	Distance from Nearest settlement	Type/Size/ Capacity/Present use/Ownership		
4.	Distance from nearest water source	-		
5.	Date of camp becoming operational dd/mm/yy			
6.	Present land use			
7.	No other trees with girth>0.3m			
	Details of top soil stacking			
1.	Quantity of top soil removed	Sq.m		
2.	Detail of storage of topsoil	Describe stackling		
	Details of workforce			
1.	Total no. of labourers	Nos.		
2.	Total no. of Male Workers	Nos.		
3.	No. of male workers below 18 years of age	Nos.		
4.	Total no. of female workers	Nos.		
5.	No of female workers below 18 years of age	Nos.		
6.	No. of children	Nos.		
	Details of dwelling units			
1.	No of dwellings	Nos.		
2.	Minimum size of dwelling	m x m		
3.	No of opening per dwelling	Nos.		
4.	Minimum size of opening	Nos.		
5.	Walls	Specifications		
6.	Roofing	Specifications		
7.	Flooring	Specifications		
8.	Drinking water tank	Specifications		
9.	Capacity of Drinking water tank	Cum		
10.	Size of drinking water tank	m x m x m		
11.	Total No. of WC	Nos.		
12.	No. of Wcs for female workers	Nos.		
13.	Maximum size of WC	m x m		
14.	Total no. of bathrooms for female workers	Nos.		
15.	Size of septic tank for WCs/Baths	m x m x m		
16.	Capacity of Water Tank for WCs/Bathrooms and general purpose			

S. N.	Item	Unit	Details	Remarks by SC, if any
17.	Fencing around camp	Y/N		
	Details of facilities			
1.	Availability of security guard 24 hrs a day	Y/N		
2.	Details of First Aid Facility	Y/N		
3.	Availability of Day Care Centre	Y/N		

Certified that the furnished information is correct the quality of work is as per god practice and all relevant information as required is attached

Environmental Specialist (Supervision Consultant)

FORM C.1 - TARGET SHEET FOR TREE CUTTING

(Reporting by contractor to Environmental Expert)

S. N.	Location	Species	Girth Size (cm)	Average dist from edge of existing railway track (m)**

** In detour section this information will not be required

Environmental Specialist (Supervision Consultant)

FORM C.2 - WATER REQUIRED FOR CONSTRUCTION

(Reporting by contractor to Environmental Expert)

Sl. No.	Source (Name)	Location	Distance from Railway Track	Water Drawn (m ³ /day)	Remarks
1.	Rivers			(;	
2.	Streams/Canal				
3.	Ponds				
4.	Tube well				
5.	Other source / tankers				
	Total Watan Haad				
	Total Water Used				

Certified that the above information is correct

Environmental Specialist (Supervision Consultant)

FORM C.3 - DUST SUPPRESSION AT BORROW & CRUSHER SITES AREA

(Reporting by Contractor to SC)

Format (Reporting Format No. __) for each Borrow Area prepared during Construction stage to be submitted at the end of the month

	Item																	Dat													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Stock Yard	Frequency of sprinkling of water (times / day)																														
	Quantity of water sprinkled (litres)																														
	Quantity of water Sprinkled around site																														
	Frequency of sprinkling of water on Haul road (times / day)																														
	Frequency of sprinkling of water at Borrow Site (times / day)																														
	Total Quantity of water Sprinkled (litres)																														
Crushe r Sites	Frequency of sprinkling of water on Haul road (times / day)																														
	Quantity of water sprinkled (liters)																														
	Quantity of Water Sprinkled on Conveyor Belt																														
	Quantity of water Sprinkled around site																														
	Quantity of water Sprinkled around Crusher site, if any																														

Certified that the above-mentioned works have been completed as specified by the Project Engineer and EMPIU

Environmental Specialist (Supervision Consultant)

FORM C.4 - POLLUTION MONITORING

(Reporting by Contractor to Environmental Expert of SC)

Construction Stage: Report -Date_____ Month_____ Year_____

(Locations at which monitoring to be conducted as per EMP)

S. N.	Location	Details of location	Duration of monitoring	Instruments used	Target Date	Date of completion	Reason for Delay if any							
14.		location	_		Date	completion	Delay II ally							
	Air Monitoring													
1														
2.														
3.														
4.														
5.														
	_		W	ater Monitoring										
1														
2														
3														
4														
5														
			S	Soil Monitoring										
1														
2														
3														
4														
5														
	·		Ν	oise Monitoring	•									
1														
2														
3														
4														
5	1													

Certified that the Pollution Monitoring has been conducted at all the locations specified in the EMP and as per the directions of the Environmental Expert SC

Environmental Expert (Supervision Consultant)

FORM C.5 - HYGIENE REPORTING AT CONSTRUCTION CAMPS AND LABOUR CAMPS

(Reporting by Contractor to Environmental Expert of SC)

Construction Stage: Monthly Report – DateMonth......Year.....

S. No.	Item	Unit	Quantity	Remarks
1.	Total No. of WCs			
2.	No. of WCs Functioning			
3.	No. of bathrooms functioning			
4.	Water Tank cleaned			
5.	First Aid facilities available			
6.	Emergency Vehicle available & functioning			
7.	Camp visit by Doctor/month	No. of times		
8.	Accident occurred, if any	Details to be given		
9.	Measures taken	Details to be given		
10.	Security available 24 hrs daily	Yes/No		
11.	Water logging if any in Camp	Yes/No		
12.	If yes, measures taken			

Certified that the furnished information is correct and all relevant information as required is attached.

Environmental Expert (Supervision Consultant)

FORM C.6 - RESTRORATION OF CONSTRUCTION SITES

(Reporting by Contractor to Environmental Expert of SC)

Reporting by Contractor to DFCCIL (EMU)

S. N.	Item	Location (km)	Unit (cum)	Volume of Topsoil Restored (m ³)	Remarks by SC
	Restoring top soil at diversions				
1.					
2.					
3.					
4.					
	Restoring of top soil at Workers Camp				
1.					
2.					
3.					
4.					
	Restoring of top soil at Construction yard and disposal of spoil				
1.					
2.					
3.					
4.					

Certified that the mitigation / enhancement works have been completed as specified and as per prevalent good construction practices.

Environmental Expert (Supervision Consultant)

FORM 0.1 - POLLUTION MONITORING

Operation Stage: Report -Date_____ Month_____ Year_____

(Locations at which monitoring to be conducted as per EMP)

S. N.	Location	Details of location	Duration of monitoring	Instruments used	Completion		
					Target	Date of	Reason for
					Date	completion	Delay if any
Air Monitoring							
1							
2.							
3.							
4.							
5.							
Water Monitoring							
1							
2							
3							
4							
5							
Soil Monitoring							
1							
2							
3							
4							
5							
Noise Monitoring							
1							
2							
3							
4							
5							

Certified that the Pollution Monitoring has been conducted at all the locations specified In the EMP and as per the directions of the SC

Nodal Officer (DFCCIL) Field Officer (EMU)