CHAPTER - 3

SOCIO-ECONOMIC PROFILE OF THE PROJECT INFLUENCE AREA

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3.1 INTRODUCATION

The project influence area is considered to be the district through which the Corridors road is passing. National Highway No. 927D (NH 927D) lies in western India. Earlier it was SH-26 and recently converted into NH-927D. NH-927D connects Dhoraji in Rajkot district with Jamnagar in Gujarat. The project length in which 72/200 km lies in Jamnagar district and remaining length lies in Rajkot district. The present SH-26 notified into NH-927D vide S.O. No. 1522(E).

This report pertains to Package-2 of Kalavad-Jamnagar section propose and finalized for Four lane because of traffic triggers 10000 PCU as per New MORTH Policy from Km 50+925 to Km 3+665 of NH-927D. Total Design Length for four lane stretch is 47.462 km.

Government of India felt the necessity of partially access controlled corridor between kalvad and Jamnagar through up gradation of kalavad-Jamnagar section of NH-927D. The proposed improvements of Kalavad-Jamnagar highway aims for:

- Important Interstate connectivity between Dhoraji to Jamnagar Port Centre.
- Connectivity too many headquarters/taluka place developed as business centre and Agriculture Marketing Yard.
- Better connectivity to important town Kalavad along the project corridor.
- Provide a platform for better economic and Industrial growth of the region.

This chapter contains the socio-economic profile for the state of Gujarat as well as the project-impacted districts for the purpose of providing a contextual background to understand the social impacts of the proposed Project. The remaining information has been provided as a supplement for the contextual background. The Key Map depicting the project road is presented in **Figure 1.1 in Chapter-1.**

3.1.1 Existing Road

The project highway is passes through major town Kalavad, Theba, Haripar and Vijarkhi in Jamnagar District.

3.1.2 Right of Way

As per the details obtained from the State PWD, the Right of Way is 24m through the project stretch.

3.2 DEMOGRAPHIC FEATURES

The Land of the Legends, stands bordered by Pakistan and Rajasthan in the north east, Madhya Pradesh in the east, and Maharashtra and the Union territories of Diu, Daman, Dadra and Nagar Haveli in the south. The Arabian Gujarat is located on the western coast of India and has the longest coastline of 1,600 km in the country. The state shares its borders with Rajasthan, Madhya Pradesh, Maharashtra and the Union Territories of Daman & Diu and Dadra & Nagar Haveli. The Arabian Sea borders the state both to the west and the south-western borders the state both to the west and the south west.

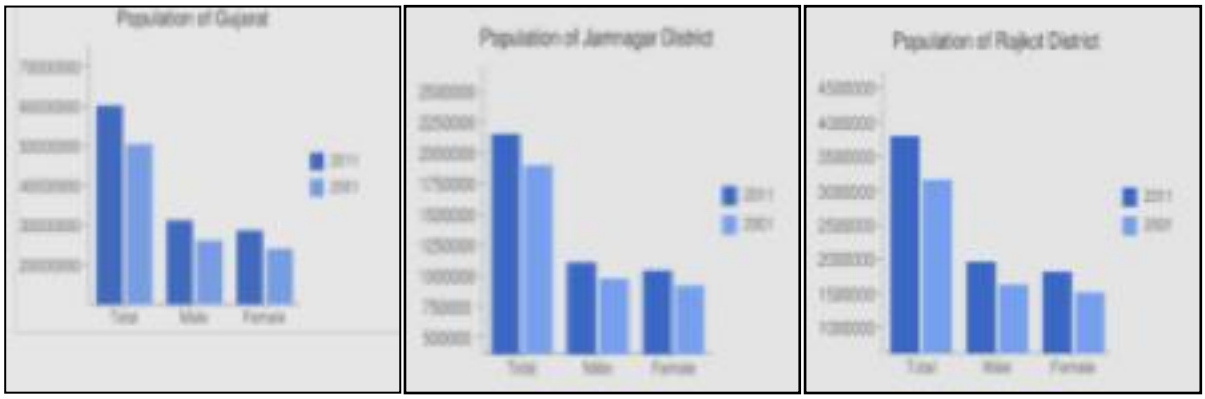
3.2.1 Population

Total population of Gujarat as per 2011 census is 60,439,692 of which male and female are 31,491,260 and 28,948,432 respectively. **Jamnagar** had population of 2,160,119 of which male and female were 1,114,192 and 1,045,927 respectively. **Rajkot** district had population of 3,169,881 of which male were 1,642,018 and remaining 1,527,863 were females. **Table 3.1** and **Figure 3.1** show the demography of Project Influenced Area in 2011.

Table 3.1: Demography of Project Influenced Area in 2011

Section Dhoraji-Jamnagar	**Project Area**	**Jamnagar**	**Rajkot**	**Gujarat**
		67.500 km	**35.300 km**	**-**
Population	2506856	2,160,119	3,169,881	6,04,39,692
Population density per sq. km.	217	152	340	308
Decadal Growth	15.7	13.44%	20.02%	19.28 %
Male	1295440	1,114,192	1,642,018	3,14,91,260
Female	1211417	1,045,927	1,527,863	2,89,48,432
Sex Ratio	942	939	949	919
Percentage of total population	4.5	3.57%	6.29%	4.99%
Child sex Ratio (0-6)	895	904	879	890
Literacy Rate	74.0	73.65%	74.65%	78.03%
Male Literacy	82.0	81.50%	83.01%	85.75%
Female Literacy	65.5	65.33%	65.93%	63.31%
Scheduled Caste Population (in %)	8.0	8.13%	7.71%	6.7
Scheduled Tribe Population (in %)	0.5	0.55%	0.42%	14.8%
Urban Population	49.5	44.95%	58.19%	42.06%
Rural Population	50.5	55.05%	41.81%	57.04%

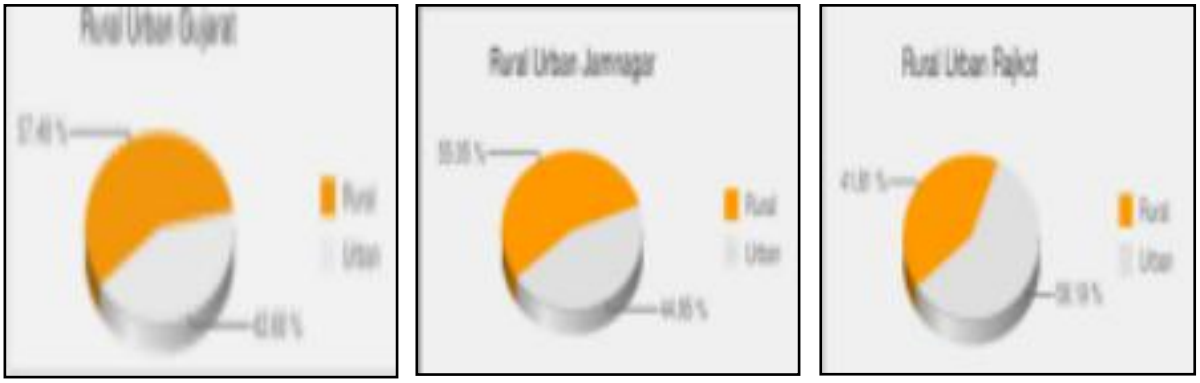
Source: *Primary Census Abstract 2011*



Source: *Primary Census Abstract 2011*

Figure 3.1: Demography of Project Districts and State

Total area of Gujarat is 196,244 Sq.km. Density of Gujarat is 308 per sq.km which is lower than National average 382 per sq.km. Census 2011 shows that density of Jamnagar district is 152 people per sq.km and Rajkot district density of 2011 is 340 people per sq.km of the total population of Gujarat state, around 57.40 percent live in the villages of rural areas. The population of rural areas of Gujarat state was 34,694,609. As per 2011 census, 55.50% population of Jamnagar districts lives in rural areas of villages. The total Jamnagar district population living in rural areas is 1,189,054. In 2011 census 41.81% population of Rajkot district lives in rural areas of village. **Figure 3.2** shows Rural & Urban population of, where project road traverses.



Source: *Primary Census Abstract 2011*

Figure 3.2: Rural & Urban population of Project Districts and State

Gujarat State had 42.60 % people live in urban regions. The total figure of population living in urban areas is 25,745,083. In 2011 district Jamnagar had 44.95% lives in urban regions of Rajkot district 58.19% lives in urban regions of the district in 2011 as per census.

Sex ratio in Gujarat is 919 i.e. for each 1000 male which is below national average of 940 as per census 2011. With regards to sex ratio in Jamnagar, it stood at 939 per 1000 male

compared to 2001 census figure of 941. Sex ratio in Rajkot, it stood at 927 per 1000 male compared to 2001 census figure of 930.

The total population growth in this decade was 19.28 percent while in previous decade it was 22.48 percent. The population of Gujarat forms 4.99 percent of India in 2011. In the previous census of India, Jamnagar district recorded increase of 21.79 percent to its population compared to 1991. In the previous census of India 2001, Rajkot district recorded increase of 26.08 percent to its population compared to 1991.

Literacy rate in Gujarat has been upward trend and is 78.033 percent as per 2011 population census. Of that, male literacy stands at 85.75% while female literacy is at 63.31 percent. The literacy rates for both sexes in urban areas are, as expected, much higher than for those in rural areas.

3.2.2 Vulnerable Population

The vulnerable population of the project districts and state is analyzed and given in this section.

Jamnagar district had 154819 schedule cast populations and Rajkot district schedule cast population is 244364 which is 8.13% & 7.71% respectively. As per 2011 census, Gujarat State had 40,74,447 scheduled caste population, which is 6.74 percent of the total population.

Jamnagar district has 10459 schedule tribe populations which is 0.55% of the total population. District of Rajkot has 13163 of scheduled tribe population which is 0.42% of the total population. The Scheduled Tribe population of Gujarat State had 89,17,174 which is 14.8% of the total population.

3.3 THE SOCIAL SERVICES

In order to strengthen various basic amenities either area based or population based, the Social and Community Programmes are required to be geared up at State level as well as district level so as the life of the people can be improved, Additional efforts in important sectors like health, education, women & child welfare, labour, environment, water supply, and sanitation, social welfare, rural housing, village & cottage industries etc. are required to bring significant improvement in the Human Development of the State. With a view to achieve the above mentioned objectives, various initiatives have been taken by the State Government.

In terms of overall social development, Gujarat has many more miles to cover to ensure that its economic growth translates into improved and sustainable human development. Although there has been significant improvement in terms of health and education infrastructure over the years, the challenge remains to further improve the access to these basic services to by communities in remote and marginalized rural areas.

- In recent years, social infrastructure in areas such as **health and education** has improved significantly. This can, to some extent, be attributed to the increased presence of the private sector in the state. However, it is crucial to ensure that access to services is enhanced for those who need it the most, especially the marginalized tribal communities living in hard-to-reach areas.
- Issues of quality and access to basic services by the poor have emerged as a priority for the State Government. Responding to this, Gujarat's 12th Five Year plan has enhanced allocations for the social sector by 40 per cent. This will not only help address the infrastructural gaps, but will also be instrumental in meeting the critical needs and entitlements of children and women.

3.3.1 Education Infrastructure

The education department of the state pays special attention to the improvement of elementary education in Gujarat. The state government has also launched the district primary education program for making primary education compulsory and free for all students up to a certain age limit. It has also taken up several measures for checking the rate of dropout at schools in Gujarat. The same uniform structure of 10+2 education is followed in the schools of Gujarat. Saurashtra University is a major university. The university is well known for several schools including private, government granted schools. Project influenced.

Rajkot district has Primary Schools 1845, Secondary Schools 426, and Higher Secondary is 40. There are 5 Engineering Colleges in the district, ITIs 17 offering courses and 7 Polytechnic.

Jamnagar has many schools including private, government granted schools. Primary Schools 1316, Secondary Schools 156, and Higher Secondary are 45. The M.P. Shah Medical College is considered to be one of the top colleges in India for Medical studies. The Gujarat Ayurved University in Jamnagar is considered to be the best university in the world for Ayurvedic studies & has students from all around the globe. Besides this, there are several colleges for arts, commerce and science.

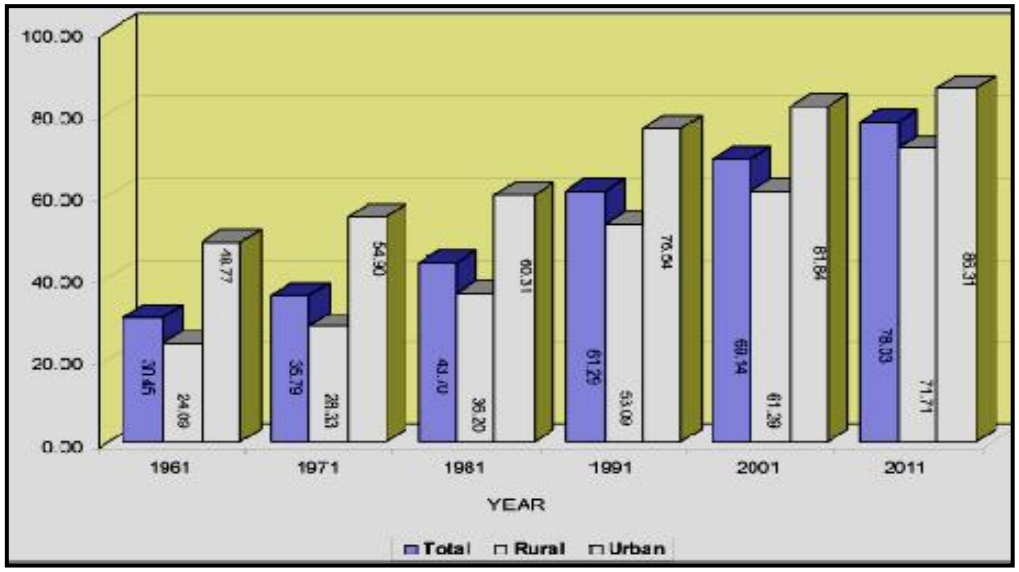
3.3.2 Literacy

Average literacy rate of project influence area in 2011 was 74% compared to 66.48% of 2001. If things are looked out at gender wise, male and female literacy were 82% and 65.5% respectively.

Average literacy rate of Jamnagar in 2011 was 73.65% compared to 66.48% of 2001. If things are looked out at gender wise, male and female literacy were 81.50% and 65.33% respectively.

In Rajkot district literacy rate in 2011 were 80.96% compared to 74.16% of 2001. Gender wise male and female literacy were 87.07% and 74.43%. Literacy in Gujarat State (1961-2011) Shown in **Figure 3.3** below.

The Literacy rate of Gujarat is 78.33 % which is higher than the all India average of 68.84%. The state has 51989 recognized government schools with primary and upper primary grades. The state is having total enrolment of 106`462 at the primary level of which the girls constitute 46.57% of the total enrolment.



***Source**: Statistical Abstract of Gujarat State- 2011*

Figure 3.3: Literacy in Gujarat State (1961-2011)

One, improvements in literacy have been quite impressive especially among girls in the Decade of 1991-2001 and one can surmise optimistically that at long last a corner has been turned. The achievement is both because the demand for education has increased and the supply has also improved in most parts of the state.

3.4 ECONOMIC FEATURES

State Domestic Product (SDP) in Common Parlance know ad " State Income" is a measure in monetary terms of the volume of all goods and services produced during a given period of time within the geographical boundaries of the state, accounted without duplication. This is the most important single economic indicator used to measure the growth and study the structural changes taking place in the economy. SDP estimates over a period of time reveal the extent and direction of the changes in the level of economic development. Sectoral composition of SDP gives an idea about the relative position of different sectors in the economy over a period of time, which not only indicates the real structural changes taking place in the economy, but also facilitates in formulation of the plans for overall economic development.

The Per Capita Net State Domestic Product, also Known as per capita income is used to determine both the absolute and relative performance of the state economy. It is also considered as an important tool to measure the regional disparities.

The state is among the top six major state economics and it contributes about 7.0 percent to the GDP at National level during the year 2009-10, though the states share to India's population is about 4.99 percent. For the Eleventh Five Year plan, a very high growth target of 11.2 percent has been set for Gujarat State by Planning commission Government of India. The State economy has been measured in terms of the Gross State Domestic Product (GSDP) at factor cost at constant prices as well as at Current prices. This is the most important single economic dictator used to measure the growth and to study the structural changes taking place in the economy.

Gross State Domestic Product (GSDP) at factor cost at constant (2004-05) prices in 2009-10 has been estimated at Rs. 331633 crore as against Rs. 300847 crore in 2008-09 registering a growth of 10.2 percent during the year. At current prices, GSDP at factor cost in 2009-10 has been estimated at Rs. 429356 crore as against Rs. 367745 core in 2008-09, registering a growth of 16.8 percent during the year. The higher growth in the economy during the year 2009-10 can be mainly attributed to manufacturing electricity, construction and communication sectors, which have contributed 11 to 34.6 percent growth during 2009-10 at constant (2004-05) prices.

The performance of the State economy in terms of GSDP in absolute values and percentage change over previous year at current and at constant (2004-05) prices are presented below:

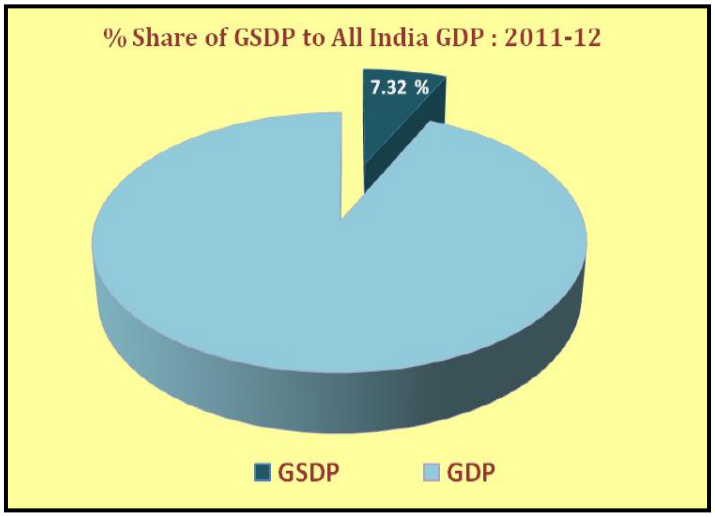
Table 3.2: GSDP at Current and Constant (2004-05)

Year	Gross State Domestic Product			
	Current Prices	**Growth**	**Constant Price**	**Growth**
2004-05	203373	-	203373	-
2005-06	244736	20.3	233776	14.9
2006-07	283693	15.9	253393	8.4
2007-08	329285	16.1	281273	11.0
2008-09	367745	11.7	300847	7.0
2009-10	429356	16.8	331633	10.2
2011-12	611767	15.3	398884	8.5

*(Prices Value in Rs. Crore and Growth in percent) *Provisional, ** Quick Estimates*

***Source**: State Domestic Product, Gujarat State*

Gujarat is very strong in the petroleum sector and is considered the petro capital of India. The state attracted cumulative FDI worth US$ 9.6 billion from April 2000-May 2014 and is the second highest recipient of FDI in India after Maharashtra. At current prices, Gujarat's gross state domestic product (GSDP) was about US$ 123.4 billion over 2012-13. **Figure 3.4** Shows percentage share of GSDP to all India: 2011-12.



***Source**: State Domestic Product, Gujarat State*

Figure 3.4: Percentage Share of GSDP to All India: 2011-12

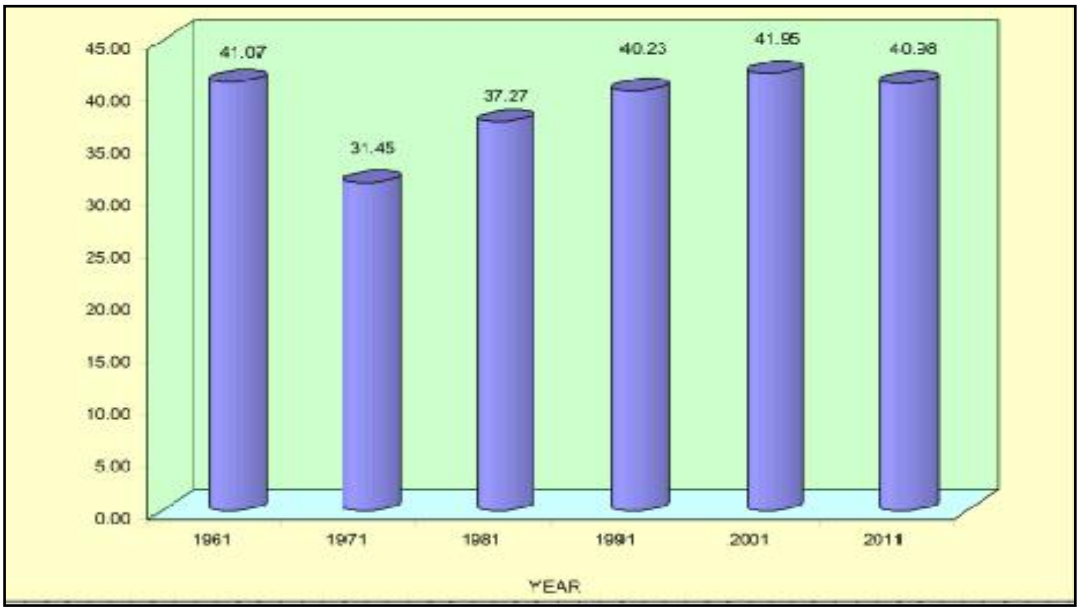
3.4.1 Distribution of Population by Workers and Non-Workers

Work participation rate is 41.0% of the total population in **Gujarat State** and in view of districts **Jamnagar & Rajkot work participation** is 8,47,440 and 14,79,050 respectively. Participation rate in project influence districts Jamnagar & Rajkot district is 33.39% -34.82% the percentage scenario of Non-Workers in State of Gujarat is 59.02% and in districts of Jamnagar & Rajkot are 60.77% and 61.12% respectively. **Table 3.3** and **Figure 3.5** show the Gujarat State Work Participation in 2011.

Table 3.3: Work Participation in Gujarat State in 2011

Section	Work Participation	Gujarat	Jamnagar	Rajkot
Dhoraji-Jamnagar	Work Participation Rate	40.97%	39.02%	38.09%
	Total Worker	40.98%	39.23%	38.88%
	Main Worker	33.70%	33.39%	34.82%
	Marginal Worker	7.28%	5.84%	4.05%
	Non Worker	59.02%	60.77%	61.12%

***Source**: Statistical Abstract of Gujarat State- 2011*



Source: *Statistical Abstract of Gujarat State- 2011*

Figure 3.5: Total Worker population Ratio

3.5 INFRASTRUCTURE

Infrastructure refers to the fundamental facilities and systems serving a country, city, or area, including the services and facilities necessary for its economy to function. It typically characterizes technical structures such as roads, bridges, tunnels, water supply, sewers, electrical grids, telecommunications, and so forth, and can be defined as "the physical components of interrelated systems providing commodities and services essential to enable, sustain, or enhance societal living conditions."

A discussion of infrastructural development has to recognize: (1) The regional specialization of the State's economy and hence of the space that is possible and desirable for the region in question; and also (2) the level of overall economic development as indicated by the per capita income GDP and assess whether infrastructural services like those which are final consumption goods drinking water, municipal infrastructure, road services and such like are adequate. It would also have to outline the actions required for the adequate development of infrastructure.

3.5.1 Infrastructure in Gujarat State

Gujarat also known as Jewel of the West is the fasted growing state of India and it's a country in itself having all the resource within. It is also the role model state for rest of India in terms of Infrastructure Projects, Tourism and Economy. Gujarat state has ancient history of Indus Valley Civilization, world's first seaports Lothal and an archaeological site Dholavira.

Gujarat has a robust Infrastructure and is pioneer in Public-Private partnership. It takes to its credit as 'Asia's Biggest' Investment Infrastructure Opportunity Centre.' Gujarat state have strategically developed very efficient and cost affective infrastructure which boost states Urban and Industrial growth.

Gujarat is well-known for its double digit economic growth, which is much higher than the national growth rate besides providing excellent infrastructure and basic services to its citizen. The State has excellent road connectivity to all villages, large number of small and large ports well distributed along with 1700 km long coast, 24 hours power supply, State-wide water supply grid, excellent educational institutions, healthcare facilities, marketing yards, State-wide fiber optic network connecting all villages, etc. With best infrastructure in the country, coupled with Good Governance, Gujarat has become the hot destination for investors not only in the country but in this part of world. Its relentless quest for a larger image of Gujarat with all round development is foreseen bearing fruits of success. As one of the youngest States of the Indian Federation, Gujarat's track record has shown impressive Development which make it a 'Growth Engine of Gujarat.'

3.5.2 Industrial Development

Gujarat is located on the western coast of the Indian Peninsula. It has the longest coastline in the country of about 1600 kms. Therefore, Gujarat plays host to foreign trade and is a natural '**Gateway**' to the fast growing economy. Conducive business environment, abundance of natural resources, skilled and semi-skilled man power, proximity to markets, responsive administration are a few reasons why Gujarat has turned a 'Leader.' A steady implementation of structural reforms to make Gujarat shine with its 'Vibrant Economy' is steadfastly growing at 15% of Industrial Growth with 18% of Country's Industrial Investment in Gujarat. A large part of the investments that Gujarat realized, especially in organised industries, could not have gone elsewhere. This is true for instance of the public and private sector investment in oil, and petrochemicals and downstream chemical units.

The state of Gujarat is one of the highly industrialized states in India with its reputation of being a highly investor-friendly state. The state has a proven track record of attracting high volumes of investment becoming the most favored investment destination in India. In the backdrop of these developments, the Government of Gujarat has declared Industrial Policy - 2009. And after series of respective studies and meetings new industrial policy will be declared shortly.

The new Industrial Policy - 2009 with its holistic approach would identify specific interventions across sectors which would facilitate in fostering significant growth and in the process to attract global investments. The new industrial policy has been formulated with the primary policy objectives of:

1. Facilitate investments in the state.
2. Employment generation and Employability enhancement.
3. Adherence to high quality standards.

During the period before 1991 attracting investment in Gujarat, especially manufacturing investment was largely dependent upon the ability to offer low cost land, supporting physical infrastructure, a benign or nurturing environment in terms of industrial promotion, a politics that allowed labour flexibility to the extent possible under national law and an administrative machinery that was geared to remove many of the hurdles that industries faced in attracting investment elsewhere in the country.

3.5.3 Human Development

Poverty levels while much lower than in the rest of India should have been even lower given the high per capita SDP of the state. The state's performance on many of the human development indicators but especially morbidity, life expectancy, gender, and most importantly literacy has been poorer than that of many states, and adjusted for its higher income, it would be much worse than is indicated by absolute values. Inequality in income distribution is likely to be much higher than in other states.

The nature of physical infrastructure development has an indirect influence on human development. Rural roads that increase access to urban functions and services for rural people, and electricity distribution both of which, are important determinants of the quality of life in rural areas.

3.5.4 Rural and Urban Development

Gujarat has a host of Government Agencies looking after the development of Infrastructure facilities like roads, ports, power, Industrial parks, etc. As a front runner in economic development, the State has set an example worth emulation and has embarked upon Infrastructure development with '**World Class Infrastructure**' charting the roadmap to a future as "**Gujarat – The World Class Growth Engine**."

Infrastructure development in a state is importantly determined by the policies, capacities and actions of the state government more than is overall economic development. The relative autonomy for the state and the lower levels of government is much larger in because the constitutional division of responsibilities between state and the centre specifies many of the infrastructure areas to be with the state government. Even more importantly the economics of infrastructure-especially the locational aspects and localization influences are strong. Typically the products and services of infrastructure, unlike other sectors are consumed locally. Thus irrigation water, town and city services, electricity, roads (except national

highways), industrial services and estates, are in the states portfolio. Oil and gas, railways and ports (where both states and the centre have roles), and telecom are with the centre.

The social infrastructure areas are even more with the state government, the impact of investments is crucially dependent upon the level of economic development besides the local culture and preferences. The impact of investments in education in the south has been somewhat higher than in states like Gujarat and Rajasthan, but the cultural aspect should not be exaggerated.

3.5.5 Villages and their Connectivity by Road

Perhaps the most crucial infrastructure is connectivity of habitats by road and it is here that state governments can make a big difference. While there are few villages in India that are not connected byroads, their quality varies considerably. The Prime Minister's Gram Sadak Yojana (PMGSY) given the large outlays and some organizational innovation such as, transparency and performance monitoring, has been significantly better than the run of the mill programmes supported by the centre Gujarat in comparison to its peers has done well in improving rural connectivity. Gujarat has a low population density except in the southern parts of the state, and that too, only the Golden Corridor. In Saurashtra and North Gujarat despite the lower density which reduces the social returns on roads, the connectivity is excellent and most villagers can easily reach urban places to access services like emergency healthcare.

3.5.6 Tourism

With the announcement of a National Tourism Policy in 2002 and the revival of the economy, tourism again picked up in the country and India has emerged as one of the five most important destinations in the world according to Lonely Planet. Large resources totaling over Rs 2,900 crore were allocated under the 10th Plan for the tourism sector. The hotel industry was given the status of infrastructure.

The emphasis of the central government would be to open up the eco-tourism business-trekking and wild life, besides continuation of heritage and monuments related tourism.

3.5.7 Education

'Smart Goals' with a future vision 'Education for All' is a major Project of the Education Department with its Continuous Education and Literacy Policies geared to promote Literacy, reduce dropout rates, Focus on Girl Education, Teachers Training and a series of other Initiatives being implemented.

Girl Education, Infrastructure, Health and Sanitation are the many areas in the process of continuous Education, Literacy, and Education awareness and on path to enhancement in

quality implementation. The Government vision is for SEE (Socio-Economic-Education) growth with primary education, secondary education, higher education, continuous education, literacy education, technical education, pharmacy education etc.

3.5.8 Transportation

Gujarat's towns and cities are well connected to each other and to the rest of India-by road and rail. Coastal shipping routes link the state's many ports. Kandla is a major international shipping terminal. There is air service both within the state and to major Indian cities outside Gujarat.

3.5.9 Health

Gujarat State has an expensive network of health and medical service institutions. To meet primary health care needs, it has 911 Primary centers, 7284 Sub Centers and 161 Community Health Centers to meet emergency referred needs.

Department of Health & Family Welfare, Government of Gujarat has created wide network of health and medical care facilities in the state to provides primary, secondary and tertiary health care at the door step of every citizen of Gujarat with prime focus on BPL families, marginalized population and weaker sections in rural and urban slum areas. Department also takes appropriate actions to create adequate educational facilities for medical and paramedical manpower in the state of Gujarat. Government of Gujarat is committed to provide medical facilities at the most level, keeping pace with rapid technological developments in the field of Healthcare.

3.5.10 Drinking Water

Gujarat is a water stressed state, with its per capita availability of fresh water at 1137 m^3 (less than 1700 m^3 per year). Several region of the state even suffer from chronic water shortages. This shortage is reflected in the shortage of potable water in many parts of the state, particularly in North Gujarat, Saurashtra and Kachachh.

The main source of water for Gujarat is surface water. The State has 185 river basins and the available quota of water in the State is 55608 million cubic meters, out of which, 38100 million cubic meters is surface water, which is only 2% of the entire quota of surface water of the country. Moreover, the available quota of surface water is also not distributed properly. Gujarat, Saurashtra and Kutch have water resources of 89%, 9% and 2% respectively, against this; the total geographical area of these regions is 45%, 31% and 24% respectively. The underground water resources of State are 17508 million cubic meters.

The quota of available surface and underground water is used for drinking purpose, industries, agriculture and hydral power, fisheries etc. Out of which, nearly 80% quota is used for agricultural production, in which irrigation also plays an important role.

3.5.11 Infrastructure in Rajkot District

3.5.11.1 Economy and Industry

Rajkot has a strong manufacturing economic base, with a market that extends not only beyond the state of Gujarat, but even the national boundaries. In its early history Rajkot was organized around the establishment of cloth mills. More recently, the emphasis has shifted to small and medium industries dominated by foundries, manufacture of oil engine, machine tools, engineering and automobile works, castor oil processing, gold and silver jewelers, handicrafts, readymade ladies garment, spices, medicines and wall clocks. Manufacturing activities are concentrated in two main industrial estates namely, Aji industrial estate and Bhaktinagar industrial estate; in addition, many small units are scattered through the city.

The occupational pattern in Rajkot is primarily based on manufacturing and service sector. About 42% of workers are engaged in service activities and 34% in manufacturing activities.

3.5.11.2 Transport

Transportation is the backbone to the development of urban areas. It enables functioning of urban areas efficiently by providing access and mobility. Passenger transport has an overriding influence on the functioning of the city. Traffic, Transportation service and Road network are key indicators to provide the image of city. The city has a dense road network. Because of the concentration of various commercial and industrial activities in Rajkot and surrounding towns, the city road network leading to the surrounding towns is heavily congested. The regional network includes NH-8B, State Highways (SH-26, SH-27 & SH-42) and District Roads. The influence area, in terms of travel demand, covers the revenue districts of Rajkot. There is heavy inflow of traffic from the region into the city and vice-versa. The Jamnagar, Gondal and Viramgaon railway lines pass through middle of Rajkot City.

The city is connected with other parts of the country by Rail, Road and Air. There are two railway stations, one at Junction Plot area and another at Bhaktinager. There are broad gauge railway line of Western Railway between Viramgam-Okha-Porbandar and meter gauge railway line between Jetalsar-Veraval-Bhavanagar. It is also well connected by broad gauge railway line with Delhi and Bombay the important two Metropolitan cities of India. There is an airport in Rajkot and the major domestic airlines run flights between Rajkot and Mumbai. Indian Airlines has four flights a week to Mumbai while Jet and Sahara have daily flights.

3.5.11.3 Education

Saurshtra University is a major university. The university is well known for several schools including private, government granted schools. Primary Schools 1845, Secondary Schools 426, and Higher Secondary are 40. There are 5 Engineering colleges in the district, ITIs 17 offering courses and 7 Polytechnic

3.5.11.4 Health

Rajkot has 50 primary healthcare centers, 13 Community healthcare centers, 3 Civil Hospitals and 12 Government Hospitals.

3.5.11.5 Tourism

The main tourist attractions in Rajkot are the Mahatma Gandhi House or Karba Gandhi No Delo, Watson museum, Aji Dam, Jagat Mandir, Rajkumar College, Lang Library, Lal Pari Lake and Randerda. The Karba Gandhi No Delo is the house of the Mahatma Gandhi where he lived from the age of six. The Mahatma Gandhi House has a good collection of things related to the Mahatma Gandhi's life. The Mahatma's Passion for the handloom is preserved in the form of a small weaving school. Lal Pari Lake and Randerda is a picturesque picnic spot, situated about 5 km from Rajkot. Aji Dam is situated about 8 km from Rajkot and supplies the town's water. Rashtriya Shala was founded by Mahatma Gandhi which has a center of patola weaving. The Lang Library has a collection of thousands of documents and books covering every period in Rajkot and Saurashtra (region) history.

3.5.12 Infrastructure in Jamnagar District

3.5.12.1 Economy and Industry

Jamnagar city has a burgeoning economy and its economic development may be attributed to the many prosperous business, trades and Industries that have their base in the city and really functioning as a major economic backbone for the city. Providing employment to a really large number of people settled there.

Jamnagar is known as 'World's Oil City' because the world's biggest oil refinery, belonging to Reliance Industries, and a smaller one belonging to Essar Oil are located in Jamnagar. It was formerly known as 'Brass City', since it houses more than 5,000 large-scale and 10,000 small-scale workshops manufacturing brass items in and around the industrial estates of Shankar Tekari, Udhyognagar, M P Shah Udhyognagar and Dared.

Jamnagar has base stations of all three wings of Defence: the Indian Air Force, Indian Army, and Indian Navy. Geographically Jamnagar supports all branches of defiance, as it has access to the sea for the Indian Navy and a large air base due to the city's strategic location close to Pakistan. The city has an all-weather intermediate seaport

3.5.12.2 Transport

The district is well connected with the State capital and surrounding district headquarters through road and rail linkages. The road network consists of National Highways, State Highways and Major District Roads. The rail network consists of both broad gauge as well as single track lines. The district headquarter has connectivity through airways for transport and

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

PROJECT BACKGROUND

The work for Consultancy Services for Preparation of Feasibility cum Detailed Design Report of Kalavad-Jamnagar Section of NH-927D has been awarded to M/s Consulting Engineers Group Ltd., Jaipur vide IAHE/Admin/07/Project-MORT&H/2014-15/18 dated 14.05.2015. Accordingly consultant has commenced the services on 29.05.2015 vide CEG/D-121/2015/79 dated 22.05.2015. After detail reconnaissance survey and preliminary option study Draft Inception Report has been submitted by consultant on 19.06.2015 vide CEG/D-121/2015/128. The comments on Draft Inception Report has been issued on 20.07.2015 vide IAHE/DPR/Tech/NH-IAHE/18/2015-16. Accordingly the DPR consultant incorporated the observations received from IAHE on Draft Inception Report and submitted the Final Inception Report on 29.07.2015. After completion of survey and Investigation work Draft Feasibility Report was submitted on 8th October 2015 vide CEG/D-121/2015/308. The review meeting for approval of alignment and project proposal was conducted at various levels with PWD and IAHE. Meanwhile MORTH issued a circular for capacity augmentation dated 26.05.2016 that when traffic triggers 10000 PCU the road section should be taken up for four lane upgradation. Accordingly IAHE asked the prepare packages eligible for four laning and two lane configuration. The consultant accordingly submitted for eligible stretches for four laning that stretch from Km. 50+925 to Km. 3+665 shall be eligible for four lane as traffic in this section is 10537 PCU. Alignment site visit also conducted with RO-MoRTH and PWD officials and accordingly comments on Draft Feasibility Report issued by RO-MoRTH was issued by IAHE vide IAHE/DPR/Tech/NH-IAHE/2015-16 dated 6.09.2015 and asked to submit Final Feasibility Report with instruction to PWD for giving their comments on Draft Feasibility Report. This report contains Final Feasibility Report based on comments received from MoRTH/IAHE/PWD.

PROJECT DESCRIPTION

- National Highway No. 927D (NH 927D) lies in western India. Earlier it was SH-26 and recently converted into NH-927D. The SH-26 notified into NH-927D vide S.O. No. 1522(E). The project road starts from km 50+925 of SH-26 (old)

at the Junction of NH-27 and SH-26. The project end point is at km 3+665 junction of SH-26 (old) and SH-25. The existing length as per km stone difference is 47+270 km. The existing project highway is mainly having two lane configurations, intermediate lane configuration. However, the highway sections passing through Kalavad, Haripar and Vijarkhi towns are having four lane configurations with

SOCIO-ECONOMIC PROFILE OF THE PROJECT INFLUENCE AREA

The project influence areas of the proposed project lies in Jamnagar district, in the state of Gujarat. The project stretch starts from Kalavad of SH-23 Junction and ends at Jamnagar of SH-25 Junction. The project stretch having 47.652 km length in Jamnagar district. It is expected that about 2,160,119 persons are likely to be benefited in Jamnagar from the project area. The project area is having 152 people per sq.km, sex ratio 939, literacy rate 73.65%, 8.73% schedule caste population and 0.55% of schedule tribe population.

TRAFFIC STUDIES AND ANALYSIS

To capture traffic flow characteristics and travel pattern of users passing through the project road and other characteristics related to miscellaneous requirements as per the TOR Traffic survey has been conducted in Month of July 2015. The CVC, OD Survey & Axle Load has been conducted at Km 10+000 & TMC has been conducted at four locations.

Classified Traffic Volume Counts

The Annual Average Daily Traffic (AADT) in terms of Vehicles and PCU for both directions traffic is shown in **Table ES.1** given below:

Table ES.1: Annual Average Daily Traffic (AADT)

Categories	Km 10+000 AADT (Both Direction)	
	Vehicles	**PCU**
2 Wheeler	4,098	2,049
3 Wheeler	617	617
Passenger Car	1,720	1,720
Mini LCV	381	381

Categories	Km 10+000 AADT (Both Direction)	
	Vehicles	**PCU**
Mini Bus	44	66
Standard Bus	227	681
LCV - 4 Tyre	67	101
LCV - 6 Tyre	178	267
2-Axle	379	1,137
3-Axle	435	1,305
MAV (4 to 6)	299	1,346
OSV (7++ Axle)	10	46
HCM/EME	14	63
Tractors-With Trailer	129	581
Tractors-Without Trailer	23	35
Bi-Cycle	46	24
Cycle-Rickshaw	1	2
Animal-Drawn	14	84
Hand-Drawn	1	3
Exempted Vehicle	29	29
Total Commercial Traffic	**1,653**	**5,012**
Total Tollable Traffic	**3,754**	**7,113**
Total Traffic	**8,712**	**10,537**

It is observed that the total traffic at km 10+000 is considerably high due to the proximity of Dhoraji and connectivity to NH-27, leading to Porbandar & Rajkot. From the survey data it is understood that at this location 70% to 80% traffic composes of 2 Wheelers, 3 Wheelers & Cars, while 10% to 20% is commercial traffic.

Turning Movement Survey

The turning movement survey was conducted at four major intersections on the project

highway to obtain information on directional movement of traffic at intersections along the highway. The 24 hour count data for each location has been analyzed for the total & peak hour traffic volume and cross road traffic.

Table ES.2: Cross Road Traffic at all the Major Intersections (in PCU)

S. No.	Location	Type of Junction	Cross Road	Cross Road Traffic (in PCU's)		
				Slow	Fast	Total
1	Km 4+700	4 Arm Junction SH-25	Along Jamnagar	69	11638	11707
			Along Rajkot Road	92	18399	18491
			Along Dwarka Road	30	23275	23305
2	Km 11+300	3 Arm Junction	Along Aliyapada Road	45	1469	1514
3	Km 45+900	3 Arm Junction SH-94	Along Falla Road	112	2906	3018
4	Km 46+500	3 Arm Junction SH-23	Along Rajkot Road	269	9261	9530

Axle Load Survey

The primary objective of axle load survey is to determine the Vehicle Damaging Factor (VDF) of commercial vehicles and over loading. The survey was conducted at km 10+000 for 2 days (12 hrs each) on random sampling basis to cover directional traffic for both empty and loaded commercial vehicles using portable weighing pads. The summarized VDF values are presented in **Table ES.3** given below:

Table ES.5: Traffic Forecast as per Most Likely Growth Rate

S. No.	Year	Total AADT (PCU)
		Km 10+000
1	2015	10,537
2	2016	11,212
3	2017	11,932

S. No.	Year	Total AADT (PCU)
		Km 10+000
4	2018	12,699
5	2019	13,525
6	2020	14,405
7	2021	15,342
8	2022	16,285
9	2023	17,285
10	2024	18,349
11	2025	19,341
12	2026	20,388
13	2027	21,493
14	2028	22,659
15	2029	23,886
16	2030	25,116
17	2031	26,410
18	2032	27,771
19	2033	29,203
20	2034	30,710
21	2035	32,247
22	2036	33,859
23	2037	35,551
24	2038	37,327
25	2039	39,195
26	2040	41,156
27	2041	43,213
28	2042	45,373
29	2043	47,643
30	2044	50,026
31	2045	52,527

ENGINEERING SURVEYS AND INVESTIGATIONS

The consultants have carried out engineering surveys and investigations that include Topographic Surveys, Road Inventory and Pavement Condition Surveys, Alignment Studies, Pavement Surface Roughness Survey, Environmental Screening and Assessment, Social

Screening Assessment, Pavement Composition Investigations, Preliminary Material Investigations for Construction Materials, Inventory and Condition Surveys for Bridges, Culverts and other Structures.

Land Use and Terrain

Land use pattern along the project corridor is mainly agricultural land and built-up. Barren land and forest area are in very few stretches along the project road.

Carriageway Width

The existing carriageway width, in 92 % of the Highway is of Intermediate lane i.e. 6.10 m and remaining 8% of the highway is of 4-lane carriageway with divider. The stretch wise carriageway width is given in **Table ES.6 below:**

Table ES.6: Existing Road Carriage Width

S. No.	Existing Location		Length (Km)	Carriageway width (m)
	From (Km)	To (Km)		
1	3+665	45+200	41.545	6.10
2	45+200	48+800	3.600	14.00
3	48+800	50+925	2.125	6.10

Existing Junctions

The project corridor involves 4 nos. of existing major junctions & 17 no. minor junctions. The major junctions involve 2 no. with NH & 2 no. with SH.

Table ES.7: Existing Major Junctions

S. No.	Existing Km	Type of Intersection	Cross Road Type	Cross Road Leading to		Remarks
				LHS	RHS	
1	46+500	3-Legged	Existing NH-927D		Rajkot	In Kalavad Village with 4-lane section
2	45+760	3-Legged	SH-94		Phalla	
3	11+210	3-Legged	SH		Aliyapada	
4	4+630	4-Legged	NH-947	Dwarka	Morbi	End Point of Project Road

Table ES.8: Existing Minor Junctions

S. No.	Existing Km	Side	Type of Junction	Type of Surface	Width of Cross Road (m)	Cross Road Leading To
1	47+500	RHS	T	BT	5.4	Mota Bhadukiya
2	47+300	Both	X	CC	4	Pipaliya (LHS) Sardarbag (RHS)
3	45+515	LHS	Y	BT	3.5	Wavadi
4	44+615	LHS	T	BT	3.7	Wavadi
5	38+710	RHS	Y	CC	3.1	Ranuja
6	31+030	RHS	T	BT	6.3	Varudi Temple
7	28+600	LHS	Y	BT	5.6	Khankotda
8	22+235	RHS	Y	BT	4.2	Nani Matli
9	19+850	RHS	T	BT	3.6	Pasaya
10	18+000	RHS	T	BT	4	Beraja
11	17+465	RHS	Y	BT	3.8	Aliya
12	12+200	LHS	Y	BT	3	Miyathara
13	11+980	RHS	T	CC	3.3	Vijrakhi
14	10+345	Both	X	BT	5.3	Suwarada (LHS) (RHS)
15	8+700	RHS	T	CC	5.8	I.O.C. Ltd
16	6+245	Both	X	CC & BT	3.9	Theba (LHS) (RHS)
17	4+630	Both	X	BT	20.5	Khambhaliya (LHS) Dhrol (RHS)

Existing Pavement Condition

The existing pavement type is flexible having earthen shoulders. Pavement condition is generally good in the project stretch. As per pavement condition survey, 37.20 km length is having good pavement 0.4 km is fair & 9.660 km is poor.

Existing Pavement Strength

Benkelman Beam deflection tests of identified stretch 14 km length of the project road were conducted to evaluate the structural strength of the existing pavement. The tests were carried out in accordance with the guidelines of IRC:81-1997. The characteristic deflection values obtained for the stretches identified are varies between 0.9mm to 2.69mm.

Pavement Composition

The pavement composition details of the existing pavement were obtained from the examination of test pits excavated at regular intervals along the project road. The details are given in the report on **Material Investigations.** The existing pavement crust thickness varies between 200mm to 685 mm.

Characteristics of the Existing Subgrade /Borrow Soil

Detailed investigations of the existing subgrade soil & borrow area material were carried out to determine strength and other engineering properties. The results of these investigations are given in **Volume-II, Part-II of Draft Feasibility Report.** The results depict that, subgrade soil classification comes under group CL & CI (50%), ML & MI (40%) and Other SM & SP (10%). CBR at field density varies between 2% to 13% and CBR at MDD varies between 4% to 23%.

During the field investigations, 13 borrow areas were identified and evaluated in the laboratory. Out of these, the details of borrow areas with CBR ranging from 14% to 18%.

Existing Cross Drainage Structure

Table ES.9: Existing Major Bridges

S. No.	Location (Km)	River	Span (m)	Super Structure	Sub Structure	Width (m)	Remarks
1	46+270 (47/2)	Dhola Wadi	9 x 7.0	RCC Solid Slab Type	Stone Masonry	8.2	Newly constructed bridge with inadequate vertical clearance (in terms of HFL)
2	35+625 (36/2)	Moti Phuljar	12 x 6.8	RCC Solid Slab Type	Stone Masonry	6.7	Submersible bridge in poor condition

1. Minor Bridges

There are 16 existing Minor Bridges on the project stretch. The types of superstructure for the Minor Bridges were found to be RCC Solid Slab resting on Stone Masonry Sub-Structure. Some common distresses observed were exposed and corroded reinforcement in slabs; spalling of concrete, damaged/missing railing, growth of vegetation on pier caps &/in vent ways, damaged wearing coat, damaged expansion joints & settlement of embankment around abutments etc. Many bridges were found to be submersible in nature and having Guard Stones instead of Railing & Crash Barrier.

Table ES.10: Existing Minor Bridges

S. No.	Structure No.	Location (Km)	Type of Structure	Span Arrangement (m)	Type of Bridge	Condition
1	46/1	45+730	Minor bridge	1 x 9.10 (Sk)	High Level	Fair
2	45/4	44+990	Minor bridge	2 x 3.00 (Clear)	High Level	Poor
3	45/2	44+570	Minor bridge	2 x 3.00 (Clear)	High Level	Poor
4	41/1	40+365	Minor bridge	2 x 3.00 (Clear)	High Level	Poor
5	40/3	39+990	Minor bridge	2 x 3.00 (Clear) (Sk)	High Level	Poor
6	40/2	39+520	Minor bridge	4 x 1.50 (Clear)	High Level	Poor
7	39/1	38+580	Minor bridge	5 x 6.50	Submersible	Poor
8	38/2	37+955	Minor bridge	2 x 3.00	High Level	Poor
9	37/2	36+880	Minor bridge	5 x 7.00	Submersible*	Fair
10	29/3	28+800	Minor bridge	3 x 6.80	Submersible	Fair
11	29/2	28+600	Minor bridge	5 x 6.80	Submersible	Poor
12	22/2	21+730	Minor bridge	4 x 6.00	Submersible*	Fair
13	21/1	20+275	Minor bridge	2 x 6.00 (Sk)	Submersible	Poor
14	18/3	17+835	Minor bridge	7 x 6.00	Submersible	Poor
15	10/1	9+050	Minor bridge	2 x 5.40	Submersible*	Fair
16	07/2	6+480	Minor bridge	6 x 3.70	Submersible*	Fair

Never been overtopped but vertical clearance found to be inadequate (freeboard above HFL)

2. Existing Culverts/ Causeways

The existing culverts observed along the project road are mainly of three types viz. RCC Slab culverts, Pipe culverts and Causeway. The structural condition of pipe culverts is generally fair, except few partially choked or buried culverts due to heavy vegetation. Most of the slab culverts are in poor condition.

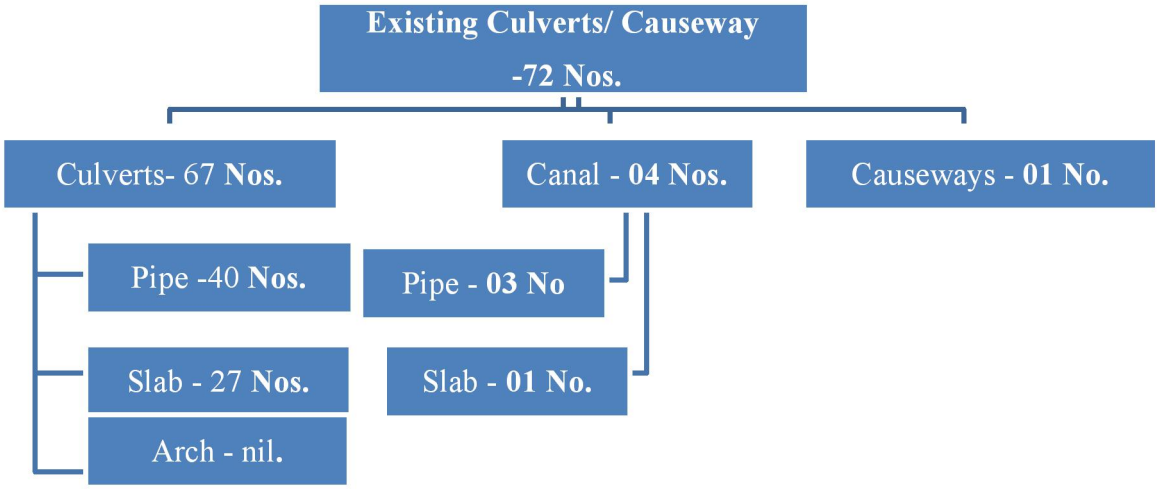


Figure ES.1: Existing Culverts along the Project Road

PROPOSED IMPROVEMENTS

Standards mentioned in the Manual of Specifications and standards for four laning of Highways with paved shoulder IRC:SP-84-2014 have been followed except at the locations where some deviation considering minimum land acquisition and R&R issue. The existing highway proposed to be upgraded to four lane with paved shoulder configuration. The four lane section is proposed to be kept as four lane configurations with 1.5m median with NJB however with improved geometrics. There are 66 nos. of Deficient geometry stretches wrt. Horizontal and Vertical geometry. The vertical geometry is also affected due to reconstruction of Bridges and other Cross Drainage works to High-level which are presently submersible. The details of Project proposal for Highway as well as Structures is summarized below with Provision of Project facilities as per specifications.

The major deficiency, as shown in **Table ES.11** below, along the existing project highway is mainly (i) reverse curve with insufficient curve length, (ii) curve radius less than Absolute minimum required i.e. 230m, (iii) curve radius less than Desirable minimum required i.e. 360m, (iv) Broken Back Curves i.e. the curve which are not satisfying the clause 9.1.7 IRC: 73:1980 and (v) length of curve is not sufficient as per existing deflection angle which is not

satisfying the clause 9.1.5 IRC: 73:1980.

The four locations Kalavad, Vijarkhi, Khandera, Haripar where option study for alignment alternatives have been explored by providing Bypasses and realignments and detail comparative study for the alternatives have been given in chapter no 7 of Improvement Proposal. The best feasible option has been recommended based on Traffic demand and Techno economical ground. In all above four locations Kalavad is major Taluka town where already four lane roads exist with some Geometric deficiency. It is recommended for Local geometric improvement instead of providing bypass. Bypass alternatives has also been explored but due to substantial Land acquisition and low traffic demand, availability of existing.

The project is generally designed for speed of 100 kmph. The geometry deficiency has been observed at many locations along the project highway. There are total 66 curve deficiencies has been observed, which is summarized below

Table ES.11: Deficient Curves

S. No.	Number of Locations	Deficiencies
1	3	Reverse curve with insufficient curve length
2	13	Radius less than Absolute minimum required
3	5	Radius less than Desirable minimum required
4	37	Broken Back Curves with sharp reverse curve
5	8	Length of curve and transition is not sufficient as per existing deflection angle

ES.1.1 Widening Scheme and Typical Cross Section

As far as possible the existing center line has been followed for the horizontal alignment design except the proposed realignments and curve improvement locations. Main TCS's proposed are presented below **(Figure ES.2 to ES.17)** for four lane cross section. Summary of widening scheme is as below.

Table ES.12: Details of Widening Scheme

S. No.	TCS Type	Details	Length (m)
1	TCS 1	4 Lane Divided Highway without Service Road with Raised Median for New Construction	12514.00

S. No.	TCS Type	Details	Length (m)
2	TCS 1A	4 Lane Divided Highway without Service Road with Raised Median for concentric Widening (Overlay)	1175.00
3	TCS 1B	4 Lane Divided Highway without Service Road with Raised Median for Right side Eccentric Widening (Overlay & PCC)	15238.00
4	TCS 1C	4 Lane Divided Highway without Service Road with Raised Median for Left side Eccentric Widening (Overlay & PCC)	6264.50
5	TCS 1D	Reconstruction/Raising Section for 4 Lane Divided Highway without Service Road with Raised Median for Concentric Widening	190.00
6	TCS 1E	Reconstruction/Raising Section for 4 Lane Divided Highway without Service Road with Raised Median for Right Side Widening	2757.00
7	TCS 1F	Reconstruction/Raising Section for 4 Lane Divided Highway without Service Road with Raised Median for Left side Widening	626.00
8	TCS 2	4 Lane Divided Highway with Service Road with Raised Median for Concentric Widening	1597.00
9	TCS 3	Span Portion of Flyover with Both Side Service Roads with 4.0m Median	60.00
10	TCS 3A	Approach Portion of Flyover with Both Side Slip Roads with 4.0m Median	1221.00
11	TCS 4	Span Portion of LVUP/VUP with Both Side Service Road Roads with 5.0m Median	318.50
12	TCS 4A	Approach Portion of LVUP/VUP with Both Side Slip Road with 5.0m Median	3132.50
13	TCS-6	4 Lane Divided Highway for New Construction in Hilly Section (Both Side Cutting)	2198.50
14	Toll Plaza	Toll Plaza Length	50.00
15	Toll Plaza Tapering	Tapering on either sides of the toll plaza	310.00

S. No.	TCS Type	Details	Length (m)
Total			**47652**

Figure ES.3: TCS-1A for 4 Lane Divided Highway without Service Road with Raised Median for Concentric Widening (Overlay)

Pavement Design

Three pavement design alternatives have been explored as Flexible pavement with Granular base and subbase, flexible pavement with CTGSB & Rigid pavement. The life cycle cost analysis for all three alternatives has been worked out and per km. Life cycle cost for all three alternatives are Rs.10.38 cr./km, Rs.10.71 cr./km, Rs.11.38 cr./km for Flexible pavement with CTSB, Rigid Pavement respectively. Due to lower life cycle cost, Flexible pavement is recommended. Adopted design traffic loading for project corridor is 42 MSA for LHS direction and 31 MSA for RHS direction.

Table ES.13: Pavement Design Alternatives

S. No.	Pavement Design Alternative	Composition								Design Life
		BC (mm)	DBM (mm)	RAP (mm)	WMM (mm)	GSB (mm)	CTGSB (mm)	DLC (mm)	PQC (mm)	
1	Flexible (VG 40)									
i	New Pavement LHS	50	85		250	200	-	-	-	15 yr.
	New Pavement RHS	50	75		250	200	-	-	-	15 yr.
ii	Overlay design LHS	50	50 to 90		-	-	-	-	-	15 yr.
	Overlay design RHS	50	0 to 85		-	-	-	-	-	15 yr.
2	Flexible with CTGSB	40		80		-	250	-	-	15 yr.
3	Rigid Pavement	-	-		-	150	-	150	280	30 yr.

Project highway involves 1 km stretch, from km 38+000 to km 39+000, proposed for reconstruction due to cracks on surface, low strength and poor quality of subgrade.

At Flyover/ VUP locations, slip road pavement design is proposed be done on 10 MSA with 8%, CBR using treated RAP material consists 40mm BC, 80mm treated RAP, 250mm Cement Treated Sub-Base.

Inter Sections and Grade Separators

Project highway improvement also involves 5 major junction developments, 13 minor junction development and 4 grade separated Structures.

Table ES.14: List of Proposed Major Junctions

S. No.	Existing Km	Design Chainage	Type of Inter-section	Cross Road Type	Cross Road Leading to		Remarks
					LHS	RHS	
1	Bypass	0.000	3-Legged	Existing NH-927D	Kalavad		Start of Kalavad Bypass
2	Bypass	9.190	3-Legged	Existing NH-927D	Kalavad		End of Kalavad Bypass
3	36+345	16.000	3-Legged	Existing NH-927D	Khandhera		At the Start and End of Khandhera Realignment
4	34+500	17.300	3-Legged	Existing NH-927D	Khandhera		
5	11+210	40.125	3-Legged	SH		Aliyapada	-

Table ES.15: List of Proposed Minor Junctions

S. No.	Existing Km	Design Chainage	Side	Type of Junction	Type of Surface	Width of Cross Road (m)	Cross Road Leading To
1	38+710	13.597	RHS	Y	CC	3.100	Ranuja
2	31+030	16.782	RHS	T	BT	6.300	Varudi Temple
3	28+600	23.062	LHS	Y	BT	5.600	Khankotda
4	22+235	29.456	RHS	Y	BT	4.200	Nani Matli
5	19+850	31.757	RHS	T	BT	3.600	Pasaya
6	18+000	33.608	RHS	T	BT	4.000	Beraja
7	17+465	34.165	RHS	Y	BT	3.800	Aliya
8	12+200	39.132	LHS	Y	BT	3.000	Miyathara

S. No.	Existing Km	Design Chainage	Side	Type of Junction	Type of Surface	Width of Cross Road (m)	Cross Road Leading To
9	11+980	39.385	RHS	T	CC	3.300	Vijrakhi
10	10+345	40.963	BOTH	X	BT	5.300	Suwarada (LHS) (RHS)
11	8+700	43.213	RHS	T	CC	5.800	I.O.C. Ltd.
12	6+245	45.067	BOTH	X	CC & BT	3.900	Theba (LHS) (RHS)
13	4+630	46.690	BOTH	X	BT	20.500	Khambhaliya (LHS) Dhrol (RHS)

Table ES.16: Grade Separated intersection without ramps

S. No.	Existing Km	Design Chainage	Salient Features	Minimum length of viaduct to be provided	Road to be carried over/under the structures
1	Bypass	1.230	LVUP	1x10.5x3.5 clear	Mota bhadukiya road
2	Bypass	4.607	VUP	1x12x5.5 clear	SH-23
3	Bypass	8.245	VUP	1x12x5.5 clear	SH-94
4	4+700	46.690	Flyover	(1x15m+1x30m+1x15m)x5.5 clear	SH-25

ES.1.1.1 Bridge and Culverts

The proposed cross drainage structures for project highway are 5 no. Major Bridge, 14 no. Minor Bridge, 2 no. Minor Bridges on Service road, 73 no. Culverts along the alignment of the road. Minor Bridges on main carriageway have been proposed for Reconstruction (10 Nos)/ New Construction (04 Nos). Total 73 nos. culverts including additional culverts that have been proposed in the project stretch. The improvement proposals for existing culverts are proposed for 4 lane configurations.

Figure ES.18: Summary of Proposed Bridges

PROJECT FACILITIES

To enhance the project facilities, 26 Bus Stops, 1 Truck Lay Byes and 1 Toll Plaza at km. 9+612 has been proposed.

The existing and proposed Salient Features of the Project Highway are listed in table below:

Table ES.17: Existing and Proposed Salient Features

S. No.	Descriptions	Existing Features	Proposed Features	Remarks
1	ROW	From Km 50+925 to 3+665 = 24.0m	Minimum 60m PROW (47.652 Km)	Approx. 60 Ha. Land acquisition will be required

S. No.	Descriptions	Existing Features	Proposed Features	Remarks
2	Carriageway Width (m)	Project Road Configuration is Intermediate lane (6.10 m) to 2-lane except 2.2 km length of 4-lane configuration is 3.500 km length in Kalavad	In Rural – 4-Lane with Paved Shoulder (46.260 Km) In Urban – 4-lanes with footpath cum drain (1.391Km)	4-lane configuration has been proposed.
3	Bridges	Major Bridges – 2 Nos Minor Bridges – 16 Nos	Major Bridges – 05 Nos. Minor Bridges – 16 Nos.	Major Bridges: a) New (03 Nos) b) Existing Minor bridges reconstructed (02 nos) Minor Bridges: a) New (04 nos) b) Reconstruction (10 nos) c) New on Service road (02 nos)
4	Culverts	72 Nos	73 Nos	Reconstruction (26 Nos) New (16 nos) Widening (31 nos)
5	Major Junctions	4 Nos	5 Nos	Major Junctions increased due to Bypass.
6	Bypass	Nil	Kalavad- 9430m Length	Total Bypass length is 9.430 km
7	Realignments	Nil	1. Haripar-1093m Length 2. Khandera -1373m Length 3. Vijarkhi-1970m Length	Total Realignments length is 4.436 km
8	Rest Area	Nil	Nil	Nil

S. No.	Descriptions	Existing Features	Proposed Features	Remarks
9	Truck Lay Bye	Nil	2 Nos	Design Ch 10.517 and Ch 45.925
10	Bus Stops/Bus Bays	16	26 Nos (Including Both Side)	Shelter Type Bus stop-12 (Both Side) Bus Bay -14 (Both Side)
11	Drain	Earthen Drain in Few Stretches along the alignment.	RCC Covered Drain – 5.254 km Earthen Drain 42.398km	There is no Existing Line drain along the project stretch
12	Cattle Underpass	Nil	Nil	Nil
13	Vehicular Underpass	Nil	VUP-2 LVUP-1	Design Ch. 1.230 (LVUP) Design Ch. 4.607 & 8.245 (VUP)
14	Flyover	Nil	1 No.	Design Ch. 46.690
15	Toll Plaza	Nil	1 No.	Design Ch. 41.835