Chapter 7. Environmental and Social Considerations

7.1 Backgrounds of Environmental and Social Considerations for the Project

7.1.1 Background of the Project

In India, roads, along with railways, have become a dominant means of domestic transport catering to 87% of passenger transport and 60% of freights transport[1]. Due to the rise in population and economic growth, the number of registered cars has increased at an average annual rate of 9.88% since 2006, and the number was exceeded 250 million in 2017. As a result of such increase in the rate of ownership of private vehicles, the efficacy of passengers and cargo transportation is one of the major constraints in India.

In order to resolve this issue, in 2001 Ministry of Road Transport and Highways (MoRTH) implemented a strategy called the "National Highway Development Project" to start road maintenance of areas which included Delhi at the center, Mumbai in the west, Kolkata in the east and Chennai in the southeast - the so called "Golden Rectangular". As of 2015, the construction of the originally planned road section of 7,522km in length was completed, while improvement of the main highway has been in progress.

Though the number of registered cars is increasing in the Northeast (annual increase of 10 % as per Basic Statistics of North East Region, North East Council, 2015), much like mainland India, the maintenance of road conditions are lagging behind. In the Northeast states, only 28.5% of the roads are paved (while the national average is 63.24% in 2017[2]), only 53% of the national highways have more than two lanes (the national average is 74.68% in 2017[2]) and several areas have no slope protection, including slope pavement and implementation of drainage facility. Such poor road conditions contribute to instability of logistics and exacerbate the economic development of these states. The GDPs per capita (2017-2018)[3] was 74,204 Indian rupees in Assam, which were low compared to the national average of 114,958 Indian rupees, and indicated the wide gap between the Northeast and the mainland. The Northeast is rich in produce and resources, such as coal, which makes industries like mining and high-value added agriculture promising for the regional and economic development of the region. However, due to poor infrastructure and connectivity, such resources take time to go to the market. In order to benefit from these resources, improving road connectivity becomes essential.

In this Project "Improvement on Road Connectivity in Northeast Region (NH 127B)" the target road, National Highway 127B (NH127B) in Assam is connected to National Highway 31C, which is partially the East-West Corridors that connects Northeast area and the other areas of India. NH127B also runs from Bhutan to northeast as an international corridor. The experience of the past 4 projects "Improvement of Road Connectivity in Northeast India (phase 1~4)" are also highly relevant to this Project, and we should provide continuous support and contribution in the Northeast region.

Improving the international network and system leads to improvement of connectivity between inner and outer northeast area, and enhances movement of people and products which influence economic property and stability of the region, in line with the with wide open India-Pacific vision. The objective of this Project is in line with the Three Year Action Agenda: 2017 April ~2020 March that the Government of India (GOI) announced for the country's future development, focusing on connectivity between northeast and the other regions.

[1] Source: Ministry of Road Transport and Highways, https://morth.nic.in/road-transport
[2] Source: Basic Road Statistics of India (2016-2017), Ministry of Road Transport and Highways
[3] Source: National Statistical Office (NSO) https://www.rbi.org.in/scripts/PublicationsView.aspx?id=19000

Given this background, the Government of India has requested the Japanese Government to implement the Project in order to establish and improve NH127B (state of Assam).

Therefore, based on this request by the Government of India, the aim of this Survey is to collect relevant information on the purpose, overview, cost, implementation method, management, and environmental and social considerations of this Project, and to collect data for formulation of sector-loan Project.

7.1.2 Project Overview

Table 7-1: Project Overview

1) Project name	Improvement of Road Connectivity in Northeast Region (NH127B, Assam)
2) The purpose of project	To newly establish and improve roads in Northeast India, from Srirampur to Dhubri in Assam state in order to improve connectivity and contribute to the promotion of economic development of the areas.
3) The overview of request by the GOI	NH 127B: Partially newly constructing, improving, and widening of 2 or 4 lane roads (including bridges, drainage channel bypass, etc.) from Srirampur to Dhubri in Assam (approximately 54 km).
4) Target Area	Assam State
5) Counterpart and Relevant Agencies	Counterpart Agencies • National Highway and Infrastructure Development Corporation Limited (NHIDCL) Relevant Agencies • Ministry of Road Transport and Highway (MORTH)

Source: JICA Survey Team

7.1.3 Category of the Project for its Environmental and Social Impacts

This project is screened in accordance with the standards for "Category A" indicated in the categorization section of the JICA Guidelines for Environmental and Social Considerations (2010), as the project falls into the road sector located in a sensitive area and is likely to have significant adverse impact due to its characteristic under the JICA guidelines for environmental and social considerations(April 2010). .

7.2 Natural and Socio-economic Environment of the Project Sites

7.2.1 Climate

(1) Overview

India has a monsoon climate, and the north-eastern region has a rainy season from May to October/November and a dry season from December to April. The climate is mild throughout the year, with a minimum temperature of about 10°C and a maximum temperature of about 32°C. In areas with heavy rainfall, there is more than 3,000 mm of rainfall annually (some 10,000 mm annual precipitation in some states), but most of it is concentrated in the rainy season. Humidity is 60-70% in the dry season and about 90% in the rainy season. Next section describes each states temperatures and precipitations in details.

The climate of the area is mainly influenced by its inland position and the prevalence of wind patterns during a major part of the year. Generally, the area experiences the following four seasons in a year:

Summer	: March to July
Monsoon	: July to September
Post-monsoon	: October and November
Winter	: December to February

(2) Precipitation

The maximum rainfall occurs from April to August and continues in abundance for over six months in a single year with occasional shower throughout the rest period of the year.

In Kokrajhar district, the average annual rainfall of Kokrajhar district is 3102.4 mm and 110 annual average rainy days are present. Heavy shower starts from April with the onset of monsoon which continues till September and July receives maximum rainfall in a year

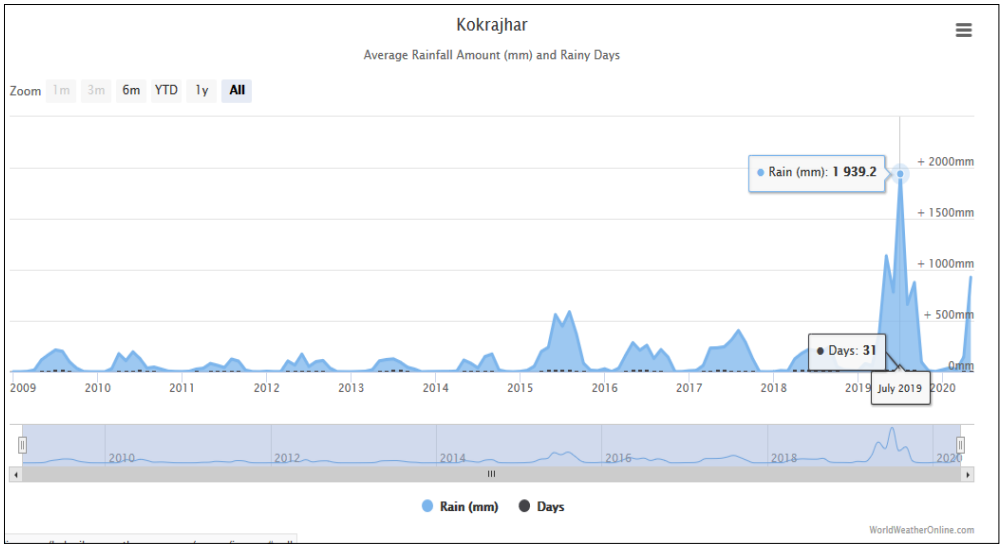


Figure 7-1: Graphical Representation Showing the Annual Trends of Rainfall in mm and Rainfall Days of Last Few Years in Kokrajhar District

(Source: https://www.worldweatheronline.com/kokrajhar-weather-averages/assam/in.aspx)

In Dhuburi District, the average annual rainfall of the district is 2,363 mm with about 65% rainfall occurring during the monsoon season and the monthly evapo-transpiration is about 40% of the rainfall, the highest in August and lowest in January as recorded.

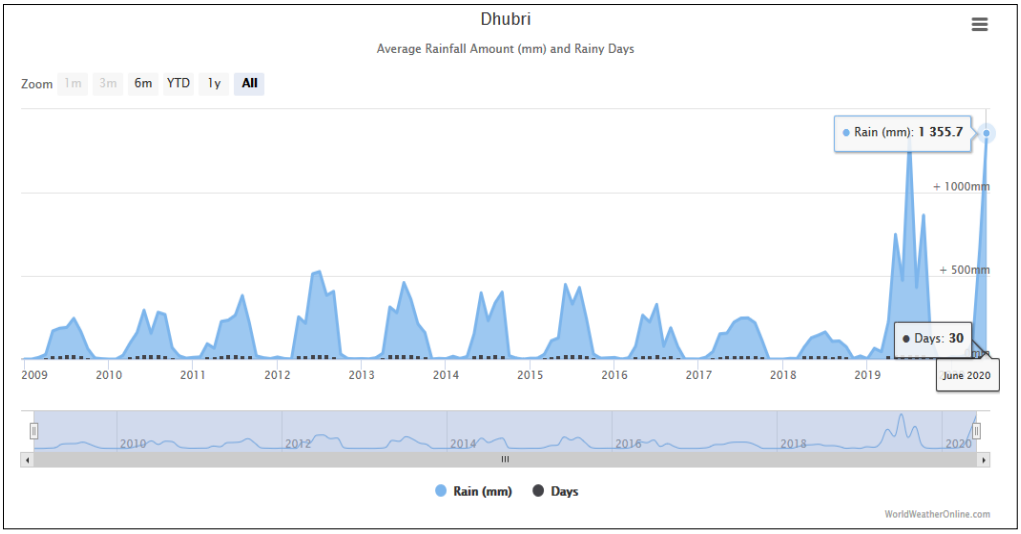


Figure 7-2: Graphical Representation Showing the Annual Trends of Rainfall in mm and Rainfall Days of Last Few Years in Dhubri District

(Source: https://www.worldweatheronline.com/lang/en-in/dhubri-weather-averages/assam/in.aspx)

(3) Temperature

Kokrajhar district: The average temperature in Kokrajhar district ranges from minimum 10°C to maximum 35℃ throughout the year. In summer season, the average temperature ranges from 27.64℃ to 31.67℃ and in the winters, it ranges from 19.34℃ to 23.66℃ (Kokrajhar District, Govt. of Assam, 2018).

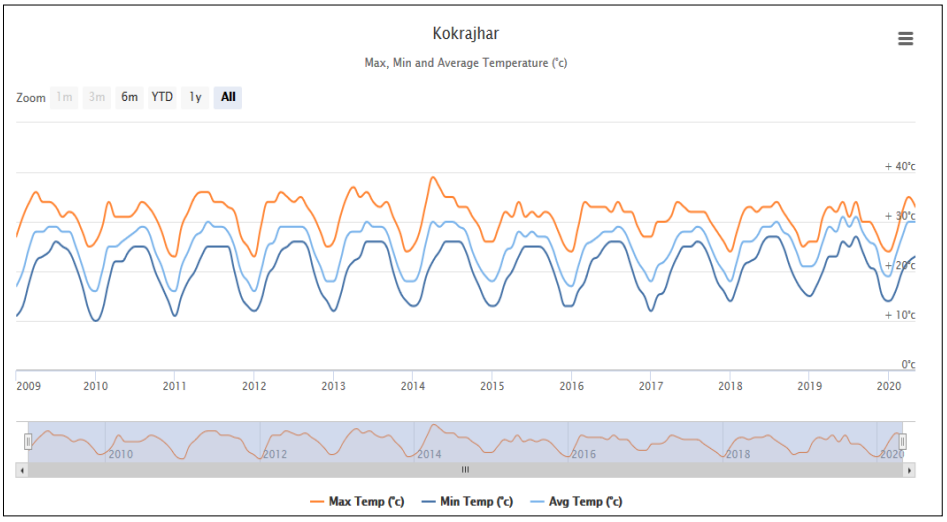


Figure 7-3: Graphical Representation Showing the Annual Trends of Temperature in ℃ of Last Few Years in Kokrajhar District

(Source: https://www.worldweatheronline.com/kokrajhar-weather-averages/assam/in.aspx)

Dhubri district: The Dhubri district has a subtropical humid climate with temperature ranging between 10.5°C (minimum, in December/January) and 30°C (maximum, in July/August). The average annual temperature in Dhubri is 24.2°C. The hottest time of the year in this district is during the southwest monsoon season

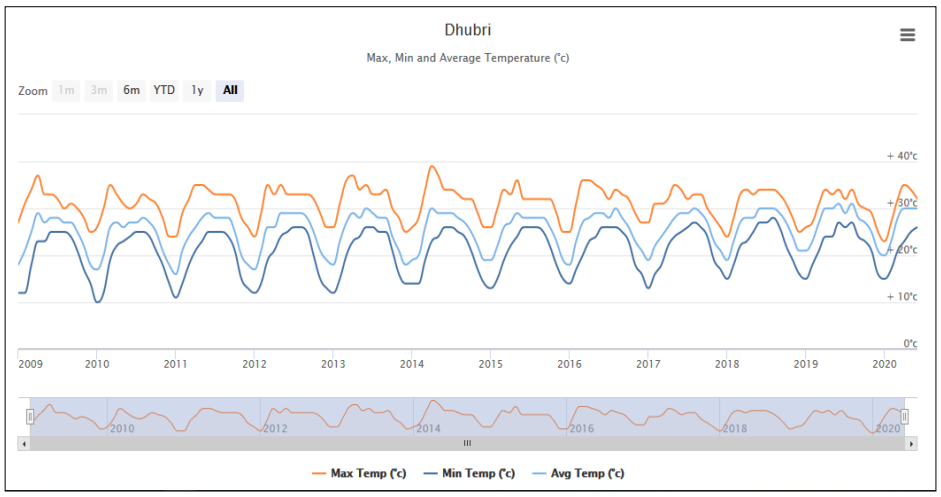


Figure 7-4: Graphical Representation Showing the Annual Trends of Temperature in ℃ of Last Few Years in Dhubri District

(Source: https://www.worldweatheronline.com/lang/en-in/dhubri-weather-averages/assam/in.aspx)

(4) Humidity

Kokrajhar district: The district is highly humid during the summer season from June to October which is when the south west monsoon season starts from June to September and October, November constitute the period of post monsoon. The average humidity remains almost same with variation from 62% in winter period to around 87% in post monsoon period.

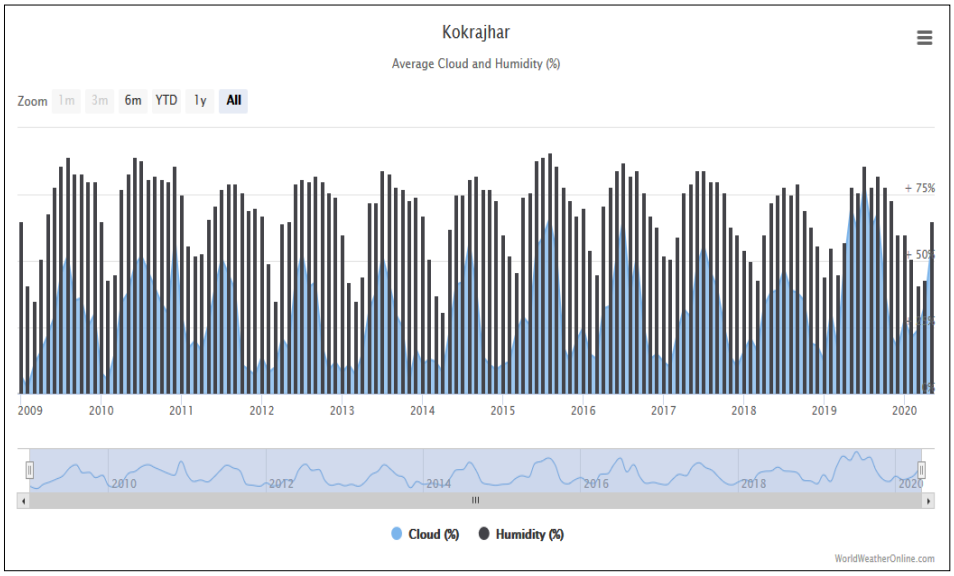


Figure 7-5: Graphical Representation Showing the Annual Trends of Relative Humidity in % of Last Few Years in Kokrajhar District

(Source: https://www.worldweatheronline.com/kokrajhar-weather-averages/assam/in.aspx)

Dhubri district: The Dhubri district is also highly humid with excessive heat during summer months. The average humidity remains almost same with variation from 78% in winter period to around 82% in post monsoon period and near about 70% in the summer season and 82% during the Southwest monsoon season.

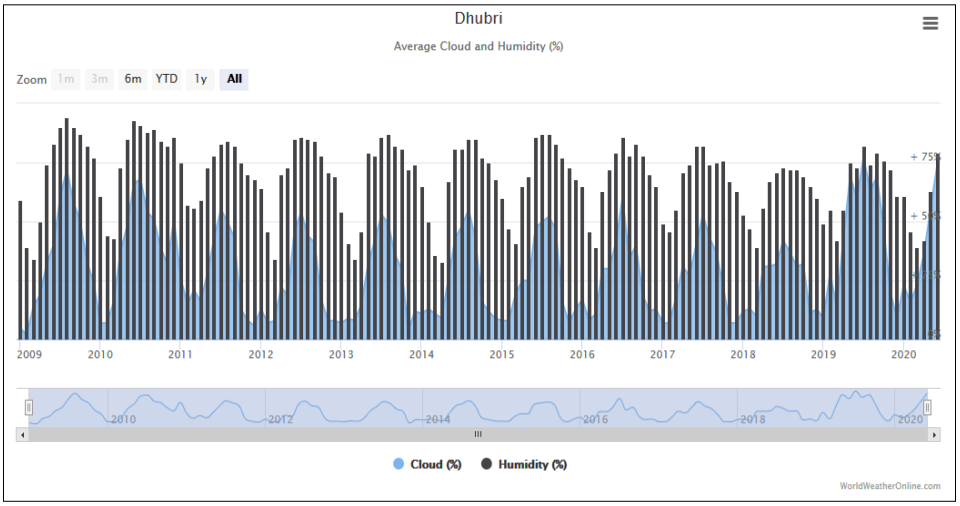


Figure 7-6: Graphical Representation Showing the Annual Trends of Relative Humidity in % of Last Few Years in Dhubri District

(Source: https://www.worldweatheronline.com/lang/en-in/dhubri-weather-averages/assam/in.aspx)

(5) Wind Speed

The average hourly wind speed in Kokrajhar district experiences *mild* seasonal variation throughout the year. The windier part of the year lasts for about 5.8 months ranging between the March to August. The calmer part of the year lasts for about *6.2 months ranging between late August to June.* From Figure 7-7, it is observed that the average wind gust of the district lies in the range of 5 to 16 kmph and average wind lies in the range of 3 to 9 kmph; it is also seen that the average wind gust in May 2020 was the highest (15.4 kmph). The predominant average hourly wind direction in Kokrajhar district varies throughout the year. The wind is most often from the south from mid May to late September; from the east from late September to mid May. In Figure 7-9, the wind rose diagram for Kokrajhar shows the hours per year the wind blows from the indicated direction and it is seen that the wind mostly blows towards the north and north east.

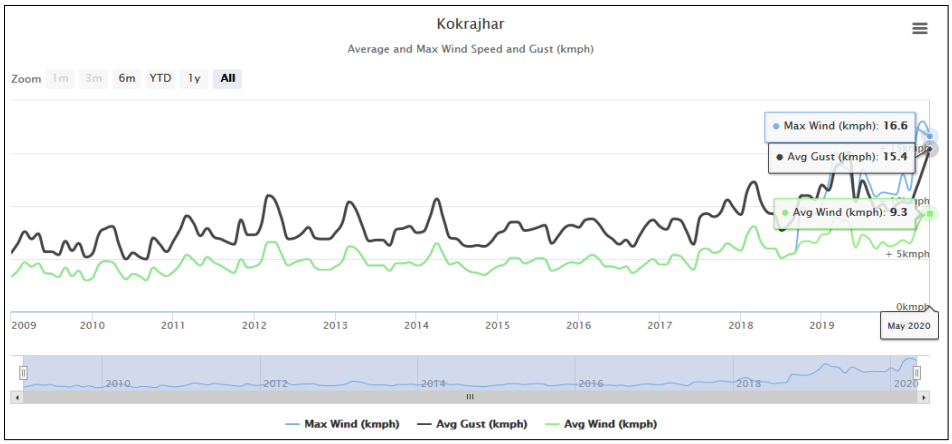


Figure 7-7: Graphical Representation Showing the Annual Trends of Wind Speed and Gust in kmph of Last Few Years in Kokrajhar District

(Source: https://www.worldweatheronline.com/kokrajhar-weather-averages/assam/in.aspx

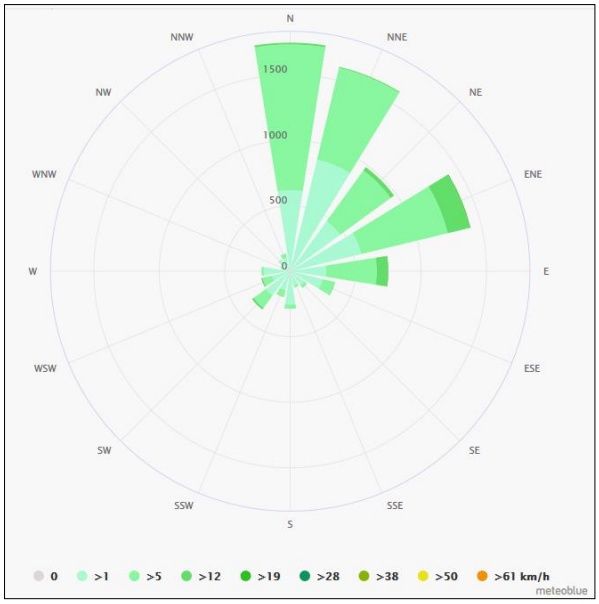


Figure 7-8: Windrose: Diagram Showing the Wind Direction in Kokrajhar District

(https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/kokrajhar_india_1266330)

Dhubri district: The average hourly wind speed in Dhubri district experiences mild seasonal variation throughout the year. The windier part of the year lasts for 5.8 months ranging between the March to September. The calmer part of the year lasts for about 6.2 months ranging between September to March. From Figure 7-9, it is seen that the average wind gust of the district lies in the range of 4 to 24 kmph and average wind lies in the range of 3 to 14 kmph; it is also seen that the average wind gust in May 2019 was the highest (22.8 kmph). The predominant average hourly wind direction in this district varies throughout the year. The wind is often from the south from mid early May to late September; from the east from late late September to early May. In Figure 7-10, the windrose diagram for Dhubri shows the hours per year the wind blows from the indicated direction and it is seen that the wind mostly blows towards the north east.

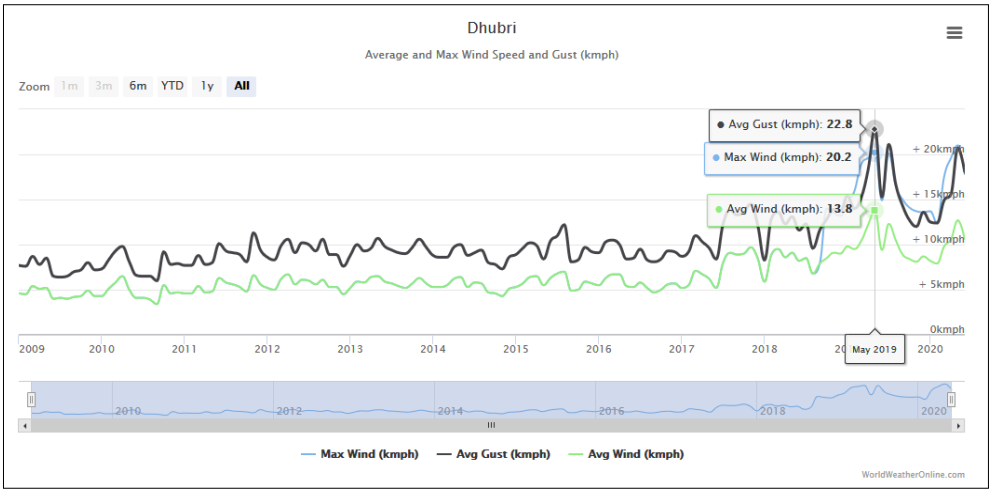


Figure 7-9: Graphical Representation Showing the Annual Trends of Wind Speed and Gust in kmph of Last Few Years in Dhubri District

(Source: https://www.worldweatheronline.com/lang/en-in/dhubri-weather-averages/assam/in.aspx)

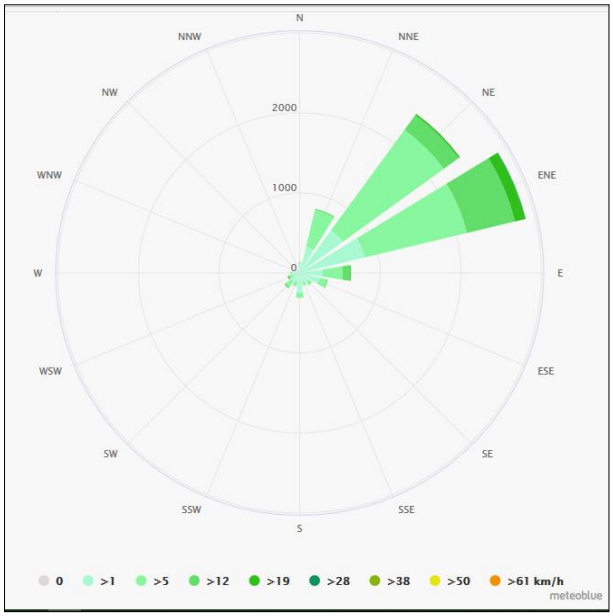


Figure 7-10: Windrose Diagram Showing the Wind Direction in Dhubri District

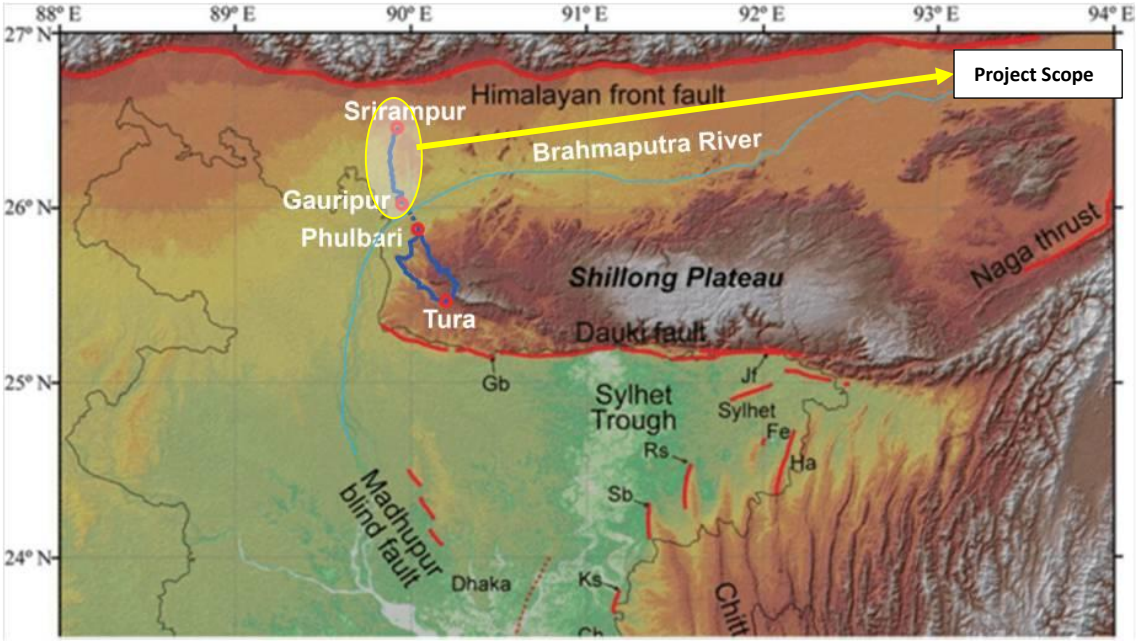
(Source: https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/dhubri_india_1272694)

7.2.2 Topography and Geology

Assam is located in the vast alluvial plain of the Brahmaputra River system. In addition to the monotonic, flat alluvial zone, in the eastern and southern parts of the state, a fragmented remnant hill (so-called Inselberg) is found. The height difference between the valley and the summit of the Zanqiu Mountains is 25-455 m.

The remaining hill has a thick laterite layer and is covered with a mixed evergreen forest. Alluvial deposits occupy 80% of the state and include buried valleys and back swamps. Most soils in the area are sandy and silty loam or clay loam. The soil is strongly acidic to slightly alkaline, moderately permeable. Some low organic carbon and low soluble salts exist as well. On the other hand, the soil in the remaining hill area is clayey and lateritic, with low permeability and high acidity. Most soils in this area are suitable for growing all types of crops.

The Brahmaputra River flows from east to west between the Himalayas and the Shillong Plateau in northeastern India, and it turns its direction to south near the western end of the Shillong Plateau. The alignment targeted for improvement of NH 127B is located near the course where the Brahmaputra River changes its course to the south, and it runs approximately north-south between Srirampur on the right bank of the Brahmaputra River and Tura on the left bank.



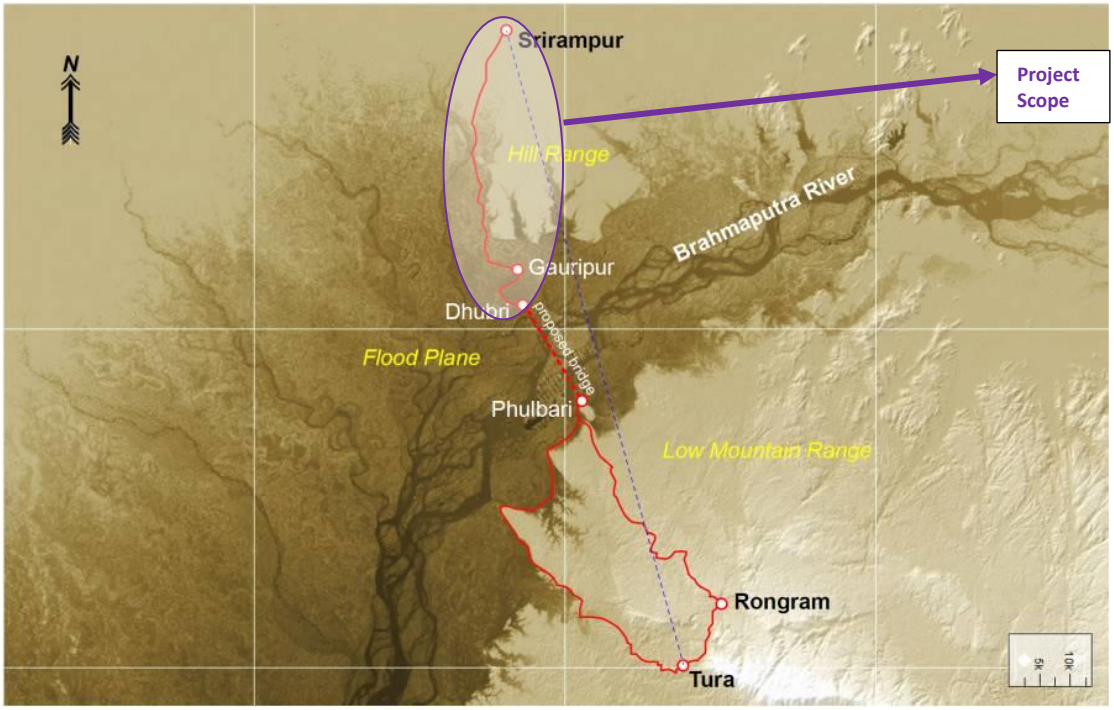
Source：Mohammad Atikul Islam (2014)

Figure 7-11: Topography of Assam and Meghalaya and the Project Alignment

On the right bank of the Brahmaputra River (north side), the terrain along NH127B is an almost flat lowland (Flood Plane) formed by floods. The flat lowland spreads widely on the right bank, but there is a hill range with a height of 15-20 m to the south of Srirampur.

The line passes through the flat surface on the west side of this hill. On the left bank of the Brahmaputra River (south side), there is a flat lowland along the river and a hilly area (Low Mountain Range) to the south. The lowland is narrower than the right bank, and the hilly areas are widely distributed.

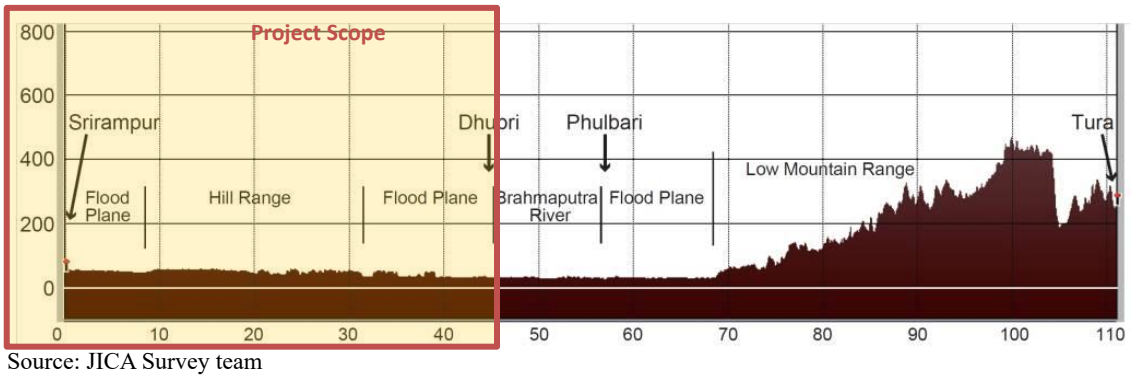
Figure 7-12 is a relief map along the route. The dark brown color has a low altitude, and the lighter the color, the higher the altitude. The white area at the southern end is about 1300 m above sea level. Particularly dark is the river channel of the Brahmaputra River. The elevation of the Brahmaputra River near the crossing of the planned line is about 25 m.



Source: JICA Survey Team

Figure 7-12: Topography of the Area

Figure 7-13 is a straight cross-section between Srirampur and Tura and it is not a cross-section along the route. The lowlands continue between the Brahmaputra River and Sri Lumpur, and there is a hill range with a slightly higher altitude. Between the Brahmaputra River and Tula, there exists the 10 km riverbank from as a flat surface, and beyond that, the altitude gradually increases and the hills spread.

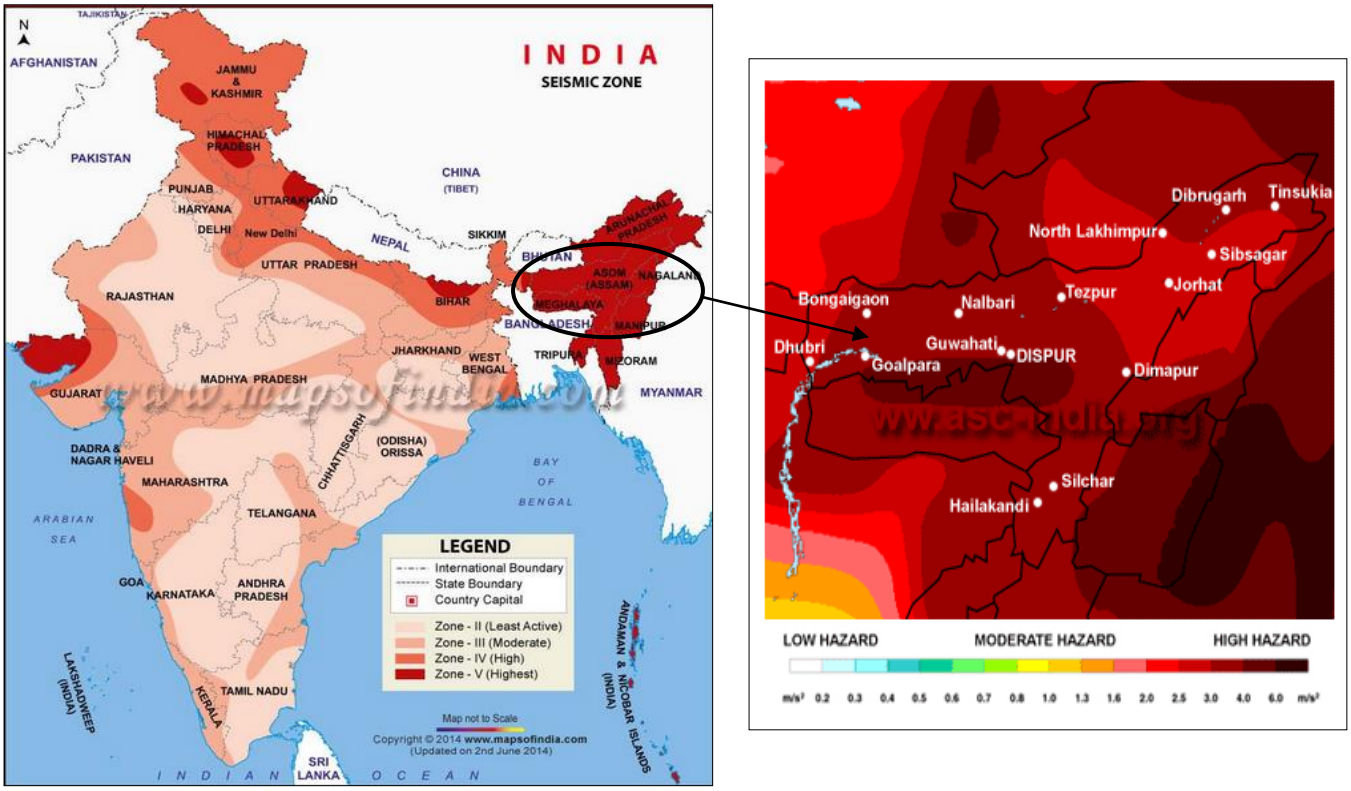


Source: JICA Survey team

Figure 7-13: Section by Sri Lanpur-Tula

(1) Seismicity

Considering the plate tectonics, Assam is in the eastern-most projection of the Indian Plate, where the plate is thrusting underneath the Eurasian Plate which creates a subduction zone. This led Assam to fall under the seismic zone V (as per the 2002 Bureau of Indian Standards (BIS) map) making the entire State prone to earthquake of moderate to very high intensity. Zone V comprises the areas with the highest risks zone which suffers earthquakes of intensity MSK IX or greater. The State has experienced two major earthquakes in the year 1897 and 1950 whose intensities were 8.7 and 8.5 on the Richter scales respectively (Assam State Disaster Management Authority). Therefore, both the districts are under seismic Zone V. Seismic zone map of India and Assam is given in figure below.



Source: http://asc-india.org/maps/hazard/haz-assam.htm

Figure 7-14: Seismic Zone Map of India and Assam

From the above map it is clear that the project road comes under zone V, which is susceptible to major earthquakes.

(2) Land Use

The project study area is dominated by Agricultural Crop Land (34.74 %), while Agricultural Follow Land is 26.10%, which shows that farming is very prevalent in the study area. Vegetation is covered in 19.93 % of the study area, while urban and rural settlement is 2.10 %. Most land along the project road is flood-prone one. Next Figure displays the photographs to represent its land use, and Figure 7-15 portrays the detailed land use and land cover map.

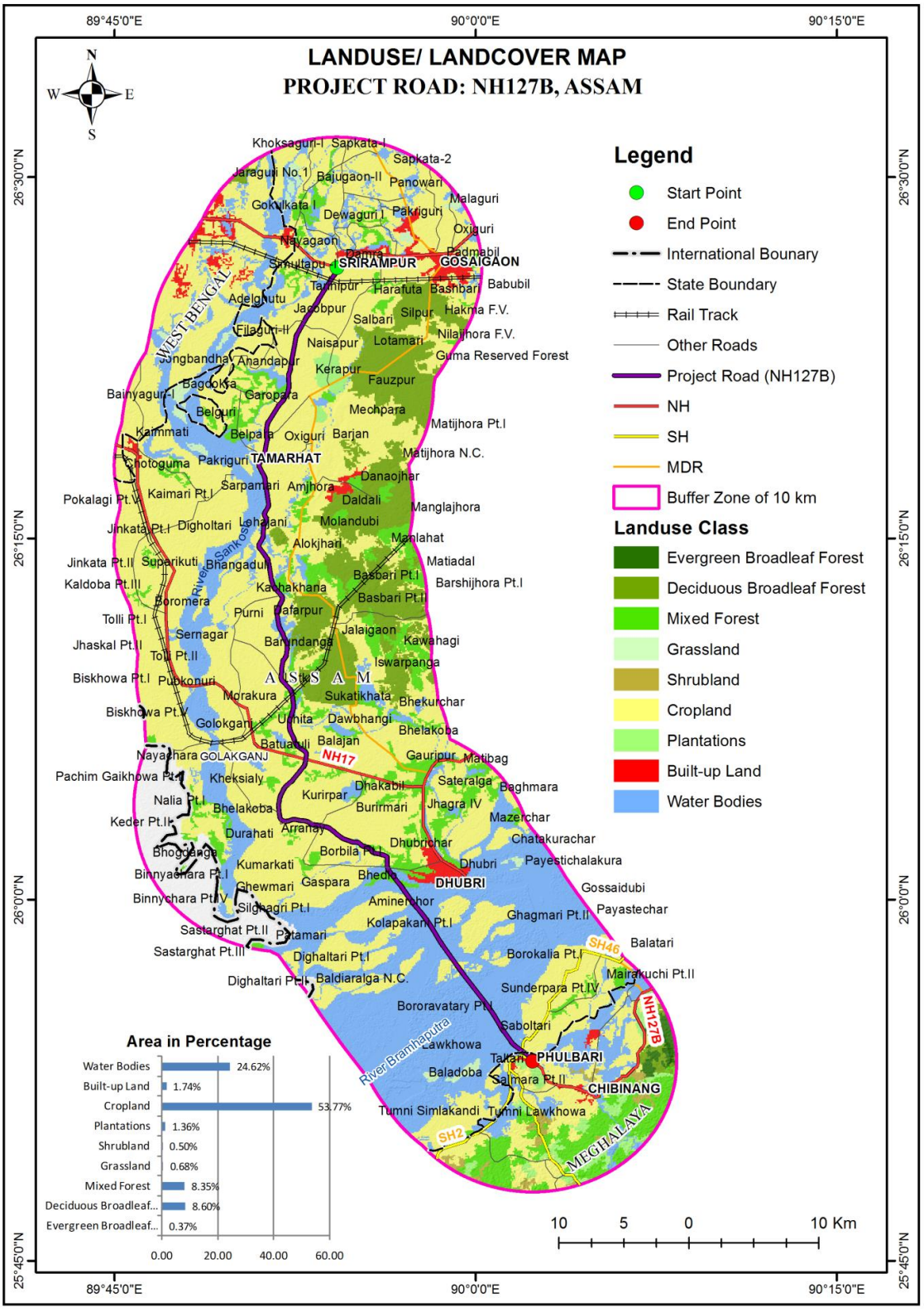
Table 7-2: Land Use Classification of Study Area

S. No.	LULC Classes	Area (in Sq Kms)	Area (in %)
1	Settlements	47.298	2.10
2	Transportation	3.228	0.14
3	Agricultural Crop Land	783.972	34.74
4	Agricultural Fallow Land	588.889	26.10
5	Barren Land / Waste Land	165.539	7.34
6	Mixed Forest	449.755	19.93
7	River Bed	120.409	5.34
8	River & Water Bodies	97.298	4.31
	TOTAL	2,256.387	100.00

Source: JICA Survey Team

Source: JICA Survey Team

Figure 7-15: Photographs of Roadside Land Use



Source: JICA Survey Team

Figure 7-16: Land Use and Land Cover along the Project Road

7.2.3 Forest and Ecosystem

(1) Forests

Forest Classifications

The Survey road alignment traverse in two districts, namely Dhubri (approximately 44 km) and Kokrajhar (approximately 10km). As per the FSR Assam report 2011, the 36.10% area of district Kokrajhar and 14.94% of district Dhubri. The details are given in the Table below.

Table 7-3: Forest Coverage in District Dhubri and Kokrajhar

District	Geographical Area	2011 Assessment			Total	% of Geographical Area
		Dense Forest	Mod. Dense Forest	Open Forest		
Dhubri	2,798	21	201	196	418	14.94
Kokrajhar	3,169	208	716	220	1,144	36.10

Source: JICA Survey Team

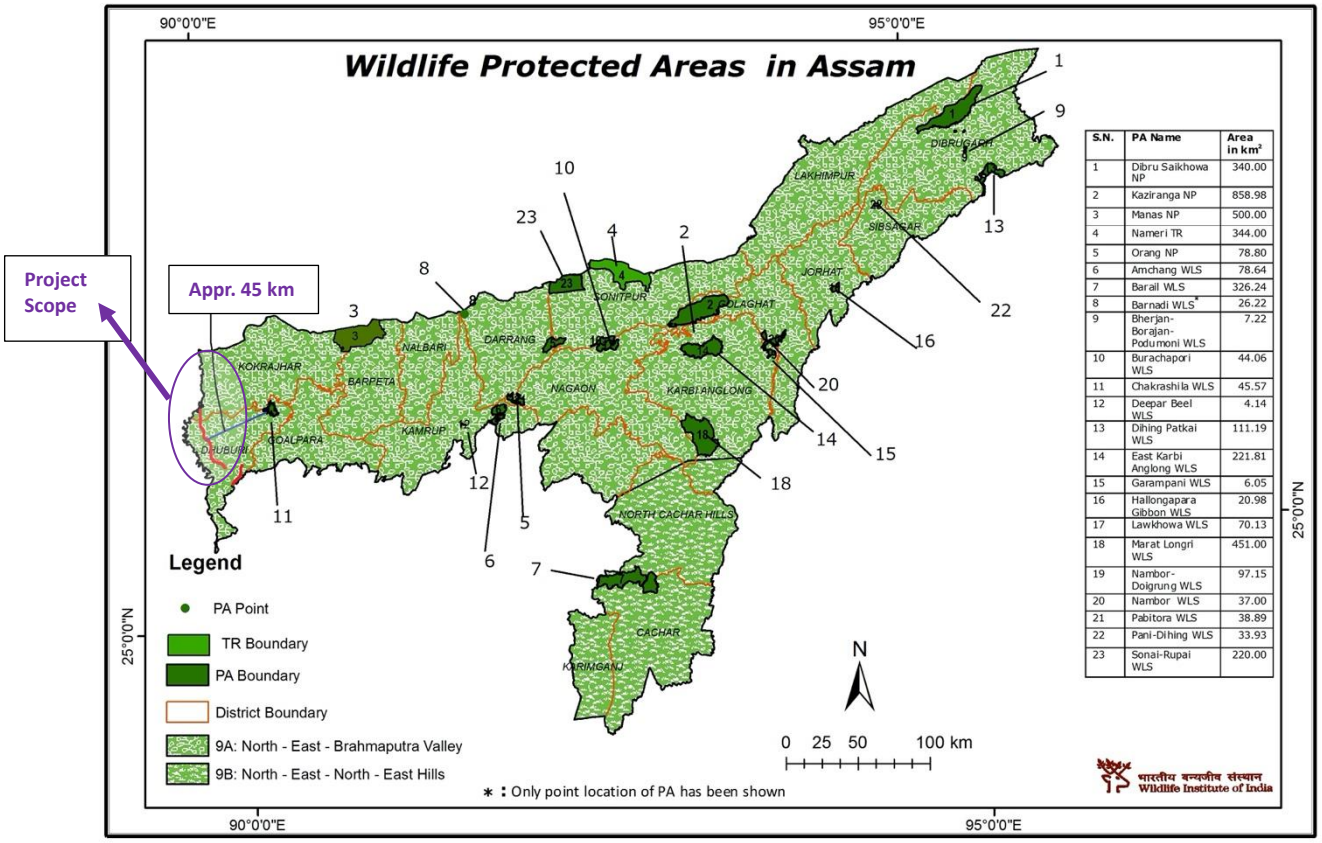
The following table shows the reserved areas in Assam. The next Figure shows the positional relationship of the project sites in the Assam State Reserve. The closest protected area to the project site is the Chakrashila WLS. The closest point to the protected area and the project site is about 45 km away, so there is little environmental impact.

The Chakrasila WLS is a wildlife sanctuary of approximately 46 km^2 that spans the Duburi and Cokrajar districts of Assam, India.

Table 7-4: Reserved Area in Assam State

Name	Year Established	Area (km2)	District
Dibru-Saikhowa NP	1999	340.0	Tinsukia,Dibrugarh
Kaziranga NP	1974	859.0	Golaghat,Nagaon
Manas NP	1990	500.0	Barpeta,Bongaigaon
Nameri NP	1998	200.0	Sonitpur
Orang NP	1998	78.8	Darrang,Sonitpur
Amchang WLS	2004	78.6	Kamrup
Barail WLS	2004	326.3	Barak Valley
Barnadi WLS	1980	26.2	Darrang
Bherjan-Borajan-Podumoni WLS	1999	7.2	Tinsukia
Chakrashila WLS	1994	45.6	Dhubri
Dihing Patkai WLS	2004	111.2	Dibrugarh, Tinsukia
East Karbi Anglong WLS	2000	221.8	Karbi-Anglong
Garampani WLS	1952	6.1	Karbi-Anglong
Gibbon WLS	1997	21.0	Jorhat
North Karbi Anglong WLS	2000	96.0	Karbi-Anglong
Laokhowa WLS	1972	70.1	Nagaon
Marat Longri WLS	2003	451.0	Karbi-Anglong
Nambor WLS	2000	37.0	Karbi-Anglong
Nambor Doigrung WLS	2003	97.2	Karbi-Anglong
Pabitora WLS	1987	38.8	Marigaon
Pani-Dihing WLS	1995	33.9	Sibsagar
Sonai-Rupai WLS	1998	220.0	Sonitpur

Source: JICA Survey Team



Source: Wildlife Institute of India

Figure 7-17: Reserved Area in Assam

Sacred Forest[4]

Sacred forests, or Sacred Groves, are patches of primeval forest that some rural communities protect as abodes of deities. Such "ecosystem people" draw their livelihoods from nearby resources and value nature for the ecological services it provides.

Majority documented of the sacred groves of Assam are situated in the districts of Karbi Anglong and Dima Hasao. The Karbi Anglong district is predominantly inhabited by a number of tribal groups and is believed to be a thriving ground of more than 40 proliferating Sacred Groves (Bhattacharjee 2015). However, out of this Sacred Groves, 17 had been listed and documented by Karbi Anglong Community Resource Management Society. 12 sacred groves had been reported from Dima Hasao district (previously North Cachar Hills district), which is being preserved by the Dimasa community (Medhi and Borthakur, 2013). Dimasa tribes of the North Cachar hills in Haflong district of Assam call sacred groves as "Madaico". The districts of Karbi Anglong and Dima Hasao are both located at far away (more than 300 km) from the project road (NH-127B).

[4] Bhattacharjee, S. (2015). Sacred Groves in Karbi Anglong: An Anthropological Observation. The Eastern Anthropologist, Vol-68 (1), pp.131-141.
- Medhi, P. and Borthakur, S. K. (2013). Sacred groves and sacred plants of the Dimasas of North Cachar Hills of Northeast India. African Journal of Plant Science, 7(2), pp.67-77.
- Talukdar, S. & A. Gupta (2017). Attitudes towards forest and wildlife, and conservation-oriented traditions, around Chakrashila Wildlife Sanctuary, Assam, India. Oryx 52(3): pp. 508-518.
- http://www.wiienvis.nic.in/Home.aspx
- http://www.cpreecenvis.nic.in/Database/Assam_2251.aspx

The present ROW does not impart any negative or positive effect on these Sacred Groves documented on these districts. One study by Talukdar and Gupta (2018) had mentioned about presence of some locally important scared groves from some villages inhabited by Boda and Rabha community near Chakrashila Wildlife Sanctuary. These lesser known, newly documented sites are locally known as "*Than"*. Chakrashila Wildlife Sanctuary is falling under Dhubri and Kokrajhar districts of Assam and is situated roughly about 45 km from the present ROW towards east. Therefore, the present ROW does not impart any negative or positive effect on these Sacred Groves mentioned by Talukdar and Gupta 2018.

No Sacred Grove had been reported or mentioned by any Governmental sources or any reliable scientific studies from close vicinity of the present ROW, which is connecting Srirampur and Dhubri. It must also be taken into account, as per data base of ENVIS Centre of Wildlife Institute of India, not a single Biodiversity Heritage Site, Conservation Reserves and Community Reserves is present with close proximity of the present ROW.

(2) Ecosystem

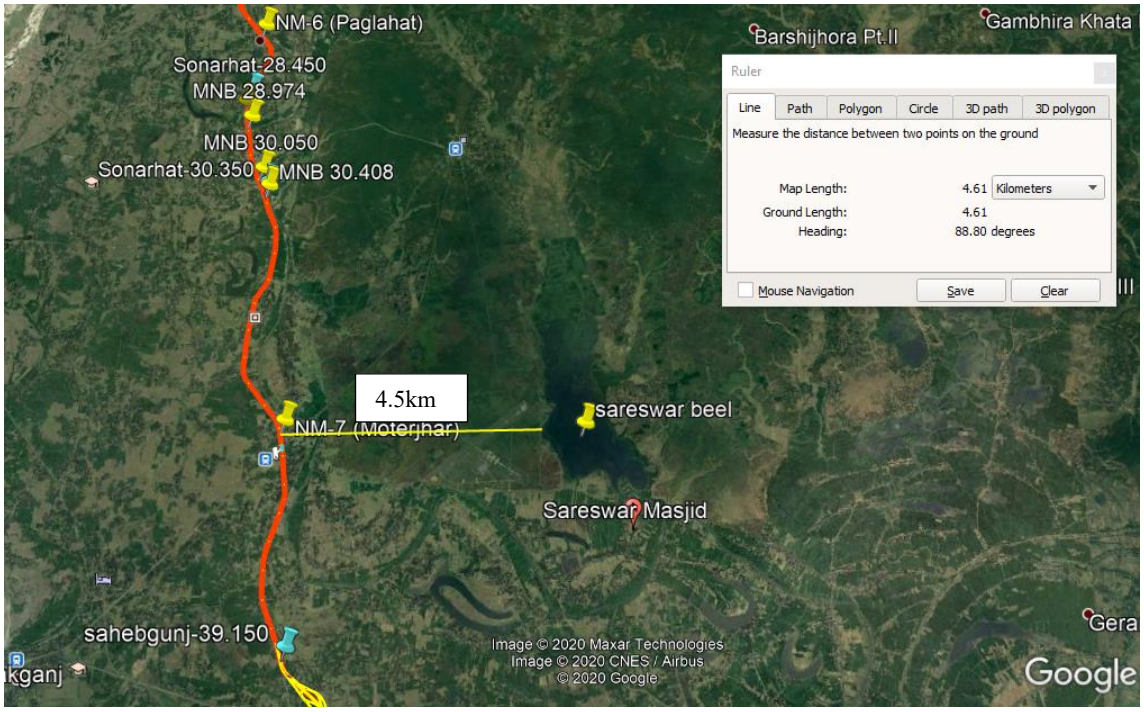
Assam is one of the essential biodiversity "hot spots" in the North-Eastern region of India. The area harbours a wide variety of wildlife species in its diverse mosaic of natural habitats. The state sustained 33 endangered mammalian fauna, more than 20 endangered avian fauna under the Wildlife Protection Act, 1972, and 45 globally threatened avian fauna and 17 endemic birds. Also, the state supports more than 15 endangered reptilian and amphibian fauna each, and 43 endangered insect fauna.

Chakrashira WLS, 45km away from the area, is known that the Golden Langur (EN endangered IB) of the order of the monkeys is inhabited, and this reserve has the second largest numbers in India.

There is a Key Biodiversity Area and International Bird Area in the vicinity of the alignment. The Sareswar Beel is situated about 6 km away from Gauripur town, Dhubri District. The distance between this project alignment and Sareswar beel i.e. 4.6km to 5.0 km. The Beel is state-owned and under the control of the Fishery Development Corporation. Growing human activities, encroachment of the Beel, siltation, commercial fishing and heavy deposit of aquatic weeds in the Beel is posing a serious threat to the Beel.

Till date, there is no official designation status in India such as Important Bird Area, Wildlife Sanctuary or Conservation Reserve had been conferred to the site by any regulatory authority or agencies. Rupsi Airport is situated on the eastern boundary of the Beel. Gauripur-Dindinga Road runs along the western bank of the Beel. Rupsi Airsport remained defunct since 1984, and presently there is plan to revive the airport under Central Government's Regional Connectivity Scheme.

Though Sareswar Beel is situated at distance as less as 5 km away from the proposed ROW on the eastern direction, neither the proposed ROW nor any of its parts is touching the any part of the Beel directly or indirectly by any means. The construction work in ROW would not going to impart any negative effect due to its considerable distance from the Beel. Furthermore, from the noise modelling, it can be inferred that noise pollution during operation phase is unlikely impact the Sareswar Beel as it is beyond the affected area.



Source: World Database on Key Biodiversity Areas

Figure 7-18: Sareswar Beel and the Alignment

7.2.4 Socio-economic Profile

(1) Introduction

The project road starting from Srirampur on NH-27 (old NH-31C) at Chainage 0.000 km to the immediate approach of proposed bridge over river Brahmaputra near Dhubri at chainage 55.700 km). The entire road falls under Kokrajhar and Dhubri district of Assam. The existing length of the project stretch is 55.700 km.

(2) Profile of Assam state

Assam, the gateway to the North East India is the largest State in the North East is bordering seven Indian states, namely Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and West Bengal and two nations namely Bangladesh and Bhutan. The state is endowed with abundant fertile land and water resources with total geographical area of 78,438 km^2 of which 98.4 % area is rural. Assam shares about 2.4 % of the country's total geographical area and provides shelter to 2.6 % population of the country. Most of the state population lives in the lush valleys of its two major river system in the 30 districts of the Brahmaputra valley and 3 districts of the Barak valley. Less densely populated three hill districts viz. Karbi-Along, West Karbi-Along & Dima Hasao, set in the low-laying hills that separate the two valleys

Assam is administratively divided into 33 districts with 80 sub-division, 219 Development Blocks and 2,202 Gaon Panchayats, out of which 3 districts with 4 sub-divisions and 16 development blocks are under three hill districts of Karbi-Along, East Karbi-Along & Dima Hasao. Further, four districts with eight sub-divisions are under Bodoland Territorial Council (BTC) area viz Kokrajhar, Chirang, Baska and Udalguri. The Brahmaputra valley consists of North Bank Plains Zone (NBPZ), Upper Brahmaputra valley Zone (UBVZ), Central Brahmaputra Valley Zone (CBVZ) and Lower Brahmaputra Valley Zone (LBVZ), whereas the Barak Valley Zone mainly consists of plain area of three districts, viz. Cachar, Karimganj and Hailakandi.

According to the census of India in 2011 the population of Assam stands at 31,205,576 of which 15,939,000 are male and 15,266,000 are female. Sex ratio in the state is 958 females per 1000 males, with some increase from 935 per 1,000 in 2001. The decadal growth of the State's population works out at 17.07% during the decade 2001-2011 as against 17.68% for the country as a whole. Out of the total population, 86% live in rural areas and 14% live in urban areas of the State. In 2011, average literacy rate in the state is 72.19%, while male rate is 77.85% and female rate is 66.27. In 2001, the average literacy rate was 63.25% (male 71.28% and female 54.61%). The density of the population of Assam has increased to 398 persons in 2011 from 340 persons in 2001 Census.

The state's economy is based mostly on agriculture, plantation and oil. In the agriculture sector, tea and silk are the main products of agriculture production. Assam is the largest economy in the northeast region. Assam tea blends are famous in entire India and also worldwide. About a quarter of India's oil is produced in the Assam-Arakan basin.

Assam's state domestic product in 2013-14 was Rs. 885.4 billion, net per capita production was Rs. 50,558, with an average growth rate of about 6% in the last 10 years. By industry, the service industry accounted for about 60% of total production value in 2013-14, and agriculture and industry accounted for about 20% each. Looking at the trends over the past 10 years, the ratio of agriculture and manufacturing has been declining, and the contribution of service industry is high. The average growth rate of each industry is 3.8% for agriculture, 2.8% for manufacturing industry and 10.3% for service industry, and the growth rate of service industry is remarkable.

Table 7-5: State Domestic Product of Assam

		2004-05	2008-09	2013-14	Average growth rate for a decade
State Domestic Product (Rs. 1 billion)		534.0	640.3	885.4	6.6%
Ratio by industry	Agriculture	25.6%	23.4%	21.3%	3.8%
	Manufacturing	27.5%	25.9%	21.3%	2.8%
	Service	46.9%	58.1%	57.5%	10.3%

Note: Based on real GDP (constant price 2004-05)
Source: Planning Commission, Government of India

In the new series (base-2011-12) estimates, the annual average growth rate of the Gross State Domestic Product (GSDP) at current prices for the years 2011-12 to 2015-16 (P) is 12.5 % and the rate of Net State Domestic Product (NSDP) at the current prices for the same period is 11.6 %. In terms of the constant (2011-12) prices the annual average growth rate during the period 2011-12 to 2015-16 (PQ) is estimated at 5.8 % for GSDP and 5.6 % for NSDP.

GSDP at constant (2011-12) prices for the year 2016-17 is estimated at Rs. 1,954.9693 billion as against Rs. 1,789.2964 billion for 2015-16 (Provisional Estimates) registering a growth of 9.26 %. The annual growth rate in respect of GSDP at constant price (2011-12) in Agriculture and its allied sector has declined from 3.28% in 2014-15 to 1.04% in 2015-16. The industrial sectors which comprises mining and quarrying, manufacturing, electricity, gas, water supply and other utility services and construction sectors is estimated at 8.33 % growth in 2016-17 as against 7.31% in the 2014-15. The services sector comprises of trade, repair, hotels and restaurants, transport, storage, communication and services related to broadcasting, financial services, real estate, and ownership of dwelling and professional services, public administration and other services and its annual growth rate of GSDP at constant price (2011-12) is calculated at 13.10 % during 2016-17 as compared to 9.67% in 2015-16.

Unemployment is the one of the significant problems in Assam. The report from the North Eastern Development Finance Corporation Limited (NEDFL) published in October 2017 stated that over 175 thousands jobs will be required by the state annually till 2020. This requirement is usually for blue collard jobs. However, the report didn't include employment in agriculture and plantation farm sectors and government offices, which will add more jobs to the projection. Assam, at present, is facing the twin challenges of increasing unemployment and a mushrooming young population.

Assam is predominantly a rural based state, almost 86% of its population still living in rural areas. The socio-economic position among the people in rural areas is very pathetic compare to urban area & all India figures. Rural poverty is more than twice that of urban poverty. The population growth in Assam also implied that there has hardly been any reduction in the absolute number of the poor over the years. Demographically, the state Assam is characterized by with her population, which is 31 million compare to all India total 1,210 million as per 2011 census. Population density of Assam is calculated as 397 per sq. km which is little high compare to national figure 382 per sq. km.

Table 7-6: Comparison of the state of Assam with National Average

Sl. No.	Category	Assam, 2011	India, 2011
1	Percentage contribution to National Population	2.58	100
2	Population Density (per sq km)	397	382
3	Sex Ratio (Females per 1000 males)	954	940
4	Under 6 years Sex Ratio (Females per 1000 males)	957	914
5	Literacy Rate	73.18	74.04
6	Male literacy rate	78.18	82.14
7	Female literacy rate	67.27	65.46
8	Human Development Index Value (HDI) 2007-08	0.444	0.467

Source: Dhar, Soma. 2014. Socio-Economic and Demographic status of Assam: A comparative analysis of Assam with India. *International Journal of Humanities & Social Science Studies (IJHSSS) A Peer-Reviewed Bi-monthly Bi-lingual Research Journal.* Volume-I, Issue-III.

The above Table 7-6 reveals that sex ratio which shows slight better picture of state Assam than national figure. In category of sex ratio among children, below 6 years, performance of Assam is better compared to all India figure. It also reveals that the female literacy rate of Assam is better than that of the national average. The state of Assam ranks 16th (out of 23 states) in regard to the Human Development Index (HDI).

(3) Profile of Kokrajhar District

Kokrajhar district occupying an area of 3,129 km^2 is located on the northern bank of the Brahmaputra River. It is one of the 33 districts of Assam with 2.85% of the state population and is the gateway to Northeast India. Both the rail and road network touch this district at Srirampur on the way to the rest of the region. It is bounded on the north by Bhutan and by West Bengal on the west; the district of Dhubri in the south and in the east by Chirang district.

Kokrajhar town is the headquarter of Bodoland Territorial Council, created on 10th February, 2003 comprising of four districts viz. Kokrajhar, Chirang, Baska, Udalguri on the north bank of Brahmaputra within Assam. Kokrajhar was originally a part of the undivided Goalpara district. In 1957 it was curved out as a Civil Sub-division from the then Dhubri Sub-division of Goalpara district.

Table 7-7: Socio- Economic Profile of Kokrajhar District

Description	2011	2001
Actual Population	887,142	843,243
Male	452,905	433,360
Female	434,237	409,883
Population Growth	5.21%	14.49%
Area Sq. Km	3,296	3,296
Density/km2	269	266
Proportion to Assam Population	2.84%	3.16%
Sex Ratio (Per 1000)	959	946
Child Sex Ratio (0-6 Age)	954	955
Average Literacy	65.22	52.29
Male Literacy	71.89	61.01
Female Literacy	58.27	43.06
Total Child Population (0-6 Age)	136,924	151,341
Male Population (0-6 Age)	70,085	77,398
Female Population (0-6 Age)	66,839	73,943
Literates	489,305	4,797,838
Male Literates	275,220	2,703,912
Female Literates	214,085	2,093,926
Child Proportion (0-6 Age)	15.43%	17.95%
Boys Proportion (0-6 Age)	15.47%	17.86%
Girls Proportion (0-6 Age)	15.19%	18.04%

Source: https://www.census2011.co.in

As per 2011 census, 85.14% population of Kokrajhar districts lives in rural areas of villages. The total Kokrajhar district population is 887,142 of which males and females are 452,905 and 434,237 respectively. In Kokrajhar district, sex ratio is 959 females per 1,000 males. It should be noted that the literacy rate of the district (58.27%) is much lower than that of the state (66.27%).

The kingdom of Bhutan is intricately linked with the district of Kokrajhar in many vital aspects of life of the people living both in the Bhutan hills and the plains of Kokrajhar. There is movement of the people across the international border for the purpose of business and tours. The Bhutanese town of Gelephu is a nice place to visit from Kokrajhar as it is just across the international boundary. There is a fine road leading from the Shyamthaibari point on the National Highway 31(C) to Gelephu. Further on, inside Bhutanese territory, there is the town of Sarbhang that also can be visited via Gelephu.

(4) Profile of Dhubri District

Dhubri district is situated in the extreme western corner of Assam. The district is surrounded by the Kokrajhar district in the north, Meghalaya state and Bangladesh in the south, Bongaigaon and Goalpara districts in the east, West Bengal state and Bangladesh in the west. The district is situated at 30 meters above the sea level on average. Distance between the district capital, Dubri to the State capital, Dispur is 290 km.

Table 7-8: Socio- Economic Profile of Dhubri District

Description	2011	2001
Actual Population	1,949,258	1,566,396
Male	997,848	804,999
Female	951,410	761,397
Population Growth	24.44%	22.97%
Area Sq. Km	2,176	2,176
Density/km^2	896	941
Proportion to Assam Population	6.25%	5.88%
Sex Ratio (Per 1000)	953	946
Child Sex Ratio (0-6 Age)	968	965

Source: https://www.census2011.co.in

Dhubri district occupies an area of 2,176 km^2 and has its population of 1,949,258. Its population density is 896/ km^2 and in comparison with average of Assam state (398/km^2), it is densely populated. Its population growth rate from 2001 to 2010 is 24.4% which is also higher than the state average (17.1%).

It has four urban areas (Dhubri, Bilasipara, South Salmara and Mankachar) covering an area of 27.24 km^2, with a total urban population of 190,546. Literacy rate in Dhubri District is 58.34% and lower than the state average (72.19%).

In 2011, the literacy rate of Dhubri was 58.34% of which male and female literacy rate was 63.10% and 53.33% respectively. As per 2011 census population data of Dhubri district, Hindus constitutes 19.92% and Muslims constitutes 79.67% of Dhubri population

7.2.5 Tribal/Ethnic Profile

The targeted part of NH127B passes through Kokrajhar district and Dhubri district in Assam. Kokrajhar district is an administrative district in Bodoland Territorial Region of Assam. It is predominantly inhabited by the Bodo tribe. The district has its headquarters located at Kokrajhar Town.

Assam State is home to Assamese, Bodo and Ahom people. Official languages used in Assam State are Assamese and Bodo. Other than this, Bengali is also used in the Survey area which is similar to Assamese. The ratio of the Scheduled Caste and Scheduled Tribe in Assam is relatively low in Dhubri District and South Salmara-Mankachar District compared to the Assam state average.

In Dhubri district, Goalpariya and Bengali are the most widely spoken language, although Assamese is the official language. Most of the people are Deshi (Goalpariya Assamese people which includes the Hindu and Muslim Goalpariya people) people. Only in Dhubri Town more than 50% Bengali people are present.

In Assam, the government acquires privately-owned land following the normal legal procedure in a similar fashion as in the other states of India. These states follow only the nationally mandated rules for land acquisition. Most of the private lands in the state are owned by individuals. Forested areas in Assam are owned by the government. There are only few areas of community owned forest. In Assam, for land acquisition of government land or private land, the project proponent has to submit a proposal for land acquisition to the District Magistrates, then the state government

receives the report from the district, which passes to the Revenue Department, to pay compensation to the owners.[5]

7.2.6 Land Use, Indigenous Knowledge and Management of Natural Resources

The land use pattern among different north-eastern states varies widely. Except in Brahmaputra and Barak valleys of Assam where substantial areas are used for agriculture, major portion of the north-east is forests, and little area is available for settled cultivation. Shifting cultivation (*"Jhum"* cultivation) is the main form of agriculture in these hills. On average 386,900 ha is put under shifting cultivation every year and an estimated 443,000 households earn their livelihood from shifting cultivation. The land use in Assam is shown in Table 7-9 and data on shifting cultivation are presented in Table 7-10. Table 7-11 also describes land utilization pattern in Assam.

Table 7-9: Percentage Share of Land Utilization in the Study Area

States	Total utilized area ('000 ha)	Forest (%)	Non-arable land (%)	Fallow land (%)	Net sown area (%)
Assam	7,850	24	39	2	36
All India	305,903	23	23	8	46

Source: Basic Statistics of North Eastern Region 2015

Table 7-10: Status of Shifting Cultivation in the Study Area

States	Annual area under shifting cultivation (ha)	Fallow period (years)	No. of Jhumia families
Assam	69,600	2-10	58,000

Source: Basic Statistics of North Eastern Region 2015

Table 7-11: Summary of Land Use in Each State

State	Description
Assam	The principal crops in the upper Assam are tea and paddy. Jute and paddy are common in the middle Assam, and paddy is in the lower Assam. In some parts of the state, vegetables are cultivated. Nagaon and Marigaon are prominent vegetable growing districts. Agro-based tea industry is most significant in the state. Jorhat, Sibsagar and Golaghat districts are famous for tea-gardens, which produce about 52% of the total tea production in India, and it contribute about 10% of state's income. Areca nut is very prominent backyard crop. Sericulture is also practised in the state. The famous silks *eri* and *muga* are produced in this state. Kamrup, Goalpara and Barpeta districts grow jute-plant.

Source: Indian Council of Agricultural Research (ICAR). 2010. *Degraded And Wastelands Of India.*

Jhum is directly supported by the forest ecosystem. Jhum has been in use for centuries and still remains a major land-use practice despite recent government effort to discourage the practice and provides a basis for subsistence farming, maintenance of cultural values and social stability for the people living in low population densities. Challenges associated with *jhum* are often caused by the high pressure due to local population growth, rather than the inherent problem of the system itself. In recent years, local farmers are responding to the new demands of the market economy and pressure on land by diversifying the cropping patterns. While *jhum* is a traditional farming method, its practice is not static but a dynamic one that continuously evolves with the changes of outside environment.

Jhum is predominant in unirrigated, difficult to access, usually at the slopes in mountainous areas, prevailing of community ownership or customary rights places dominated by indigenous

[5] Interview to Public Works Department, Assam. 26 June 2018.

population. NH127B (Assam) passes through well connected habituated area, costly land with irrigation and other resources. There is no area *Jhum* is operated in the land need to be acquired. As per the Entitlement Matrix, *Jhum* or any form of Cultivation will be compensated identically.

7.2.7 Stakeholder Consultations during the Screening Process

According to the DPR prepared for the improvement of NH127B in Assam, at the time of reconnaissance survey and baseline data collection, informal discussions have been held with the local public residing in indirect project influence area to obtain an overview of likely impacts and concerns of the community. Consultation was held at several locations along the project road alignment covering areas where public activity was intense and close to proposed alignment covering the village panchayats and some villagers.

The "institutional level" consultations were held with representatives of institutions having stakes in implementation of the project. The institutions contacted included state forest department, District Administration, Revenue Department, etc. In addition to them, officials from other departments were also contacted on several occasions. The contacted officials included tehsildars (tax officers), and NGOs.

The consultation with institutional officials focused on the following issues

- Project description: - Need for the 2/4 lanes of the project road, benefits of the project, etc.
- Social and environmental assessment processes required by the Government of India;
- The extent/nature of negative social and environmental impacts and the need for rehabilitation and resettlement in the project. Avoidance, mitigation and enhancement aspects in the project;
- Dissemination of resettlement and rehabilitation policy formulated for the project prescribing various resettlement and rehabilitation options to facilitate in improving or at a minimum regaining the former status of living of the people affected by the project at no cost to them; and
- People's participation in the planning, implementation and evaluation stages.
- Clarifications were sought from Chief Conservator of forest and DFO offices regarding requirements of tree cutting permission.

During the environmental and social screening survey primary stakeholders have been consulted at site and outcome of the consultations have been furnished in Table 7-12.

Table 7-12: Issues Discussed in the Stakeholders Consultation

Issues Discussed	Outcome
Relocation Options Compensations/Assistance	Displaced Persons whose residential structures are getting affected prefer not to get disturbed and if disturbance is not avoidable then they shall be relocated very nearby. Shop owners and workers raised the issue of loss of their livelihood during the resettlement period due to loss of business. During consultation they were convinced to relocate to a nearby place thereby ensuring restoration of the livelihood of the workers. People are ready to shift if properly relocated and compensated. Most of the displaced persons demanded house for house option in this place instead of money compensation.
Safety due to alignment	People expressed their views on the risk if the road is widened at the dense settlement area affecting residential structures on both sides. The displaced persons proposed that they should be shifted to the one side of the road to ensure road safety for villagers/road users.
Relocation of school buildings Relocation of Temples	People expressed their views on the risk involved if the road passed through the village affecting residential structures on both sides. The sites for relocation of schools and temples were identified in consultation with the villagers and the village panchayat. There were differences in opinions among the villagers in demolishing/ shifting the temple.
Cross Drainage for bypass	People have shown their concern for the proposed drainage pattern for the realignment of a portion of the project road. In this regard the lined rectangular drains with proper outfall shall be planned as a part of the project design of the main carriageway. Adequate cross drainage structures should be planned after study of hydrology of the Survey area.
Utilities and basic infrastructures	People showed their concern about what will happen with the utility lines if the road is widened. Adequate care shall be taken for the shifting of the utilities.
Employment during construction	People were of demand if the local people are given preference for employment during the construction phase of the project. Such options shall be explored to the extent possible and mostly the unskilled worked can be hired from nearby locality.

Source: Assam DPR Volume 4 EIA 2020

The following are the key findings from the public consultation: -

- Participants were aware of the project and were willing to give up their agricultural land but not their house.
- People were also concerned about the religious structures, burial / cremation ground, trees, plantations, orchards that were getting affected;
- People in most of the cases, agreed to participate in the process of identifying alternate site for relocation of their structures
- The PAPs were also concerned about the rate of compensation, mode of payment and timely disbursement of the same.
- PAPs were concerned about the loss of livelihood as a result of large-scale acquisition of agricultural land.
- The PAPs were particularly concerned about the loss of community assets like the schools/religious structures.

7.3 Legal Framework and Screening of the Project

7.3.1 Requirement of EIA under Indian Regulation

(1) National Law on Environment

The environment-related legislation in India entrusts the MoEFCC to operate the "Environmental Protection Act of 1986". The MoEFCC has the jurisdiction over the entire environment-related laws and regulations in India, and has a great power in the operation and revision, continuous development NH, and monitoring of environmental pollution.

In India, some terms that are different from those used in Japan are used in the legal system, so the terms used in Indian law and their order are shown below.

a. Acts:
This is approved by the Diet and this is ranked at the highest. It accompanies the obligations and penalties.

b. Rules:
Based on the law, the government agency (ministry) establishes the detailed rules for implementing the law.

c. Notifications:
It defines specific procedures and operational procedures to supplement the rules.

d. Guidelines:
It is created by the central competent authority to support the enforcement of rules by the local government agencies that are the rules' enforcement agents. It has no legal obligations, but it indicates recommended efforts.

Pollution-related laws in India are regulated by the Central Pollution Control Board (CPCB).Two Acts: 1) The Water (Prevention and Control of Pollution) Act, 1974; and 2) The Air (Prevention and Control of Pollution) Act, 1981 have been enacted prior to environmental protection-related laws and regulations. Then, in 1986, the Environmental (Protection) Act came into effect. In order to regulate the environmental pollution advocated in this, the following pollution-related laws and regulations were sequentially enacted.

1) The National Environmental Tribunal Act, 1995 India;
2) The National Environment Appellate Authority Act,1997;
3) The Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996;
4) The Bio-Medical Waste (Management and Handling) Rules,1998;
5) The Recycled Plastics Manufacture and Usage Rules,1999;
6) The Municipal Solid Wastes (Management and Handling) Rules,2000;
7) The Noise Pollution (Regulation and Control) Rules,2000;
8) The Ozone Depleting Substances (Regulation)Rules, 2000;
9) The Batteries (Management and Handling) Rules,2001;
10) The Manufacturing, Storage and Import of Hazardous Chemicals (Amendment) Rules, 2000;
11) The Hazardous Waster (Management and Handling - Amendment) Rules, 2000.

Among the environmental laws and regulations in India, those that are particularly relevant to this project are shown in Table below.

Table 7-13: Environmental Acts and Regulations in India

No.	Acts and regulations	Purpose & outlines	Enforcement day or amendment day
1	Environment (Protection) Act	Basic act on the environment gives the central government the authority to make rules for environmental protection	1986
2	Notification on Environment Impact Assessment of Development projects (and amendments)	Prescribes the procedures for obtaining environmental approval required for implementing projects that may have a significant impact on the environment.	2006,2009,2012
3	Wildlife Protection Act	Protect wildlife and birds through the establishment of national parks and reserves	1972, 1982, 1986, 1991, 1993, 2002, 2006, 2013
4	Forest (Conservation) Act	Forest conservation and management	1927, 1980
5	Air (Prevention and Control of Pollution) Act (and subsequent amendments)	To prevent air pollution, manage it, and promote mitigation	1981
6	Water (Prevention and Control of Pollution) Act (and subsequent amendments)	To prevent water pollution, control it, and improve water quality	1974, 1988, 2003
7	Hazardous waste Handling and management act, 1989	Permit procedure for management and handling of hazardous waste	1989, 2003
8	Noise Pollution (Regulation and Control) rules 2000	Noise regulation and management	2000
9	Solid Waste Management Rules 2016	Municipal solid waste collection, separation, storage, transportation, treatment and disposal regulations, final disposal site regulations, composting, leachate treatment and incineration standards, etc.	2016
10	Construction and Demolition Waste Management Rules	Disposal of construction and demolition waste such as construction materials, debris and rubble	2016

Source: JICA Survey Team

The Environment Impact Assessment Notification of 1994[6] is the first legal document established in India on Environmental Impact Assessment. The concept of EIA was introduced in 1979, but it was never mandatory for the government or private entities to conduct EIA.

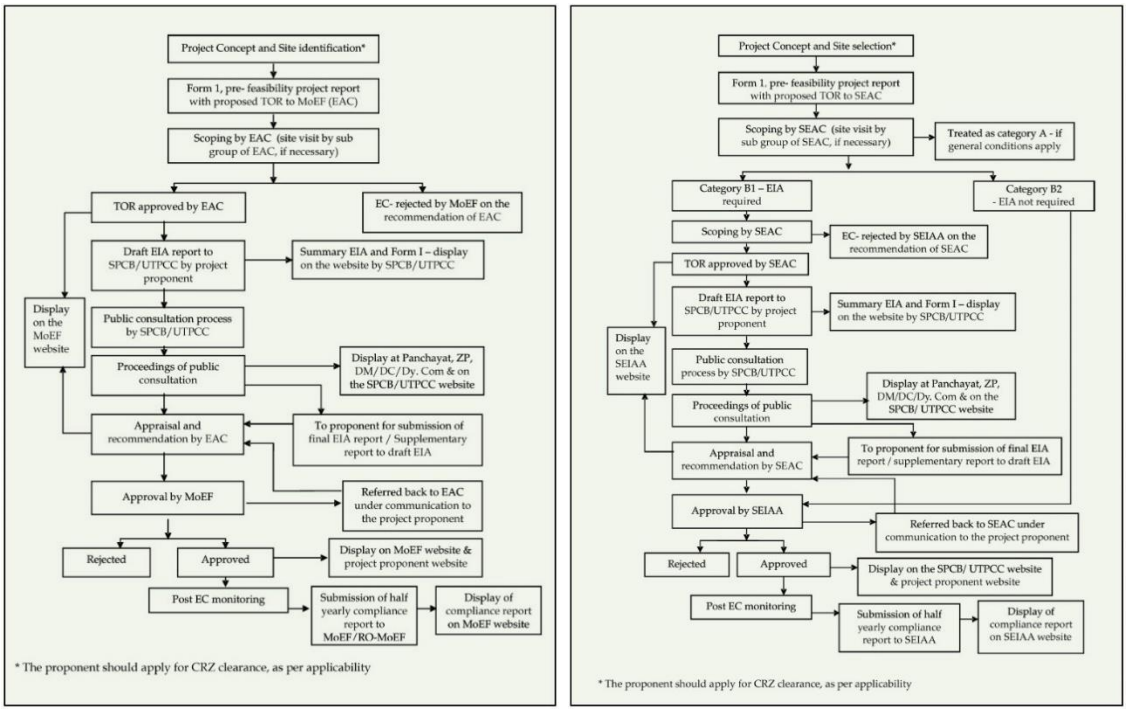
EIA notification 2006[7] succeeded the 1994 notification, and it is the primary EIA legislation in India thus far. This notification divided all projects into two categories: Category "A" and "B."

Figure 7-19 shows the legal procedure for environmental clearance procedures required for the projects screened as Category A and B. According to the Notification on the Environmental Impact Assessment of Development Projects, 2006, Environmental Clearance for matters falling under Category "A" is required from MOEFCC through recommendation by the Expert Appraisal Committee (EAC). For matters under Category "B", Environmental Clearance is required from the State Environment Impact Assessment Authority (SEIAA). The SEIAA is to base its decision

[6] Environment Impact Assessment Notification S.O.60 (E), dated 27/01/1994
[7] Environmental Impact Assessment Notification S.O. 1533(E) dated 14/09/2006

on the recommendations of a State or Union territory level Expert Appraisal Committee (SEAC) as to be constituted for in this notification. The EACs at the Central Government and SEACs at the state level should screen, scope, and appraise projects in Category "A" and Category "B" respectively. EACs and the SEAC are to meet once every month for screening, scoping and appraisal of development projects.

National level economic development projects as well as the projects of each industrial sector in India, are obliged to follow the guidelines of observing environmental impacts. Elaborating environmental management and monitoring programs are also one of the obligations.



Source: Environmental Impact Assessment Guidance Manual for Highways, 2010

Figure 7-19: Environmental Clearance Procedures for Category A (Left) and B (Right)

According to the and EIA notification amendment of 2006 and its gazetted amendments up to now, any highway project including expressways falls under Category A, if the project entails:

i) New National Highways; and
ii) Expansion of National Highways greater than 100km involving an additional right of way or land acquisition greater than 40m on the existing alignments and 60m on re-alignments and bypasses.

Category B if the project entails:

i) State Highway; and
ii) State Highway Expansion projects in hilly terrain (above 1,000 m AMSL) and or ecologically sensitive areas.

The amendment in 2014 on the notification[8] also applies that General Condition to the above such as:

"Any project or activity specified in Category 'B' will be appraised at the Central Level as Category 'A', if located as a whole or in part within 5 km from the boundary of: (i) Protected Areas indicated under the Wild Life (Protection) Act, 1972 (53 of 1972); (ii) Critically Polluted areas as indicated by the Central Pollution Control Board constituted under the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974) from time to time; (iii) Eco-sensitive areas as indicated under Sub-Section (2) of Section 3 of the Environment (Protection) Act, 1986, and (iv) inter-State boundaries and international boundaries;"

This project will contain two NH127B alignments (Assam side and Meghalaya side) and NH208, and it deals with these three alignments separately. NH208 contains the widening of national highways and the total length is more than 100 km. On the other hand, the extension of the improvement target alignment of NH127B in Assam accounts for approximetely 54km. Since it is less than 100km, it does not fall into category A and does not require EC.

In accordance with the above domestic law, even if this project does not require EC from MoEFCC, this survey will implement environmental and social considerations in accordance with JICA guidelines and we prepare EIA and RAP.

The necessity of public hearings is stipulated in Environment (Protection) Act, 1986 and the Notification of EIA, 2006. In applying for Environmental Clearance for a Category A or B project, the proponent is required to approach the Pollution Control Board for a public hearing. The Pollution Control Board needs to conduct a public hearing together with the EIA draft report, Environmental Management Plan, etc. Even if a public hearing for Environmental Clearance is not required, if the project employs some air polluting instrument (hot mixture for bitumen, etc.) it requires commissioning by the Pollution Control Board, based on the Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981.

(2) State Law on Environment (Assam State)

In connection with environmental law, the Ministry of Environment, Forest and Climate Change (MoEFCC) of the central government level and the State Environment Assessment Committee (SEAC) of the state government level will approve environmental permits and each review is being conducted.

In addition, the State Pollution Control Board (SPCB) will carry out approval under the Toxic Hazardous Materials Handling Act (1989). Regarding the environmental and social impact caused by this project and necessary procedures, interviews will be conducted with the project implementing body and related organizations and departments. Confirm the consistency between the Indian environmental system and the JICA Guidelines for Environmental and Social Considerations (April 2010). For the items that are inconsistent, we will fill the gap with the environmental research consultants, conducting an EIA survey locally, NHIDCL, the project implementing agency, State Public Works Department, and the department in charge of examining the EIA report of the state. ..

Assam has a state-level legal system that includes:

- Assam Forest Service (Class-I) Rule (1942)
- Assam Government's Guidelines for Compensatory Afforestation (2000)
- Assam (Control of Felling & Removal of trees from Non-forest Land) Rules (2002)

[8] http://www.moef.nic.in/sites/default/files/SO-1598-99.pdf accessed on 13 Jul. 2018.

- Assam Forest (Removal And Storage of Forest Produce) Regulation Act (2000)
- Assam Compensatory Afforestation Fund Rules (1994)
- Rules framed under the Water (Prevention & Control of Pollution) Act, 1974 (Assam Rules-1977)
- The Air (Prevention & Control of Pollution) Assam Rule, 1991, framed under Air (Prevention & Control of Pollution) Act, 1981
- The Assam Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Rules, 2015

The Assam Science Technology & Environment Council (ASTEC) was set up in the year 1987 under the Science & Technology Department (then Science Technology and Environment Department) of Government of Assam. It was set up as an autonomous Council as the main implementing wing of the State S&T Department. The Council is also responsible for developing S&T programmes and policies for the state of Assam.

(3) Gaps between Indian Law and JICA Guidelines on ESC

Applicability of JICA's Guidelines for Environment and Social Considerations (ESC) is required if a project is funded by JICA. If a significantly adverse impact on the environment or society has been identified in JICA-assisted project, the following has to be thoroughly considered and studied. Table below shows the comparison JICA Guideline and Laws in India regarding EIA.

Table 7-14: Gaps between JICA Guideline and Laws in India regarding ESC

No.	Items	JICA Guideline	Laws in India	Principle for this Project
1	ESC requirement	ESCs are pre-requisite and comprehensively discussed in JICA guidelines. JICA will take necessary measures to ensure that the appropriate ESC is given; When JICA reviews a project proposal and finds that the project could cause negative impacts on the environment or society, JICA advises the project proponents to provide appropriate ESC; If the negative impact of the project cannot be avoided or mitigated to an acceptable level, JICA will not support its implementation.	Separately discussed in each constriction, law, standard.	Compliance with JICA guidelines, the national constriction, law, standards will be referred and ensured.
2	Requirement of EIA	Environmental and social surveys at the EIA level (Category A projects) Proposed projects likely to have significant adverse impacts on the environment and society. Category A includes projects in sensitive sectors (ex. Roads, railways, and bridges), projects that have characteristics that are liable to cause adverse environmental impacts (ex. Large-scale involuntary resettlement), and projects located in or near sensitive areas. IEE level (Category B projects) Projects whose potential adverse impacts on the environment and society are less adverse than those of Category A projects.	EIA notification of 2006 5Projects requiring EIA (Category A projects) i)New National Highways ii) Expansion of National Highways greater than 100km involving an additional right of way or land acquisition greater than 40m on the existing alignments and 60m on re-alignments and bypasses. Projects whose requirements of EIA are judged by the state level Environment Impact Assessment Authority (Category B projects) i) State Highway ii) State highway Expansion projects in hilly terrain (above 1,000 m AMSL) and or ecologically sensitive areas	EIA will be prepared as category A in accordance with JICA Guidelines though not required by Laws in India

No.	Items	JICA Guideline	Laws in India	Principle for this Project
3	Scope of Impacts to Be Assessed	In addition to the direct and immediate impacts of projects, their derivative, secondary, and cumulative impacts as well as the impacts of projects that are indivisible from the project are also to be examined and assessed to a reasonable extent.	In addition to the direct and immediate impacts of projects, their derivative, secondary, and cumulative impacts as well as the impacts of projects that are indivisible from the project are also to be examined and assessed to a reasonable extent.	Derivative, secondary, and cumulative impacts as well as the impacts of projects that are indivisible from the project are also to be examined.
4	Avoid Adverse effects	Priority should be given to the avoidance of adverse impacts on the environment or society when a project is planned; Minimization or mitigation of impacts should be considered only if avoidance is not feasible and if the benefit of the project outweighs the cost of mitigation measures; The project proponents must assess the environmental and social impacts at the earliest possible stage of planning, and implement ESC measures in accordance with the ESC Guidelines.	Separately discussed in each constriction, law, standard.	The national and international laws and standards will be referred and ensured.
5	Stakeholder meetings/ Public consultation	Stakeholder meetings shall be held at the stages of the scoping draft and report draft.	Public consultation shall be conducted after submission of draft report.	To hold Stakeholder meetings at the stages of scoping draft and report draft.
6	Disclosure of EIA	EIA reports are required to be made available to local residents of the country in which the project is to be implemented. The EIA reports are required to be available at all times for perusal by project stakeholders such as local residents; and copying must be permitted.	MOEF&CC shall display the Summary of the draft EIA report on its website, and also make the full draft EIA available for reference at a notified place during normal office hours at the Ministry in Delhi.	To disclose EIA in accordance with JICA Guidelines.

No.	Items	JICA Guideline	Laws in India	Principle for this Project
7	Certificate regarding the environment and society	If the project requires a certificate other than an EIA regarding the environment and society, indicate the title of said certificate and confirm the approval. monitoring	Forest Clearance will be required. The Contractor has to obtain permits from MSPCB for setting up hot-mix plants, batching plants, etc., under the Air and the Water Acts, whose results shall be reported to the Project proponents.	To confirm requirement of permits in accordance with the laws in India.
8	Monitoring	available to local project stakeholders.	Project proponents are required to submit environmental management plan & programme. It shall be mandatory for the project management to submit every half a year compliance reports in respect to the stipulated prior environmental clearance terms and conditions.	To implement environmental monitoring in accordance with the laws in India.
9	Human rights	Development project should aim for fair distribution of its benefits and must not burden or exclude certain stakeholders for the sake of others; The project proponents must respect the rights of all people concerned, and pay special attention to vulnerable social groups such as women, elderly, the poor, people with disabilities, indigenous peoples, ethnic minorities, and other minority groups to ensure that they are involved in decision-making processes and that they benefit from the project	Six fundamental human rights in Indian Constitution. Rights Vulnerable social groups such as women, elderly, the poor, people with disabilities are covered. Regarding indigenous peoples, ethnic minorities, and other minority groups TTAADC will cover the situation.	To ensure human rights should be properly protected throughout the project period according as the national standards.

Source: JICA Survey Team

(4) Environmental Standards

A variety of environmental standards have been established by CPCB in accordance with the above-mentioned laws and regulations. The various standards directly related to this project are shown below.

1) National Ambient Air Quality Standards
2) Water Quality Criteria
3) Vehicular Exhaust
4) Auto Fuel Quality
5) Noise and Emission Limits for Diesel Engines for Generators
6) Noise Standards

In addition, emission standards for various manufacturing industries have been established in detail for each industry. This project is a road widening project (including new bypass construction). Therefore, in the waste, soil, air, water pollution, noise and vibration during construction, and road usage after the completion of construction work, the problems of noise and vibration due to the increase in traffic volume must be considered. Among these environmental pollution issues in this project, there are no clear regulations regarding waste during construction, soil pollution, and vibration.

Each Environmental standard is shown as the followings.

Table 7-15: Air Pollution Standard of India

S. No.	Pollutant	Time Weighted Average	Concentration in Ambient Air		
			Industrial, Residential, Rural and Other Area	Ecologically Sensitive Area (notified by Central Government)	Methods of Measurement
(1)	(2)	(3)	(4)	(5)	(6)
1	Sulphur Dioxide (SO_2), µg/m³	Annual*	50	20	- Improved West and Gaeke
		24 hours**	80	80	-Ultraviolet fluorescence
2	Nitrogen Dioxide (NO_2), µg/m³	Annual*	40	30	- Modified Jacob & Hochheiser (Na-Arsenite)
		24 hours**	80	80	- Chemiluminescence
3	Particulate Matter (size less than 10µm) or PM_{10} µg/m³	Annual*	60	60	- Gravimetric - TOEM
		24 hours**	100	100	- Beta attenuation
4	Particulate Matter (size less than 2.5µm) or $PM_{2.5}$ µg/m³	Annual*	40	40	- Gravimetric - TOEM
		24 hours**	60	60	- Beta attenuation
5	Ozone (O_3) µg/m³	8 hours**	100	100	- UV photometric - Chemilminescence
		1 hour**	180	180	- Chemical Method
6	Lead (Pb) µg/m³	Annual*	0.50	0.50	- AAS /ICP method after sampling on EPM 2000 or equivalent filter paper - ED-XRF using Teflon filter
		24 hours**	1.0	1.0	
7	Carbon Monoxide (CO) mg/m³	8 hours**	02	02	- Non Dispersive Infra Red (NDIR) spectroscopy
		1 hour**	04	04	
8	Ammonia (NH_3) µg/m³	Annual*	100	100	-Chemiluminescence
		24 hours**	400	400	-Indophenol blue method

Source: National Pollution Control Board, India

Table 7-16: Air Pollution Standard of IFC Guidelines (Reference)

Table 1.1.1: WHO Ambient Air Quality Guidelines[7,8]		
	Averaging Period	Guideline value in mg/m³
Sulfur dioxide (SO_2)	24-hour 10 minute	125 (Interim target-1) 50 (Interim target-2) 20 (guideline) 500 (guideline)
Nitrogen dioxide (NO_2)	1-year 1-hour	40 (guideline) 200 (guideline)
Particulate Matter PM_{10}	1-year 24-hour	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline) 150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate Matter $PM_{2.5}$	1-year 24-hour	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline) 75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
Ozone	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

Source: IFC General EHS Guidelines (2007)
https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/policies-standards/ehs-guidelines

Table 7-17: Water Pollution Standards in India

Designated best use	Class	Criteria
Drinking water source without conventional treatment but after disinfections	A	Total coliform organisms MPN/100ml shall be 50 or less pH between 6.5 and 8.5 Dissolved oxygen 6 mg/l or more Biochemical oxygen demand 2 mg/l or Less
Outdoor bathing (organised)	B	Total coliform organisms MPN/100ml shall be 500 or less pH between 6.5 and 8.5 *Dissolved oxygen 5 mg/l or more Biochemical oxygen demand 3 mg/l or Less
Drinking water source with con- ventional treatment followed by disinfection	C	Total coliform organisms MPN/ 100ml shall be 5000 or less pH between 6 and 9 Dissolved oxygen 4 mg/l or more Biochemical oxygen demand 3 mg/l or less
Propagation of wild life, fisheries	D	pH between 6.5 and 8.5 Dissolved oxygen 4 mg/l or more *Free ammonia (as N) 1.2 mg/l or less
Irrigation, industrial cooling, con- trolled waste disposal	E	pH between 6.0 and 8.5 Electrical conductivity less than 2250 micro mhos/cm Sodium absorption ratio less than 26 Boron less than 2mg/l

Source: National Pollution Control Board, India

Table 7-18: Water Pollution Standards in the US (Reference)

Pollutant (P = Priority Pollutant)	CAS Number	Freshwater CMC1 (acute) (µg/L)	Freshwater CCC2 (chronic) (µg/L)	Saltwater CMC1 (acute) (µg/L)	Saltwater CCC2 (chronic) (µg/L)
Acrolein (P)	107028	3ug/L	3ug/L	—	—
Aesthetic Qualities	—	—	—	—	—
Aldrin (P)	309002	3	—	1.3	—
Alkalinity	—	—	20000	—	—
alpha-Endosulfan (P)	959988	0.22	0.056	0.034	0.0087
Aluminum pH 5.0 - 10.5	7429905	--	--	—	—
Ammonia	7664417	—	—	—	—
Arsenic	7440382	340	150	69	36
Atrazine	1912249				
Bacteria	—	—	—	—	—
beta-Endosulfan (P)	33213659	0.22	0.056	0.034	0.0087
Boron	—	—	—	—	—
Cadmium (P)	7440439	1.8	0.72	33	7.9
Carbaryl	63252	2.1	2.1	1.6	—
Chlordane (P)	57749	2.4	0.0043	0.09	0.004
Chloride	16887006	860000	230000	—	—
Chlorine	7782505	19	11	13	7.5
Chlorpyrifos	2921882	0.083	0.041	0.011	0.0056
Chromium (III) (P)	16065831	570	74	—	—
Chromium (VI) (P)	18540299	16	11	1100	50
Color	—	—	—	—	—
Copper (P)	7440508	—	—	4.8	3.1
Cyanide (P)	57125	22	5.2	1	1

Pollutant (P = Priority Pollutant)	CAS Number	Freshwater CMC1 (acute) (µg/L)	Freshwater CCC2 (chronic) (µg/L)	Saltwater CMC1 (acute) (µg/L)	Saltwater CCC2 (chronic) (µg/L)
Demeton	8065483	—	0.1	—	0.1
Diazinon	333415	0.17ug/L	0.17ug/L	0.82ug/L	0.82ug/L
Dieldrin (P)	60571	0.24	0.056	0.71	0.0019
Endrin (P)	72208	0.086	0.036	0.037	0.0023
gamma-BHC (Lindane) (P)	58899	0.95	—	0.16	—
Gases, Total Dissolved	—	—	—	—	—
Guthion	86500	—	0.01	—	0.01
Hardness	—	—	—	—	—
Heptachlor (P)	76448	0.52	0.0038	0.053	0.0036
Heptachlor Epoxide (P)	1024573	0.52	0.0038	0.053	0.0036
Iron	7439896	—	1000	—	—
Lead (P)	7439921	82	3.2	140	5.6
Malathion	121755	—	0.1	—	0.1
Mercury (P)	7439976 22967926	1.4	0.77	1.8	0.94
Methoxychlor	72435	—	0.03	—	0.03
Methyl Tertiary-Butyl Ether (MTBE)					
Mirex	2385855	—	0.001	—	0.001
Nickel (P)	7440020	470	52	74	8.2
Nonylphenol	84852153	28 ug/L	6.6 ug/L	7 ug/L	1.7 ug/L
Nutrients	—	—	—	—	—
Oil and Grease	—	—	—	—	—
Oxygen, Dissolved Freshwater	7782447	—	—	—	—
Oxygen, Dissolved Saltwater					
Parathion	56382	0.065	0.013	—	—
Pentachlorophenol (P)	87865	19	15	13	7.9
pH	—	—	6.5 – 9	—	6.5 – 8.5
Phosphorus Elemental	7723140	—	—	—	—
Polychlorinated Biphenyls (PCBs) (P)	—	—	0.014	—	0.03
Selenium (P)	7782492	—	---	290	71
Silver (P)	7440224	3.2	—	1.9	—
Solids Suspended and Turbidity	—	—	—	—	—
Sulfide-Hydrogen Sulfide	7783064	—	2	—	2
Tainting Substances	—	—	—	—	—
Temperature	—	—	—	—	—
Toxaphene (P)	8001352	0.73	0.0002	0.21	0.0002
Tributyltin (TBT)	—	0.46	0.072	0.42	0.0074
Zinc (P)	7440666	120	120	90	81
4,4'-DDT (P)	50293	1.1	0.001	0.13	0.001

Source: https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table

Table 7-19: Fuel Standard in India

Diesel Specification

Contents	1996	2000	2005	2010
Cetane No, Min	45	48	48	51
Sulphur % W/w, Max	0.5	0.25 0.25(metro)	0.05	0.035
Distillation T95	-	370	370	360
Polyaromatic	-	-	-	11

Gasoline Specification

Contents	1996	2000	2005	2010
RVP at 38 Deg.c,kpa	35-70	-	35-60	60
Benzine % by Vol.,Max	5	5.0 3.0(metro)	3.0 (all) 1.0 (metro)	1
Lead G/m3, Max	0.15% (low Pb) 0.013% (unleaded)	0.013	0.013	0.005
Sulphur % by mass, Max	0.10 (low Pb) 0.20 (unleaded)	0.1	0.05	0.015
Aromatics % v/v., Max	-	-	45	42
Oxygen %by Vol., Max	-	-	2	2.7

Source: National Pollution Control Board, India

Table 7-20: Noise Standard by Diesel Generators in India

No.	Descriptio
1	The maximum permissible sound pressure level for new diesel generator (DG) sets with rated capacity upto 1000 KVA, manufactured on or after the 1st January, 2005 shall be 75 dB(A) at 1 metre from the enclosure surface.
2	Noise limits for diesel generator sets not covered by 1, shall be as follows:-
	2.1 Noise from DG set shall be controlled by providing an acoustic enclosure or by treating the room acoustically, at the users end.
	2.2 The acoustic enclosure or acoustic treatment of the room shall be designed for minimum 25 dB (A) insertion loss or for meeting the ambient noise standards, whichever is on the higher side (if the actual ambient noise is on the higher side, it may not be possible to check the performance of the acoustic enclosure/acoustic treatment. Under such circumstances the performance may be checked for noise reduction upto actualambient noise level, preferably, in the night time). The measurement for Insertion Loss may be done at different points at 0.5 m from the acoustic enclosure/ room, then averaged.
	2.3 The DG set shall be provided with proper exhaust muffler with insertion loss of minimum 25 dB (A).
	2.4 Guidelines for the manufacturers/ users of Diesel Generator sets shall be as under:-
	2.4 (1) The manufacturer shall offer to the user a standard acoustic enclosure of 25 dB (A) insertion loss and also a suitable exhaust muffler with insertion loss of 25 dB(A).
	2.4 (2) The user shall make efforts to bring down the noise levels due to the DG set, outside his premises, within the ambient noise requirements by proper citing and control measures.
	2.4 (3) Installation of DG set must be strictly in compliance with the recommendations of the DG set manufacturer.
	2.4 (4) A proper routine and preventive maintenance procedure for the DG set should be set and followed in consultation with the DG set manufacturer which would help prevent noise levels of the DG set from deteriorating with use.

Source: National Pollution Control Board, India

Table 7-21: Emission Standard in India (From 1991)

Norms	Passenger Car	Heavy Diesel Vehicles			
	CO (g/km)	CO (g/km)	HC (g.km.hr)	NOx (g.km.hr)	PM (g.km.hr)
1991Norms	14.3-27.1	14	3.5	18.0	-
1996 Norms	8.68-12.40	11.2	2.4	14.4	-
1998Norms	4.34-6.20	-	-	-	-
India stage 2000 norms	2.72	4.5	1.1	8.0	0.4
Bharat stage-II	2.2	4.0	1.1	7.0	0.2
Bharat Stage-III	2.3	2.1	1.6	5.0	0.1
Bharat Stage-IV	1.0	1.5	1.0	3.5	0.0

Source: National Pollution Control Board, India
Note: Bharat is the emission standard name of India, and Stage IV is the standard applied from April 2010. Same standard as Euro Stage

Table 7-22: Noise Standards in India (Vehicles)

S. No.	Type of vehicle	Noise Limits from 1st January, 2003, dB(A)
1.0	**Two wheeler**	
1.1	Displacement upto 80 cc	75
1.2	Displacement more than 80 cc but upto 175 cc	77
1.3	Displacement more than 175 cc	80
2.0	**Three wheeler**	
2.1	Displacement upto 175 cc	77
2.2	Displacement more than 175 cc	80
3.0	**Vehicles used for carriage of passengers and capable of having not more than nine seats, including the driver's seat**	74
4.0	**Vehicles used for carriage of passengers having more than nine seats, including the driver's seat, and a maximum gross Vehicle Weight(GVW) of more than 3.5 tonnes**	
4.1	With an engine power less than150 KW	78
4.2	With an engine power of 150 KW or above	80
5.0	**Vehicles used for carriage of passengers having more than nine seats, including the driver's seat: Vehicles used for carriage goods.**	
5.1	With maximum GVW not exceeding 2 tonnes	76
5.2	With maximum GVW greater than 3 tonnes but not exceeding 3.5 tonnes	77
6.0	**Vehicles used for transport of goods with a maximum GVW exceeding 3.5 tonnes.**	
6.1	With an engine power less than 75 KW	77
6.2	With an engine power of 75 KW or above but less than 150 KW	78
6.3	With an engine power of 150 KW or above,	80"

Source: National Pollution Control Board, India

Table 7-23: Noise Standards in India

Area Code	Category of Zones	Limits of Leq in dB(A)	
		Day time*	Night time*
A	Industrial	75	70
B	Commercial	65	55
C	Residential	55	45
D	Silence Zone **	50	40

Source: Gazette Notification dated 26th December 1989. It is based on the weighted equivalent noise level (Leq).
* Day time is from 6 am to 9 pm whereas night time is from 9 pm to 6 am
** Silence zone is defined as area up to 100 meters around premises of hospitals, educational institutions and courts. Use of vehicles horns, loud speakers and bursting of cracking are banned in these zones
These noise standards have been given the status of statutory norms vide Noise Pollution (Regulation and Control) Rules, 2000. However, these rules have changed the periods for 'Day Time' and 'Night Time' to 6 a.m. to 10 p.m. and 10 p.m. to 6 am respectively.

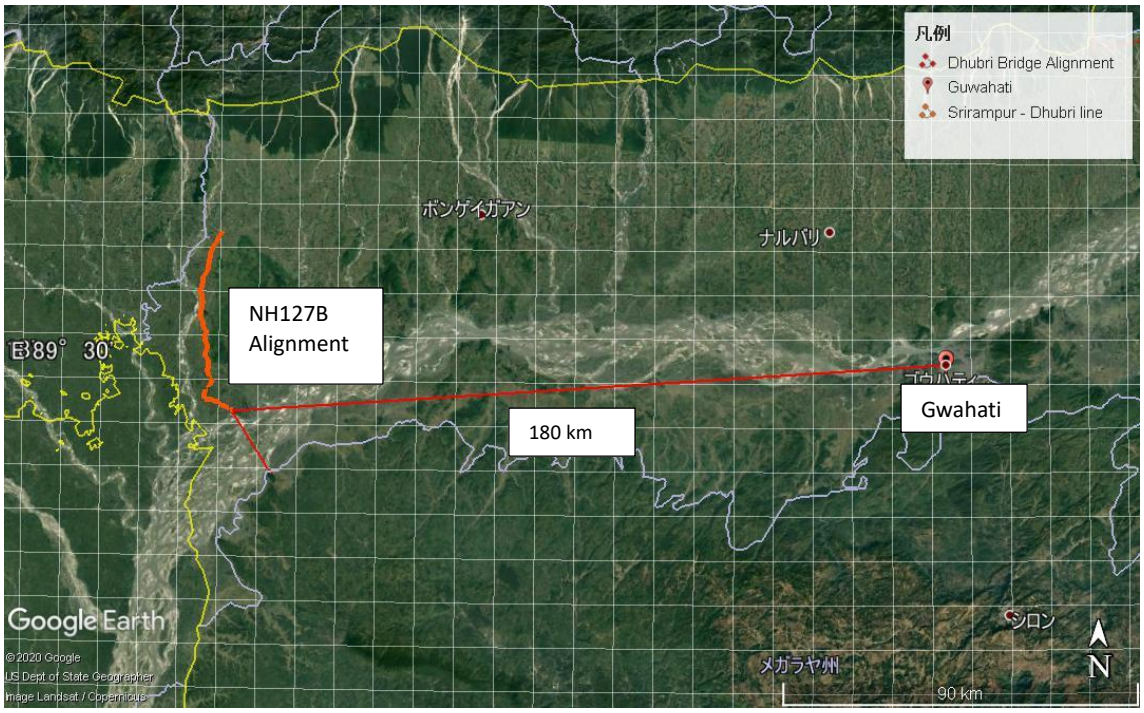
Table 7-24: Noise Standards by IFC Guidelines (References)

Table 1.7.1- Noise Level Guidelines[54]		
	One Hour L_{Aeq} (dBA)	
Receptor	Daytime 07:00 - 22:00	Nighttime 22:00 - 07:00
Residential; institutional; educational[55]	55	45
Industrial; commercial	70	70

Source: https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/policies-standards/ehs-guidelines

7.3.2 Environmental Monitoring at the State Level

The monitoring of the state is pursued by Assam Pollution Control Board and the monitoring is mainly occurred in Guwahati area, the central city next to the Assam's state capital, Dispur. The distance between Dhubri and Guwahati is approximately 180 km.



Source: JICA Survey Team

Figure 7-20: The City Where State Monitoring Mainly Take Place

(1) Monitoring on Water Quality at Assam State Level

Each state in India implements pollution control measures in accordance with the CPCB policy, and the same applies to the three northeastern states. Water quality monitoring is carried out in accordance with various standards established by CPCB. Table below shows the monitoring status and results at each location. Water quality is currently being monitored at 14 places in Assam. Biochemical oxygen consumption is worse than the standard.

Table 7-25: Monitoring on Water Quality in Assam (2017)

Lab. Ref No.	Source	Date & Time of Collection	pH	D.O. (mg/L)	C.O.D. (mg/L)	B.O.D. (mg/L)	RCl_2 (mg/L)	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	FreeNH_3-N (mg/L)	Chromium as Cr^{6+} (mg/L)	Lead as Pb (mg/L)	Zinc as Zn (mg/L)	Copper as Cu (mg/L)	Chromium as Cr (T) (mg/L)	Nickel as Ni (mg/L)	Cadmium as Cd (mg/L)	Mercury as Hg (mg/L)	Total Coliform	Faecal Coliform
GW-41/17 MBW-23/17	Water from Deepor Beel near Railway Bridge	18.01.2017 2.50 PM	7.3	5.7	41.9	**11.0**	0.44	149.0	70.0	Nil	BDL	0.015	0.051	0.012	0.018	BDL	BDL	BDL	2700	**2000**
GW-42/17 MBW-24/17	Water from Deepor Beel at mid-point.	18.01.2017 3.20 PM	7.2	5.5	20.2	**5.0**	0.89	147.0	50.0	Nil	BDL	BDL	0.013	BDL	BDL	BDL	BDL	BDL	**12000**	**1400**
GW-43/17 MBW-25/17	Water from Deepar Beel at northern-side	18.01.2017 3.45 PM	7.3	7.6	18.6	3.2	0.89	146.0	44.0	Nil	BDL	0.011	0.003	BDL	BDL	BDL	BDL	BDL	1500	300
GW-44/17 MBW-26/17	Water from Deepar Beel near view point	18.01.2017 4.05 PM	7.8	11.0	23.5	**3.9**	1.80	126.0	56.0	0.08	BDL	0.006	0.010	BDL	BDL	BDL	BDL	BDL	1500	300
GW-45/17 MBW-27/17	Water from Bahini River after confluence with Mora Bharalu at Pamohi	18.01.2017 4.30 PM	7.4	**Nil**	26.4	**9.4**	0.44	143.0	92.0	Nil	BDL	0.004	0.032	BDL	BDL	BDL	BDL	BDL	6400	**1400**
GW-46/17 MBW-28/17	Water from Deepar Beel near view point	18.01.2017 6.00 PM	7.8	5.8	26.4	**3.4**	1.80	123.0	60.0	0.09	BDL	0.002	0.007	BDL	BDL	BDL	BDL	BDL	2000	910
GW-47/17 MBW-29/17	Water from Deepor Beel at mid-point.	18.01.2017 6.20 PM	7.3	5.0	18.6	**4.6**	0.89	140.0	48.0	Nil	BDL	BDL	0.004	BDL	BDL	BDL	BDL	BDL	1100	360
GW-48/17 MBW-30/17	Water from Deepar Beel at northern-side	18.01.2017 6.40 PM	7.4	6.5	20.2	**3.8**	0.89	142.0	40.0	Nil	BDL	0.005	0.006	BDL	BDL	BDL	BDL	BDL	2000	360
GW-49/17 MBW-31/17	Water from Deepor Beel near Railway Bridge	18.01.2017 7.15 PM	7.4	**2.5**	43.5	**8.0**	0.44	145.0	74.0	Nil	BDL	0.010	0.042	0.005	0.012	BDL	BDL	BDL	2000	360
GW-54/17 MBW- 36/17	Water from Deepor Beel near Railway Bridge	24.01.2017 11.30 AM	7.1	**2.4**	43.5	**8.2**	0.80	172.0	62.0	Nil	BDL	0.014	0.014	0.008	0.011	BDL	BDL	BDL	2800	1500
GW-55/17 MBW-37/17	Water from Deepar Beel at northern-side	24.01.2017 11.50 AM	7.3	6.2	17.1	**4.4**	0.44	158.0	38.0	Nil	BDL	0.012	BDL	BDL	0.001	BDL	BDL	BDL	1600	360
GW-56/17 MBW-38/17	Water from Deepor Beel at mid-point.	24.01.2017 12.05 PM	7.4	5.4	15.5	**3.8**	Nil	154.0	42.0	Nil	BDL	0.014	0.035	BDL	BDL	BDL	BDL	BDL	9500	1900
GW-57/17 MBW-39/17	Water from Deepar Beel near view point	24.01.2017 12.15 PM	7.4	4.4	30.9	**4.2**	0.89	132.0	52.0	0.03	BDL	0.008	0.008	BDL	BDL	BDL	BDL	BDL	1500	600
GW-58/17 MBW-40/17	Water from Bahini River after confluence with Mora Bharalu at Pamohi	24.01.2017 1.10 PM	7.3	4.7	31.0	**12.2**	0.44	147.0	88.0	Nil	BDL	0.015	0.007	0.001	0.001	BDL	BDL	BDL	5300	**1600**

Source: Assam Pollution Control Board

(2) Air Quality Monitoring

Atmospheric monitoring is carried out in each state of India in accordance with the CPCB policy. The next table shows the results of atmospheric monitoring in Assam (7 points). Regarding PM, some places exceed the standard values of 60 μg/m3 of PM2.5 and 100 μg/m3 of PM10, which are the annual average national standards.

Table 7-26: Atmospheric Monitoring Results in Assam (2020)

Assam state（7 locations, 2020）

Date: 07.03.2020

NAMP Station	First week (01.02.20)			Second week (03.02.20 to 07.02.20)			Third week (10.02.20 to 15.02.20)			Fourth week (17.02.20 to 21.02.20)			Fifth week (24.02.20 to 29.02.20)		
	PM_{10} (μg/m³)	SO_2 (μg/m³)	NO_x (μg/m³)	PM_{10} (μg/m³)	SO_2 (μg/m³)	NO_x (μg/m³)	PM_{10} (μg/m³)	SO_2 (μg/m³)	NO_x (μg/m³)	PM_{10} (μg/m³)	SO_2 (μg/m³)	NO_x (μg/m³)	PM_{10} (μg/m³)	SO_2 (μg/m³)	NO_x (μg/m³)
Head Office, Bamunimaidam, Guwahati-21	-	-	-	228.11	9.66	19.66	217.78	9.66	21.66	218.00	9.00	16.33	111.22	10.33	15.33
Khanapara Guwahati-22	-	-	-	117.00	7.66	15.66	106.67	7.33	14.00	141.00	7.66	14.66	70.66	7.66	14.66
Boragaon Guwahati-34	-	-	-	226.66	6.66	14.33	209.66	7.00	15.33	228.66	7.33	16.00	153.66	6.66	16.00
ITI, Gopinathnagar Guwahati-16	-	-	-	238.33	6.33	15.66	219.33	6.66	15.66	240.00	7.00	15.66	143.33	7.00	15.66
Pragjyotish College, Santipur Guwahati-9	-	-	-	119.00	7.66	14.66	189.66	7.33	14.00	164.66	7.33	14.00	123.33	6.33	15.00
Guwahati University Guwahati-14	-	-	-	116.00	6.33	12.66	128.66	6.00	12.00	128.66	6.33	13.66	81.00	6.66	14.33
Average value for Guwahati City	-	-	-	**174.18**	**7.38**	**15.44**	**178.63**	**7.33**	**15.44**	**186.83**	**7.44**	**15.05**	**113.87**	**7.44**	**15.16**

Source: Assam Pollution Control Board

(3) Noise Monitoring

The noise monitoring monitors the noise caused by the use of fireworks and other items in each state on a daily basis and before and after national holidays (such as the Deepavali festival). No

mobile sources are monitored. The next table shows the results of noise monitoring in each state. When there is a celebration of a large religious event, there emerges the noise of the fireworks.

Noise pollution has also been recorded in residential areas near Guahati, the central city of Assam. There are some that do not meet the criteria for residential and commercial areas.

Table 7-27: Noise Monitoring Results in Assam (2017)

Assam (3 locations, 2017)

Noise Level Meter			
Location A: PANBAZAR MMC(Silence)			
Make:		Envirotech	
Model:		**SLM-109**	
Serial No:		530045	
Sl. no.	**Time Duration**	Normal Day 12.10.17	Deepawali Day 19.10.17
		Leq dB(A)	**Leq dB(A)**
1	18:00 Hrs to 19:00 Hrs	66.79	68.1
2	19:00 Hrs to 20:00 Hrs	68.00	73.9
3	20:00 Hrs to 21:00 Hrs	66.35	72.3
4	21:00 Hrs to 22:00 Hrs	59.00	73.1
5	22:00 Hrs to 23:00 Hrs	53.07	72.0
6	23:00 Hrs to 24:00 Hrs	49.40	68.5
Average L equivalent dB(A) Between (18:00 to 24:00 hrs)		**60.00**	**71.3**

Source: Assam Pollution Control Board

(4) Soil Pollution Monitoring

Soil pollution is monitored in each state. The following table shows the results of monitoring conducted in Assam. The results are at 5 locations.

Table 7-28: Soil Pollution Monitoring Results in Assam

Five locations in Assam (Guwahati 2017)

Bamunimaidam, Guwahati-21

Analysis Report of Soil Samples collected from differen locations of Deepar Beel

Lab. Ref No.	Date & Time of Collection	Date of Receipt	Source	pH (1:5)	Lead as Pb (mg/Kg)	Zinc as Zn (mg/Kg)	Copper as Cu (mg/Kg)	Chromium as Cr (T) (mg/Kg)	Nickel as Ni (mg/Kg)	Cadmium as Cd (mg/Kg)	Collected by
SD-07/17	18.01.17 2.50 PM	07.01.17	Soil Sample from Deepar Beel near Railway Bridge	6.6	24.50	115.2	48.00	57.80	2.80	BDL	D. N. Dev Choudhury, EES & M. Das, AEE
SD-08/17	18.01.17 3.20 PM	07.01.17	Soil Sample from Deepar Beel at mid point	6.3	20.00	100.8	41.10	53.70	6.80	BDL	
SD-09/17	18.01.17 3.45 PM	09.01.17	Soil Sample from Deepar Beel at northern side	6.1	23.30	85.8	34.00	56.40	3.30	BDL	
SD-10/17	18.01.17 4.05 PM	09.01.18	Soil Sample from Deepar Beel near View Point	6.1	24.10	103.9	47.70	64.60	18.40	0.2	
SD-11/17	24.01.17 1.10 PM	10.01.20	Soil Sample from Basistha Bahini River after confluence with Mora Bharalu at Pamohi	6.9	19.80	101.0	31.50	42.70	BDL	BDL	

Source: Assam Pollution Control Board

7.3.3 Legal Framework Applicable to Land Acquisition, Resettlement and Rehabilitation

(1) Legal Framework

As per the JICA Guidelines of Environmental and Social Considerations, this project is categorized as Category A. Thus, a full Resettlement Action Plan will be prepared on the possible impacts identified and measured in social impact assessment and mitigation measures as provisioned in the Entitlement Matrix created from the RFCTLARR Act, 2013 and Assam RFCTLARR Rules, 2015, and will be as per the JICA's Guidelines in accordance of World Bank's OP 4.12.

The Resettlement Plan will be disclosed and implemented in the project and the compensation and resettlement and rehabilitation assistances will be released to the PAHs before the Civil Construction starts. The Resettlement Plan will be implemented, and the Monitoring of the Resettlement Plan will be guided by the Policy and Guidelines of JICA and World Bank which is discussed in this Report.

Brief description of the legal provisions of relevant acts, policies and their applicability to the project is discussed below in Table 7-29.

Table 7-29: Legal Framework and Applicability

Sl. No.	Acts, Notifications and Policies	Relevance to this Project	Applicability
National and State Acts and Policies			
1	Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act (RFCTLARR, 2013	The act extends to the whole of India. The act provides for a transparent process and fair compensation in land acquisition for public purpose and provides for rehabilitation and resettlement of landowners and those affected by land acquisition. It comprises four schedules that provide the minimum applicable norms for compensation based on market value, multiplier and solatium; resettlement and rehabilitation (resettlement and rehabilitation) entitlements to landowners and livelihood losers; and facilities at resettlement sites for Project Affected Persons, besides providing flexibility to states and implementing agencies to provide higher norms for compensation and resettlement and rehabilitation.	Applicable to payment of compensation in association with Assam RFTCTARR Rules 2015. Not applicable to land acquisition as National Highway Act, 1956 is applied to it.
2	Assam Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Rules, 2015	State Government and also the Central Government department(s) or its organization (s) based on merit of its project may go in for the direct purchase of land for public purpose mainly involving the early commissioning of infrastructure projects like roads, railways, bridges, food go downs, drinking water, flood protection works and other similar projects, as the Government may consider, in rural and / or urban areas through Zilla Parishad/ Municipality/Municipal Corporation/other Government bodies and parastatals, as the case may be, by adopting, the following given procedures.	Applicable

Sl. No.	Acts, Notifications and Policies	Relevance to this Project	Applicability
3	The Right to Information Act, 2005	The act provides for setting out the practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, the constitution of a Central Information Commission and State Information Commissions and for matters connected therewith or incidental thereto.	Applicable
4	Minimum Wages Act, 1948	The act provides for fixing minimum rates of wages in certain employments. WHEREAS it is expedient to provide for fixing minimum rates of wages in certain employments	Applicable
5	Equal Remuneration Act, 1976	The act provides for the payment of equal remuneration to men and women workers and for the prevention of discrimination, on the ground of sex, against women in the matter of employment and for matters connected therewith or incidental thereto	Applicable
6	The Child and Adolescent Labour (Prohibition and Regulation) Act, 1986	The act prohibits the engagement of children in any occupations and to prohibit the engagement of adolescents in hazardous occupations and processes and the matters connected herewith or incidental thereto	Applicable
7	Scheduled Castes and Scheduled Tribes Orders (Amendment) Act 2002	This act provides the inclusion in the lists of Scheduled Tribes, of certain tribes or tribal communities or parts of or groups within tribes or tribal communities, equivalent names or synonyms of such tribes or communities, removal of area restrictions and bifurcation and clubbing of entries; imposition of area restrictions in respect of certain caste in the list of Schedule Castes and exclusion of certain castes and tribes from the list of Schedule Castes and Schedule Tribes, in relation to the states of Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Goa, Gujrat, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, .Maharastra, Manipur, Mizoram, Orissa, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh and West Bengal.	Applicable
8	The Constitution (Eighty-Ninth Amendment) Act, 2003	The Constitution (Eighty-Ninth Amendment) Act, 2003 amend the article 338 by insert article 338A on 28th September 2003. Thus the National Commission for Scheduled Castes and Scheduled Tribes was bifurcated into the National Commission for Scheduled Castes and the National Commission for Scheduled Tribes	Applicable
9	Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006	This act has been enacted to recognize and vest the forest rights and occupation of forest land in forest dwelling Scheduled Tribes and other traditional forest dwellers, who have been residing in such forests for generations, but whose rights could not be recorded.	Applicable

Sl. No.	Acts, Notifications and Policies	Relevance to this Project	Applicability
10	Schedule VI Sixth Schedule, Tribal Areas and Autonomous District/ Regional Councils	The Constitution of India makes special provisions for the administration of the tribal dominated areas in four states viz. Assam, Meghalaya, Tripura and Mizoram. As per article 244 and 6th Schedule, these areas are called "Tribal Areas", which are technically different from the Scheduled Areas under 5th schedule. Only the Governor is empowered to increase or decrease the areas or change the names of the autonomous districts. The Autonomous District Council (ADC) is the district within a state to which central government has given varying degrees of autonomy within the state legislature.	Applicable
11	National Tribal Policy in *2006*.	Ministry of Tribal Affairs had prepared a draft National Tribal Policy in 2006. This became out of context in view of certain legislative and policy changes and these necessitated further revision of the draft policy. Meanwhile, a High Level Committee (HLC) was constituted on 14.08.2013 to prepare a position paper on socio-economic status of STs and suggest a way forward. The Committee submitted its Report on 29.05.2014 which contains 108 recommendations cutting across various Central Ministries/Departments as well as State Governments.	Applicable
12	World Bank OP/BP 4.12 – Involuntary Resettlement	The project involves land acquisition for widening, realignments, junction improvements, bypasses etc. It would also adversely affect structures used for various purposes, livelihood of people (mainly earning their livelihood by means of petty shops and providing various services). Many of them have been operating in the government land. Thus both title holders and non-title holders alike would be affected as a consequence of the project.	Applicable
13	Worl Bank OP/BP 4.10 – Indigenous People	In the context of India Indigenous Peoples may be referred to "scheduled tribes". A part of the project area is under the administrative control of Bodoland Territorial Council. The policy on Indigenous People would not be triggered if presence of tribal groups with close attachment to land in the project area is not established as there is already a highway and the project is only upgrading it. Further, this policy is not triggered if there is no "collective attachment to geographically distinct habitats" or "institutions that are separate from those of the dominant society and culture".	Applicable
14	World Bank Policy – Access to Information	The policy governs the public accessibility of information in the Bank's possession. The Bank allows access to any information in its possession that is not on a list of exceptions. Documents such as all SIA and RAP will be disclosed both by the borrower and Bank.	Applicable
15	JICA Guidelines for Engironmental and Social Considerations	JICA encourages host country governments, including local governments, borrowers, and project proponents, to implement the appropriate measures for environmental and social considerations when engaging in cooperation activities. At the same time, JICA provides support for and examinations of environmental and social considerations in accordance with the guidelines. The detail is available at the link below. https://www.jica.go.jp/english/our_work/social_environmental/guideline/index.html	Applicable

Source: JICA Survey Team

(2) National Highway Act and RFCTLARR

The development of national highway networks has been one of the most important and priority interests of the nation even before the independence from the British rule. In order to realize the priority of the nation, the National Highways Act (1956) (NH Act) has been one of the most powerful laws in India. NH Act is applicable for land acquisition for any national highway development. Due to the controversies on compulsory land acquisition under the outdated acts including NH Act, the Government has significantly updated legal frameworks of land acquisition in India since 2013. For the improvement of NH-127B, two major laws and a guideline will be applied. Those three frameworks are 1) NH Act, 2) the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act (RFCTLARR), 2013, and 3) A Manual of Guidelines on Land Acquisition for National Highways Under the National Highways Act, 1956 (MORTH).

National Highways Act (NH Act)

NH Act had maintained the exclusive powers against other laws and personal rights despite controversies for its abilities and practices to acquire land compulsorily till 2015. Due to the controversies on low compensation decided by competent authorities or compulsory land acquisition under the out dated acts in India, the Government finally replaced the land acquisition act (1894) and enforced the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (RFCTLARR) in 2013 for any project except national priority sectors such as railway and road. However after 2015, even NH Act needs to adapt the safeguard provisions defined by the Schedule I, II and III of the RFCTLARR by the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement (Removal of Difficulties) Order 2015 dated 28th August 2015. The order has added an altogether new dimension for compensation to not only the landowners but also non-title holders as well as inclusion of adequate resettlement and rehabilitation assistance to ensure the recovery of the living standards.

RFCTLARR 2013 and its Schedules Applicable for NH Act

RFCTLARR replaced the colonial era land acquisition law (1894) and generally follows the international standards of social safeguards, particularly compensation for losses with market values (fair compensation) and adequate resettlement and rehabilitation assistance as per the National Rehabilitation and Resettlement Policy, 2007. Since the process of land acquisition under the RFCTLARR takes years without any limitation of process time by the competent authorities, priority sectors such as railways and national highways have retained powers to follow their simplified process for faster land acquisition. In addition, due to broad definitions for compensatory requirements, competent authorities for land acquisition (CALA) have faced difficulties to implement RFCTLARR in reality, which has triggered enormous numbers of court cases to solve all over India.

A Manual of Guidelines on Land Acquisition for National Highways Under the National Highways Act, 1956, MORTH (2018) (MORTH LA Guidelines 2018)

Due to the broad definitions of the RFCTLARR causing difficulties to enforce the RFCTLARR's provisions by CALA for the national highway projects, MORTH decided to define such broad definitions by "A Manual of Guidelines on Land Acquisition for National Highways Under the National Highways Act, 1956 (MORTH LA Guidelines 2018)" and instructed all agencies responsible for national highway development including NHIDCL to follow the manual. Some instructions to supplement the second schedule of RFCTLARR by the MORTH LA Guidelines (2018) is given in Table 7-30.

Table 7-30: Interpretation of the Second Schedule of RFCTLARR under the National Highways Act Projects

#	Elements	RFCTLARR Entitlement/ provision	Guidelines for MoRTH/ NHAI
1	Provision of housing units in case of displacement	(1) If a house is lost in rural areas, a constructed house shall be provided as per the Indira Awas Yojana specifications. If a house is lost in urban areas, a constructed house shall be provided, which will be not less than 50 sq mts in plinth area. (2) The benefits listed above shall also be extended to any affected family which is without homestead land and which has been residing in the area continuously for a period of not less than three years preceding the date of notification of the affected area and which has been involuntarily displaced from such area: Provided that any such family in urban areas which opts not to take the house offered, shall get a one-time financial assistance for house construction, which shall not be less than Rs. 150,000: Provided further that if any affected family in rural areas so prefers, the equivalent cost of the house may be offered in lieu of the constructed house: Provided also that no family affected by acquisition shall be given more than one house under the provisions of this Act. Explanation. – The houses in urban area may, if necessary, be provided in multistoried building complexes.	(i) This benefit is envisaged for the "affected family" in case of displacement. (ii) It is an admitted position that certain residential units may come within the RoW or extended RoW in the process of Land Acquisition for a road project. The owners of such dwelling units are in any case entitled to the price of land situated under such dwelling units, as also the assessed value of the structure. In addition to the above, such land-owners would also be entitled to a constructed house, if the affected family is displaced and dislocated from the area. (iii) The "Indira Awas Yojana", as referred to in the Second Schedule, has been revamped as "Pradhan Mantri Gramin Awaas Yojana" now for the Rural areas. (iv) Similarly, the Ministry of Housing and Urban Affairs is implementing a scheme known as "Pradhan Mantri Awas Yojana-Housing for All (Urban)" for the Urban areas. (v) Both the above Ministries have specified the size of the dwelling units being provided to the beneficiaries and the financial limits for construction/ provision of such units under the above schemes. It is natural that the costing of such units would also get suitably adjusted from time to time. (vi) It is, therefore, in order that a family, whose dwelling unit is lost in the process of acquisition of land for a NH Project and is displaced and dislocated from the affected area are also paid the amount prescribed under the two schemes at such time, subject to a minimum of Rs. 1.50 Lakh, in addition to the compensation amount for the land and the structure paid to them. (vii) The possibility of an affected family being in unauthorized occupation of such land cannot be ruled out. In such cases, while the

#	Elements	RFCTLARR Entitlement/ provision	Guidelines for MoRTH/ NHAI
			affected persons/ family would not be entitled to any compensation for the land and the assessed value of the structure (being in unauthorized occupation by way of encroachment on public land), however, the affected family, if displaced and dislocated, would still be entitled to the benefits as per para (vi) above under the Second Schedule if it has been in occupation of such place for a period of three years or more.
2	Land for land	In the case of irrigation project, as far as possible and in lieu of compensation to be paid for land acquired, each affected family owning agricultural land in the affected area and whose land has been acquired or lost, or who has, as a consequence of the acquisition or loss of land, been reduced to the status of a marginal farmer or landless, shall be allotted, in the name of each person included in the records of rights with regard to the affected family, a minimum of one acre of land in the command area of the project for which the land is acquired: Provided that in every project those persons losing land and belonging to the Scheduled Castes or the Scheduled Tribes will be provided land equivalent to land acquired or two and a one-half acres, whichever is lower.	Not attractive in the case of NH Projects
4	Choice of Annuity or Employment	(a) The appropriate Government shall ensure that the affected families are provided with the following options: (b) where jobs are created through the project, after providing suitable training and skill development in the required field, make provision for employment at a rate not lower than the minimum wages provided for in any other law for the time being in force, to at least one member per affected family in the project or arrange for a job in such other project as may be required; Or (c) one time payment of Rs. [redacted] per affected family; or (d) annuity policies that shall pay not less than two thousand rupees per month per family for twenty years, with appropriate indexation to the Consumer Price Index for Agricultural Labourers.	The scheme of "Rehabilitation and Resettlement" is applicable in cases where the landowner, whose land is acquired, and the landless family whose source of livelihood is dependent upon such landowner, is dislocated and compelled to change his place of residence or business due to such acquisition. This situation normally does not occur in the case of acquisition of land for linear projects like National Highways, unless a person's entire landholding is acquired. The Second Schedule refers to Sections 31(1), 38(1), and 105(3) of the RFCTLARR Act and these sections do not contain any provision in respect of this component of "Choice of Annuity or Employment". Secondly, even if it is assumed that these provisions have a correlation with the overall scheme of RFCTLARR Act, 2013, this component has multiple options, which have to be specified by the appropriate government. It is beyond the Competent Authority or the Collector to make an Award in this behalf in the absence of any provision by the Appropriate Government.

#	Elements	RFCTLARR Entitlement/ provision	Guidelines for MoRTH/ NHAI
5	Subsistence grant for displaced families for a period of one year	Each affected family which is displaced from the land acquired shall be given a monthly subsistence allowance equivalent to three thousand rupees per month for a period of one year from the date of award. In addition to this amount, the Scheduled Castes and the Scheduled Tribes displaced from Scheduled Areas shall receive an amount equivalent to fifty thousand rupees. In case of displacement from the Scheduled Areas, as far as possible, the affected families shall be relocated in a similar ecological zone, so as to preserve the economic opportunities, language, culture and community life of the tribal communities	This provision is attractive in the case of displaced families. This would be applicable in cases where the family whose land is acquired, or the landless family whose source of livelihood is dependent on such landowning displaced family. In each such case, an amount of Rs. 36,000 would be payable. Further, if such displacement of any family from the Scheduled Castes and the Scheduled Tribes takes place in the Scheduled Areas, an additional amount of Rs. [redacted]- would be payable.
7	Cattle shed/ Petty shops cost	Each affected family having cattle or having a petty shop shall get one-time financial assistance of such amount as the appropriate Government may, by notification, specify subject to a minimum of twenty five thousand rupees for construction of cattle shed or petty shop as the case may be.	The one-time financial assistance of Rs. [redacted]/- or the amount as may be prescribed by the appropriate government, would be payable to an affected family if the land where its source of livelihood was existing (petty shop/ cattle), comes under acquisition.
8	One-time grant to artisan, small traders and certain others	Each affected family of an artisan, small trader or self-employed person or an affected family which owned non agricultural land or commercial, industrial or institutional structure in the affected area, and which has been involuntarily displaced from the affected area due to land acquisition, shall get one-time financial assistance of such amount as the appropriate Government may, by notification, specify subject to a minimum of twenty-five thousand rupees	Applicable only in cases of involuntary displacement of the affected family from the affected area due to land acquisition
10	One-time Resettlement Allowance	Each affected family shall be given a one-time Resettlement Allowance of fifty thousand rupees only.	This provision would apply only where an affected family is displaced and has to re-settle somewhere else due to acquisition of his land.
11	Stamp duty and registration fee	(1) The stamp duty and other fees payable for registration of the land or house allotted to the affected families shall be borne by the Requiring Body. (2) The land for house allotted to the affected families shall be free from all encumbrances. (3) The land or house allotted may be in the joint names of wife and husband of the affected family.	This provision would be applicable only in rare cases where an alternate residence or land is allotted to the affected family. The amount of Stamp Duty would be paid only upon submission of documentary evidence to that effect.

Reference: A Manual of Guidelines on Land Acquisition for National Highways Under the National Highways Act, 1956, MORTH (2018)

7.3.4 Gaps between JICA Guidelines and National Legal Framework on Land Acquisition, Resettlement and Rehabilitation

After the full enforcement of RFCTLARR supplemented by the MORTH LA Guidelines (2018), there are only limited gaps between JICA Guidelines for Environmental and Social Consideration and National Legal Frameworks for NH projects. NHIDCL adapts JICA Env. Guidelines for those minor gaps, such as removal of three (3) years eligibility conditions for non-title holders. Full gap analysis between JICA Env. Guidelines and National Legal Frameworks for NH Projects on Land Acquisition, Resettlement and Rehabilitation is given in the table below.

Table 7-31: Gap Analysis JICA Guidelines and Legal Frameworks for the Proposed Project on Land Acquisition, Resettlement and Rehabilitation

No.	JICA Guidelines	Highways Act 1956 & its notifications* with RTFCLARR provisions	GAP between JICA Guidelines & Laws of India	Safeguard Policy of the Proposed Project
1	Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. (JICA GL)	MORTH Notification 2018 Determination of alignment/ route for widening of National Highways – approach reg.: "In such a situation, there is every likelihood of achieving a better alternative in the form of a greenfield alignment, a few km away, to the left/ right or north/south of the existing alignment. A few test cases have shown that most of these challenges are effectively met if we take up construction of greenfield NH arteries, especially where the traffic volumes justify up-gradation of a two-lane road to higher configurations,…"	No	Conduct alternative study and avoid as much as possible
2	When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken. (JICA GL)	MORTH Notification 2018. Policy Guidelines for land acquisition, tree felling, utility shifting across the alignment therefor – approach reg: The policy guidelines shall be followed henceforth to minimize the requirement of additional land acquisition, optimization of utility shifting and felling of trees.	No	Effective measures to minimize impact and to compensate for losses should be taken.

No.	JICA Guidelines	Highways Act 1956 & its notifications* with RTFCLARR provisions	GAP between JICA Guidelines & Laws of India	Safeguard Policy of the Proposed Project
3	People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels. (JICA GL)	Second and Third Schedules of the RFCTLARR Reg.: Compensation provisions ensures the restoration of living standards	No	PAPs who must be resettled involuntarily and whose means of livelihood will be hindered or lost must be sufficiently compensated and supported at least restore their standard of living, income opportunities and production levels to pre-project levels
4	Compensation must be based on the full replacement cost as much as possible. (JICA GL)	MORTH Notification 2016 Acquisition of missing plots from bulk acquisition through consent- reg., (vii): The account payee cheque towards the compensation/ replacement value of land shall be given to the title-holder at the time of registry. All taxes, registration charges and other expenses like value of the stamp papers, etc. shall be borne by the Project Implementing Authority;	No	The account payee cheque towards the compensation/ replacement value of land shall be given to the title-holder at the time of registry. All taxes, registration charges and other expenses like value of the stamp papers, etc. shall be borne by the Project Implementing Authority;
5	Compensation and other kinds of assistance must be provided prior to displacement. (JICA GL)	Act: The amount of compensation shall be deposited by the government before taking possession of the land. (3H)	Yes, timing of the assistance is missing in Highways act and relevant regulations and guidelines	Compensation and other kinds of assistance must be provided prior to displacement.
6	For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. (JICA GL)	No definition	Yes, no SIA requirements as per the Highways act	For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public
7	In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. (JICA GL)	No specific provisions as per the Highways act and notifications, except the individual negotiation with land title holders	Yes, no specific requirements under the highways act	In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance.

No.	JICA Guidelines	Highways Act 1956 & its notifications* with RTFCLARR provisions	GAP between JICA Guidelines & Laws of India	Safeguard Policy of the Proposed Project
8	When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people. (JICA GL)	No specific provisions as per the Highways act and notifications, except the individual negotiation with land title holders	Yes, no specific requirements under the highways act	When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people. (JICA GL)
9	Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans. (JICA GL)	No specific provisions as per the Highways act and notifications, except the individual negotiation with land title holders	Yes, no specific requirements under the highways act	Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans
10	Appropriate and accessible grievance mechanisms must be established for the affected people and their communities. (JICA GL)	The National Highways Act, 1956 contains provisions of appointment of an Arbitrator, as also reference to the Principal Civil Court of original jurisdiction for the disposal of any such disputes. Subject to the provisions of this Act, the provisions of the Arbitration and Conciliation Act, 1996 (26 of 1996) shall apply to every arbitration under this Act.	No	Appropriate and accessible grievance mechanisms must be established for the affected people and their communities
11	Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits. (WB OP4.12 Para.6)	Affected households, land and property will be identified through site investigation (3B), no specific provisions to prevent subsequent influx	No, except the prevention measures for subsequent influx of encroachment	Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits

No.	JICA Guidelines	Highways Act 1956 & its notifications* with RTFCLARR provisions	GAP between JICA Guidelines & Laws of India	Safeguard Policy of the Proposed Project
12	Eligibility of benefits includes, the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying. (WB OP4.12 Para.15)	Schedules of the RFCTLARR Reg. ensures eligibility of formal title holders and non-title holders (who are tenants, sharecroppers and artisans, excluding squatters and encroachers), but with at least 3 years of prior evidences	No, except condition of eligibility for non-title holders for proof of 3 years of occupation, and exclusion of squatters and encroachers from the affected family	Eligibility of benefits includes, the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying
13	Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based. (WB OP4.12 Para.11)	Available in the provisions of RTFCLARR (2013) but excluded by the MORTH manual of guidelines(2018)	Yes, preference is excluded by the MORTH LA guidelines	Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based and land is available.
14	Provide support for the transition period (between displacement and livelihood restoration). (WB OP4.12 Para.6)	Schedules of the RFCTLARR Reg. ensures the assistances during the transmission periods and the MORTH LA guidelines as well	No	Provide support for the transition period (between displacement and livelihood restoration) as per the RTFCLARR and MORTH LA guidelines
15	Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc. (WB OP4.12 Para.8)	Schedules of the RFCTLARR Reg. ensures socially vulnerable groups such as SC, ST and the MORTH LA guidelines as well	No	Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc
16	For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared. (WB OP4.12 Para.25)	None	ARAP is not defined by the Indian frameworks.	As the proposed project affect more than 200 people, full RAP should be prepared.

* including the MORTH "A Manual of Guidelines on Land Acquisition for National Highways Under the National Highways Act, 1956
Source: JICA Survey Team

7.3.5 Special Attentions to the Tribal Area Designated by the Schedule VI of the Constitution of India

The Constitution of India pays special attentions to the tribal communities and sets special safeguards for those designated tribal peoples and special protected area for those peoples. In the case of the state of Assam, article 244/244A and the Sixth Schedule defines the constitution of autonomous area by the designated tribal peoples. Essential parts of the constitution are extracted in the box below.

P*ART X*
THE SCHEDULED AND TRIBAL AREAS
244. Administration of Scheduled Areas and tribal areas.*—(1) The provisions of the Fifth Schedule shall apply to the administration and control of the Scheduled Areas and Scheduled Tribes in any State other than the States of Assam, Meghalaya, Tripura and Mizoram.*
(2) The provisions of the Sixth Schedule shall apply to the administration of the tribal areas in the States of Assam, Meghalaya, Tripura and Mizoram.

SIXTH SCHEDULE
[Articles 244(2) and 275(1)]
Provisions as to the Administration of Tribal Areas in the States of Assam, Meghalaya, Tripura and Mizoram
1. Autonomous districts and autonomous regions.*—(1) Subject to the provisions of this paragraph, the tribal areas in each item of Parts I, II and IIA and in Part III of the table appended to paragraph 20 of this Schedule shall be an autonomous district.*
2. Constitution of District Councils and Regional Councils.
3. Powers of the District Councils and Regional Councils to make laws.*—(1) The Regional Council for an autonomous region in respect of all areas within such region and the District Council for*

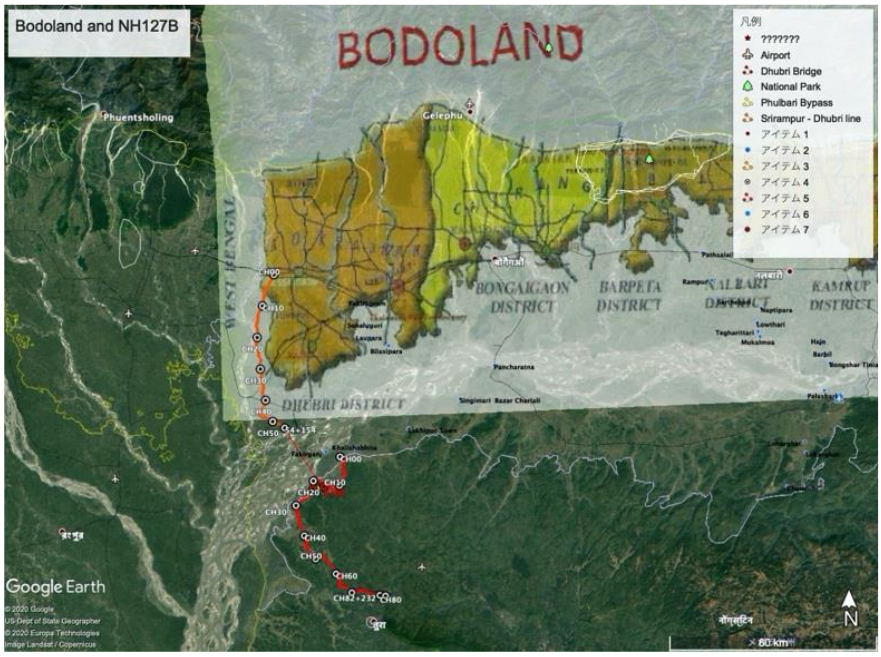
- *(a) the allotment, occupation or use, or the setting apart, of land, other than any land which is a reserved forest for the purposes of agriculture or grazing or for residential or other non-agricultural purposes or for any other purpose likely to promote the interests of the inhabitants of any village or town: Provided that nothing in such laws shall prevent the compulsory acquisition of any land, whether occupied or unoccupied, for public purposes by the Government of the State concerned in accordance with the law for the time being in force authorizing such acquisition;*
- *(b) the management of any forest not being a reserved forest;*
- *(c) the use of any canal or water-course for the purpose of agriculture;*
- *(d) the regulation of the practice of jhum or other forms of shifting cultivation;*
- *(e) the establishment of village or town committees or councils and their powers;*
- *(f) any other matter relating to village or town administration, including village or town police and public health and sanitation;*
- *(g) the appointment or succession of Chiefs or Headmen;*
- *(h) the inheritance of property;*
- *(i) marriage and divorce;*
- (j) *social customs*

3. Powers of the District Councils and Regional Councils to make laws…
4. Administration of justice in autonomous districts and autonomous regions…
6. Powers of the District Council to establish primary schools, etc…
20. Tribal areas…
Part I…
3. The Bodoland Territorial Area District…
Part II…
3. The Garo Hills District.
PART IIA
Tripura Tribal Areas District…

Source: The Constitution of India

As shown in the box above, the Constitutional provision under Article 244 (2) and its Sixth Schedule of the Constitution of India, the 'Tribal Areas' is defined and the governor of the concerned states "*may, by public notification, (a) include any area in 3[any of the Parts] of the said table, (b) exclude any area from 3[any of the Parts] of the said table, (c) create a new autonomous district, (d) increase the area of any autonomous district, (e) diminish the area of any autonomous district, (f) unite two or more autonomous districts or parts thereof so as to form one autonomous district, [(ff) alter the name of any autonomous district], (g) define the boundaries of any autonomous district.*." The objective behind setting up the Autonomous District Council (ADC) is to hand over certain administrative and legal authority to ADC in order that it may devote concerted attention to all aspects of cultural, social and economic improvement of the tribal people, who have been treated unequally/partially and suffering from such status and thereby could be free from practices in the majority of the population.

As shown in Figure 7-21, the alignment of NH127B in Assam state under the Project would overlap a little with the area under control of the Bodoland Territorial Council. Impacts on the Scheduled Tribe by the project is further discussed in Section 7.10, the Indigenous Peoples Plan below.



Source: Google Earth
http://www.bodoland.gov.in/btcataglance.html
https://wptbc.assam.gov.in/portlet-innerpage/bodoland-territorial-council
https://www.assamonline.in/about/bodoland

Figure 7-21: Project Alignment of NH127B and the Area under Jurisdiction of Bodoland Territorial Council

7.4 Alternative Analysis

(1) Comparison with without Project Scenario

In the state of Assam, the total freight transport output is likely to be doubled every 7 to 10 years and the passenger transport is also likely to be doubled every in 7 to 10 years. The 'With' and 'without' project scenarios are analysed with this backdrop of requirement of reliable quality infrastructure for sustained growth of state's economy and consequent well-being of its citizens.

The project will have multiple benefits. The project will unlock the potential of development of the area and fast connectivity. This project will also reduce the travel time substantially and it is expected that the journey from Srirampur in 30-40 minutes. The present journey time is more than 2-3 hours. In addition this project road will provide further other benefits like:

- Fast and safe connectivity resulting in saving in fuel, travel time and Total Transportation Cost to the Society;
- Employment opportunities to people;
- Development of local industry, agriculture and handicrafts;
- Transporting, processing and marketing of agricultural products;
- Reduction in accidents;
- Reduction in pollution;
- Opening of opportunities for new occupations;
- Better approach to Medical & Educational services and quick transportation of Perishable goods like fruits, Vegetables and Dairy products; and
- Improved quality of life for people and so on

Providing better connectivity will ensure that goods and people from areas covered by the road can move in and out of the areas quicker and save time. Increased trade and commerce activity are expected. Accounting just for the savings in the Vehicle Operating Costs makes the project viable. However, there would be an increase in the vehicular pollution-air and noise, in the vicinity of the highway. Some agricultural land will have to be diverted for road use to widen and realignments planned. This construction will result in loss of private properties and loss of living.

If the project is not implemented, the area will keep the rural landscapes of the croplands (34.7 %) and agricultural fallow land (26.1%) and mixed forest, so this is the positive environmental effects for without project option. However, there are a lot of negative environmental effects for without-project option. There is a likelihood that the roads presently carrying the traffic between Srirampur-Dhubri Road will deteriorate further and rampant traffic disruptions will hinder the free flow of the traffic. In the absence of the project, the road agencies responsible for construction and maintenance of NH-127B will also find it extremely difficult to generate funds for such a massive improvement of the road infrastructure from their own resources. Increased air pollution, due to slow moving traffic and congestion, will follow suit. Noise levels in built up portions will rise due to deterioration of the pavement as well as increased honking.

Therefore, "With" project scenario, with its minor adverse impacts is more acceptable than the "Without" project scenario which would mean an aggravation of the existing problems. The potential benefits of the proposed road improvements are substantial and far- reaching both in terms of the geographical spread and time. Hence, it is clear that the implementation of the project will be a definite advantage to State of Assam in order to achieve all-round development of its economy and progress of its people.

(2) Alternative Analysis

On most of the alignment of the project, improvement and widening of the existing road alignement are the best option to achieve the project objective. However, at three parts of the aligenment, bypasses detouring the existing alignment would be better option. Thus, analysis of alternatives to systematically compares feasible alternative alignments is conducted at the part of the alignment.

The below criteria with different weights were applied to compare the alternatives and select a preferred alignment: -

(Critical selection criteria)

- Land Acquisition: Minimum land to be acquired with maximum avoidance of involuntary resettlement. Try to acquire govt. land as much as possible and minimum acquisition of existing structures should be used for fixation of proposed alignment.
- Social Impacts: Impacts on the existing structures and resettlement and rehabilitation should be minimized.
- Cost Effectiveness: The project cost consisting of civil construction cost, LA & resettlement and rehabilitation utility shifting cost of the proposed alignment should be minimized.
- Environmental impacts: Loss of forest land, expected pollution and other environmental impacts should be minimized.

（Other selection criteria）

- Design Speed: The proposed alignment should maintain design speed between 80-100 kmph.
- Safety: The proposed alignment has been prepared in such a way that it requires minimum safety hazards along its entire length.
- Damage of utilities: Dagmage of utilities should be minimized.

A. Alternative Alignment Option Study for Bypass in between existing km 20.700 to km 23.450 (Near Madhya Petla Village)

Options	Symbol	Node	Length
Option-1		A – B – C - D	2,750m
Option-2		A – E – F – G - D	2,750m
Option-3		A – E – G - D	2,725m

Source: JICA Survey Team

Figure 7-22: GIS Image of Alternative Alignment Option Study for Bypass in between existing km 20.700 to km 23.450

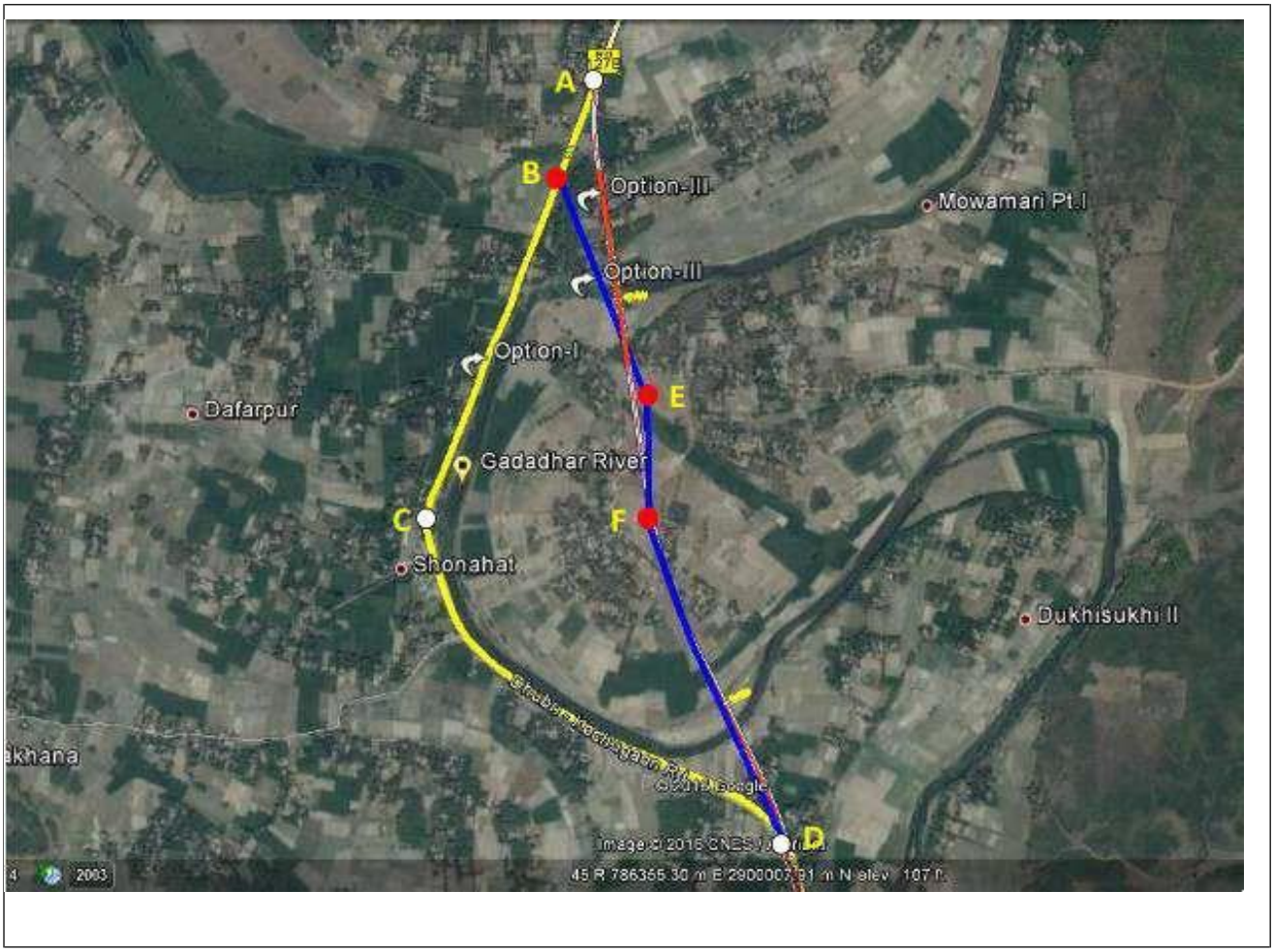
The comparison for proposed three alignment options are given below. In considering alternative routes, we drew conclusion based on discussion and evaluation applying all the above-mentioned multiple criteria.

As shown in the row No.7 and 8 of the table below, to avoid negative social impacts, Alighment-III is evaluated as the best followed by Alignment-II. However, Alignment-III has disadvantage against the other options when applying other criteria, as it involves huge land acquisition cost and civil cost. A comparison between Alignment-I and II shows that Alignment-II is preferred to Alignment-I, as it is avoiding Gangadhar River and built up location of Madhya petal village and has the least environmental impacts.

S. No.	Design, Safety & other Parameter	Alignment Option - I (Follows the Existing alignment)	Alignment Option - II (Red alignment)	Alignment Option- III (Blue alignment)
1	Design Speed	100 Kmph	100 Kmph	100 Kmph
2	Total Length	Total length 2.750 km	New alignment length 2.750 km,	New alignment length 2.725 km,
3	Land Acquisition	4.13 Hectare	16.50 Hectare	16.35 Hectare
4	Description of alignment	This Alignment Passes in between Gangadhar River &Gadadhar River within Builtup Area of Madhya Petla Village.	Alignment having right angle crossing over Gadadhar River.	Alignment having Skew crossing over Gadadhar River.
5	Environment-Lost Forest land	No forest land is diverted. Approximately 25 number of trees to be cut.	No forest land is diverted. Approximately 13 number of trees to be cut.	No forest land is diverted. Approximately 18 number of trees to be cut.
6	Environment-Expected Pollution	Due to the road geometry, congestion and narrow stretches, pollution is a major concern. This pollution is hardly mitigated due to engineering capacity /costing.	During construction phase both air and noise pollution will be a concern, which can be minimized by appropriate mitigation measures. The pollution during construction phase is temporary, once the road is operational, the air and noise pollution get reduced by smooth traffic movement.	During construction phase both air and noise pollution will be a concern, which can be minimized by appropriate mitigation measures.
7	Social Impact and R&R	Nearly 55 Nos. structures and one Big Temple are affected	Nearly 15 nos. structures are affected	Nearly 4 nos. structures are affected
8	Affected Family	Nearly 64 nos. Families are Structure lost	Nearly 18 nos. Families are Structure lost	Nearly 6 nos. Families are Structure lost
9	Social Impact and resettlement and rehabilitation	Nearly 45 Nos. structures and one Big Temple are affected	Nearly 4 nos. structures are affected	No conflict structures
10	Structures and Protective Works	Both side service/slip road, approx 800m Retaining/curtain wall/ grouted rip-rap, to protect embankment in contact with water and approx. 10 nos. balancing box culverts are required.	2 nos. minor Bridge (approx length 48m) required over Gadadhar River and approx. 8 nos. balancing box culverts are required.	1 nos. major Bridge required over Gadadhar River due to skew crossing (approx.. length 96m) and 1 no minor bridge required (approx length 48m) and approx. 8

S. No.	Design, Safety & other Parameter	Alignment Option - I (Follows the Existing alignment)	Alignment Option - II (Red alignment)	Alignment Option- III (Blue alignment)
				nos. balancing box culverts are required.
11	Civil Cost	159.9 million (59.2 million Per km)	240.4 million (86.6 million Per km)	302.4 million (106.7 million Per km)
12	resettlement and rehabilitation & LA Cost	LA Cost = 30.6 million resettlement and rehabilitation Cost = 46.5 million	LA Cost = 81.5 million resettlement and rehabilitation Cost = 4.2 million	LA Cost = 80.8 million resettlement and rehabilitation Cost = Nil
13	Total Cost Including resettlement and rehabilitation and LA	237.0 million	326.0 million	383.2 million
14	Utility Shifting Cost	Maximum	Minimum	Minimum
15	Result		√	
16	Comment	• Totally following the existing alignment • Land acquisition cost is less than option II &III • This Alignment Passes in between Gangadhar River & Gadadhar River with in Builtup Area of Madhya Petla Village. • Approximately 45 nos. of houses are affected at Madhya Petla village. So, LA and resettlement and rehabilitation cost is high. • Utility Shifting Cost maximum	• Totally No build-up alignment • R& R cost is less than option I • Right angle crossing over Gadadhar River • Civil cost is high because 2 nos. minor bridge is required over Gadadhar River. • LA Cost High • Utility Shifting Cost minimum	• Totally No build-up alignment • R& R cost is Nil • Civil cost is high because 1 nos. major Bridge required over Gadadhar River due to skew crossing (approx length 96m) and 1 no minor bridge required (approx length48m) • LA Cost high compare to Option I • Utility Shifting Cost minimum

B. Alternative Alignment Option Study for Bypass in between existing km 28.850 to km31.200 (Near Sonahat Village)



Legend

Options	Symbol	Node	Length
Option-1		**A – B – C – D**	2,350m
Option-2		**A – F – D**	1,900m
Option-3		**A – E – F – D**	1,660m

Source: JICA Survey Team

Figure 7-23: GIS Image of Alternative Alignment Option Study for Bypass in between existing km 28.850 to km 31.200

The comparison for proposed three alignment options are given below. In considering alternative routes, we drew conclusion based on discussion and evaluation applying all the above-mentioned multiple criteria.

Alignment-I has disadvantage in several criteria, as it involves hightse numbers of affected structures and families among the three option, huge cost for civil work and resettlement and rehabilitation, the geometrical conditions which would cause difficulty in construction and pollution. Comparing Alignment-II and III, though Alignment-III has a little less impacts on

structures and households than Alignment-II, Alignment II is preferred and recommended, as Alignment-II requires less private land acquisition and also less total project cost.

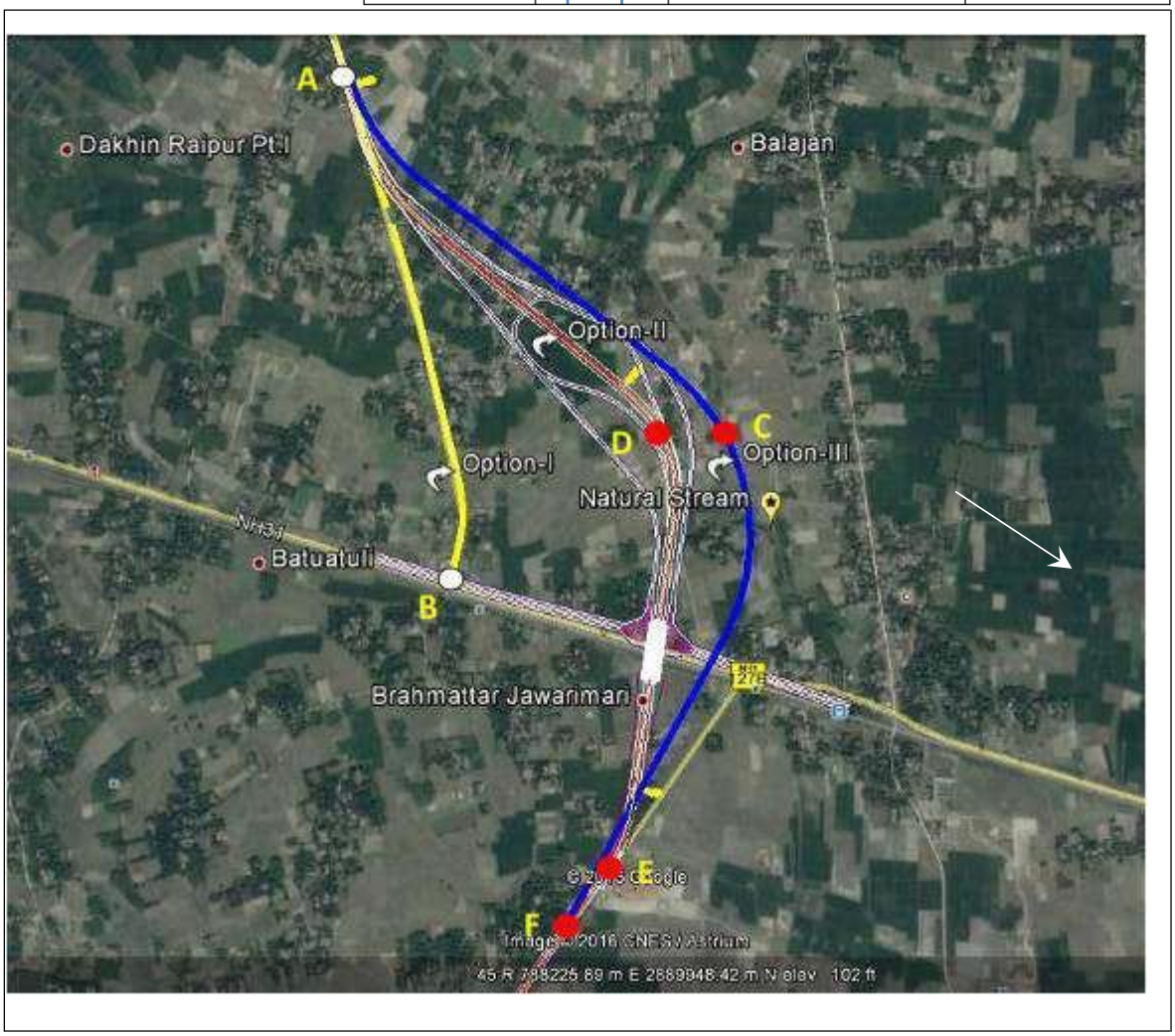
S. No.	Design, Safety &other Parameter	Alignment Option - I (Follows the Existing alignment)	Alignment Option - II (Red alignment)	Alignment Option- III (Blue alignment)
1	Design Speed	65 Kmph	100 Kmph	80 Kmph
2	Total Length	Total length 2.350 km	New alignment length 1.900 km,	New alignment length 1.660 km,
3	Land Acquisition	3.50 Hectare	Private Land=5.0 Ha; Govt Land = 6.40 Ha	Private Land=5.96 Ha; Govt Land = 4.0 Ha
4	Description of alignment	This Alignment passes along the Gadadhar River and Builtup Area of Sonahat Village.	No build-up Alignment passes through maximum Govt. Lands.	No build-up Alignment passes through minimum Govt. Lands.
5	Environment-Lost Forest land	No forest land is diverted. Approximately 98 number of trees to be cut.	No forest land is diverted. Approximately 17 number of trees to be cut.	No forest land is diverted. Approximately 19 number of trees to be cut.
6	Environment-Expected Pollution	Due to the road geometry, congestion and narrow stretches, pollution is a major concern. This pollution is hardly mitigated due to engineering capacity /costing.	During construction phase both air and noise pollution will be a concern, which can be minimized by appropriate mitigation measures. The pollution during construction phase is temporary, once the road is operational, the air and noise pollution get reduced by smooth traffic movement.	During construction phase both air and noise pollution will be a concern, which can be minimized by appropriate mitigation measures.
7	Social Impact and R&R	Nearly 78 Nos. structures and one Big Mosque are affected	Nearly 20 nos. structures are affected	Nearly 10 nos. structures are affected
8	Affected Family	Nearly 85 nos. Families are Structure lost	Nearly 20 nos. Families are Structure lost	Nearly 12 nos. Families are Structure lost
9	Social Impact and resettlement and rehabilitation	Nearly 90 Nos. structures and one Big Mosque are affected	Nearly 5 nos. structures are affected	Nearly affected
10	Structures and Protective Works	Both side service/slip road required in built up area, approx 1450m Retaining/curtain wall/ grouted rip- rap, to protect embankment in contact with water and approx. 8 nos. balancing box culverts are required.	2 nos. minor Bridge (approx length 48m) required over Gadadhar River and approx. 6 nos. balancing box culverts are required.	2 nos. minor Bridge (approx length 48m) required over Gadadhar River and approx. 6 nos. balancing box culverts are required.

S. No.	Design, Safety &other Parameter	Alignment Option - I (Follows the Existing alignment)	Alignment Option - II (Red alignment)	Alignment Option- III (Blue alignment)
11	Civil Cost	200.9 million (85.5 million Per KM)	206.6 million (108.7 million Per KM)	201.0 million (121.1 million Per KM)
12	resettlement and rehabilitation & LA Cost	LA Cost = 26.1 million Resettlement and rehabilitation Cost = 93.0 million	LA Cost = 24.7 million Resettlement and rehabilitation Cost = 5.2 million	LA Cost = 29.4 million Resettlement and rehabilitation Cost = 10.3 million
13	Total Cost including resettlement and rehabilitation and LA	320.0 million	236.5 million	240.8 million
14	Utility Shifting Cost	Maximum	Minimum	Minimum
15	Result		√	
16	Comment	Totally following the existing alignment Land acquisition cost is less than option II & III	Totally No build-up alignment R& R cost is less than option I & III	Totally No build-up alignment resettlement and rehabilitation cost is less than Option I
17		This Alignment passes along with Gadadhar River so protection cost is so high Approximately 90 nos. of houses are affected at Sonahat village. So, LA and resettlement and rehabilitation cost is also high. Poor Geometry. Design Speed has not reached as per standard.	Civil cost is high because 2 nos. minor bridge is required over Gadadhar River.	Civil cost is high because 2 nos. minor bridge is required over Gadadhar River. R& R cost is more than Option II

C. Alternative Alignment Option Study for Bypass in between existing km 39.750 to km 41.900 (Near Saheb ganj Village)

Legend:

Options	Symble	Node	Length
Option-1		**A – B - F**	2,150m
Option-2		**A – D - E**	2,050m
Option-3		**A – C - F**	2,250m



Source: JICA Survey Team

Figure 7-24: GIS Image of Alternative Alignment Option Study for Bypass in between existing km 39.750 to km 41.900

The comparison for proposed three alignment options are given below. In considering alternative routes, we drew conclusion based on discussion and evaluation applying all the above-mentioned multiple criteria.

The cost of the grade separator is not considered in this analysis of alternative alignment options as it is applicable to all the three options.

Alignment-I has disadvantage against the other options, as number affected structures and households are the biggest in this option, and so is the cost of LA and R&R. The civil construction cost is also the biggest in Alignment-I. Comparing Alignment-II and III, Alignment-II is preferred,

as the alignment is shorter, land acquisition and civil construction is less, though it has slightly more households and structure affected.

S. No.	Design, Safety &other Parameter	Alignment Option - I (Follows the Existing alignment)	Alignment Option - II (Red alignment)	Alignment Option- III (Blue alignment)
1	Design Speed	100 Kmph	100 Kmph	100 Kmph
2	Total Length	Total length 2.150 km	New alignment length 2.050 km,	New alignment length 2.250 km,
3	Land Acquisition	3.23 Hectare	12.30 Hectare	13.50 Hectare
4	Description of alignment	This Alignment passes through Builtup Area of Saheb Ganj Village.	This Alignment passes through completely No build-up land and some structures are to be effected.	This Alignment passes through completely No build-up land & one settlement area are effected
5	Environment-Lost Forest land	No forest land is diverted. Approximately 20 number of trees to be cut.	No forest land is diverted. Approximately 13 number of trees to be cut.	No forest land is diverted. Approximately 19 number of trees to be cut.
6	Environment-Expected Pollution	Due to the road geometry, congestion and narrow stretches, pollution is a major concern. This pollution is hardly mitigated due to engineering capacity /costing.	During construction phase both air and noise pollution will be a concern, which can be minimized by appropriate mitigation measures. The pollution during construction phase is temporary, once the road is operational, the air and noise pollution get reduced by smooth traffic movement.	During construction phase both air and noise pollution will be a concern, which can be minimized by appropriate mitigation measures.
7	Social Impact and R&R	Nearly 55 Nos. structures and one Big Mosque are affected	Nearly 20 nos. structures are affected	Nearly 12 nos. structures are affected
8	Affected Family	Nearly 68 nos. Families are Structure lost	Nearly 22 nos. Families are Structure lost	Nearly 15 nos. Families are Structure lost
9	Civil Construction Cost (Without Grade Separator)	104.3 million (48.5 million Per KM)	85.3 million (41.6 million Per KM)	93.3 million (4.15 million Per KM)
10	Resettlement and rehabilitation & LA Cost	LA Cost = 23.9 million resettlement and rehabilitation Cost = 62.0 million	LA Cost = 60.8 million resettlement and rehabilitation Cost = 5.2 million	LA Cost = 67.0 million resettlement and rehabilitation Cost = 25.8 million
11	Total Cost including resettlement and rehabilitation and LA	190.2 million	151.2 million	185.8 million
12	Utility Shifting Cost	Maximum	Minimum	Minimum

S. No.	Design, Safety &other Parameter	Alignment Option - I (Follows the Existing alignment)	Alignment Option - II (Red alignment)	Alignment Option- III (Blue alignment)
13	Results		√	
14	Comments	Totally following the existing alignment Land acquisition cost is less than option II & III	This Alignment passes through completely No build-up land and some structures are to be effected.	Totally No build-up alignment
15		Approximately 60 nos. of houses are affected at Saheb Ganj village. So, LA and resettlement and rehabilitation cost is also high.	Total Cost is less than option I & III Short length than option III	Total Cost is higher than option I & II

7.5 Scoping and Analysis of Alternatives based on Generic Concept of Hilly Road

In this section, we will do scoping to determine the extent of the environmental and social consideration items considered essential and the investigation method.

7.5.1 Survey TOR

Table 7-32: Survey TOR

Impact item	Prediction and evaluation method
Soil	Predict the impact based on the results of the field survey, literature and similar cases reviews, and road design (scale of cuts and fills)
Soil erosion	Predict the impact based on the results of the field survey, literature and similar cases reviews, and road design (scale of cuts and fills)
Hydrology /hydrology	Predict the impact based on the results of the field surveys and the results of hydraulic and hydrological surveys, and plan the appropriate placement of culverts.
Ecosystem	Investigate the general condition of ecosystems and flora (villages, slash-and-burn, natural forests, plantations) that characterize the areas along the railway line, and their relationships with other ecosystems. Select ecologically important areas, including areas near protected areas in two seasons(the dry and rainy seasons): field surveys at least one season and one from secondary source Confirm the existence of valuable species around the 127B line through field surveys and interviews with related organizations and neighboring residents . Check the type, size, and distribution of the main row of trees. Study on literature and similar cases reviews to predict the impacts.
Protected area	Confirm the condition of the natural environment in the vicinity of the project alignment through site surveys and interviews with related organizations and residents around the project alignment . Study on literature and similar cases reviews to predict the impacts.
Landscape	Consider the potential of the entire route along the project alignment and tourism potentials through site surveys and interviews with related organizations and residents around the project alignment. Evaluate the landscapes considering the harmony and continuity of the proposed landscape.
Natural disasters	Areas with a high risk of disaster will be selected through field surveys and interviews with relevant organizations and residents around the project alignment. Study on literature and similar cases reviews to predict the impacts.
Air quality	Measure roadside NO 2 and PM 2.5 PM 10 . The survey method conforms to the environmental standards of India.
Water quality	Measure the water quality (pH , BOD , COD , SS , coliforms) of the river that crosses the project alignment . Study on literature and similar cases reviews to predict the impacts.
Soil pollution	Study on literature and similar cases reviews to predict the impacts.
Noise / vibration	Predict roadside equivalent noise level. The survey method conforms to Indian or international standards. Study on literature and similar cases reviews to predict the impacts.
Waste / hazardous materials	Investigate the collection/disposal status of waste along the road and the status of illegal dumping (location, amount and type of waste, etc.). Study on literature and similar cases reviews to predict the impacts.
Involuntary Relocation of residents	Census survey predicts the number of involuntary resettlement due to widening work. Conduct surveys on affected residents and compensation details.

Impact item	Prediction and evaluation method
Land use	Predict impact based on field survey results and literature reviews and similar cases
Use of local resources	Predict impact based on field survey results and literature reviews and similar cases
Basic plan, regional / city plan	Predict impact based on field survey results and literature reviews and similar cases
Social organizations and local decision-making organizations	Predict impact based on field survey results and literature reviews and similar cases
Social infrastructure and services	Study on literature and similar cases reviews to predict the impacts. Confirm the buried objects such as telephone poles, water pipes, optical cables, etc. in the road site by conducting field surveys and collecting information by related organizations.
Local economy and life/living	Predict impact based on field survey results and literature reviews and similar cases
Uneven distribution of damage and benefits	Predict impact based on field survey results and literature and similar cases reviews
Conflict of interest in the region	Predict impact based on field survey results and literature and similar cases reviews
Water use, water rights and community rights	Predict impact based on field survey results and literature and similar cases reviews
Cultural and historical heritage	Confirm the location, scale and importance of cultural heritage along the road. Study on literature and similar cases reviews to predict the impacts.
Religious facilities	Check the location and scale of religious facilities such as graveyards and churches along the road. Study on literature and similar cases reviews to predict the impacts.
Sensitive Facilities (ex. Hospital, school, precision machine factory)	Check the locations of roadside hospitals, schools, nurseries, recreational facilities, and religious facilities that require special consideration. Predict impact based on field survey results and literature reviews and similar cases
Poor people	Predict the impact based on the survey results of affected residents and literature reviews and similar cases.
Ethnic Minorities/ Indigenous People	Predict the impact based on the results of field surveys and literature reviews such as demographics and similar cases.
Gender	Study on literature and similar cases reviews to predict the impacts.
Public Health (sanitation and infectious diseases)	Study on literature and similar cases reviews to predict the impacts.
Occupational safety and health	Study on literature and similar cases reviews to predict the impacts.
Accidents	Study on literature and similar cases reviews to predict the impacts.
Climate change	Literature and similar cases reviews and consider adaptation measures that should be included in road design.

Source: JICA Survey Team

7.5.2 Scoping Matrix

The scoping matrices for Assam are displayed.

Table 7-33: Scoping Matrix

Item	Scoping Analysis of the Anticipated Environmental Impacts			
	Pre-construction	Construction Stage	Operation Stage	Rational of the Impact Assessment
Natural Environment				
Climate/ Meteorological Phenomena				P: No impact is expected.
				C/O: Impact on microclimate would occur but to the extent that they are of negligible scale.
Topography		✓		P: No impact is expected.
				C: Changes in topographic conditions over the project area takes place due to the requirement of cutting and filling work.
				O: Topographic conditions should become stable after the completion of construction works, which include slope protection and stabilization.
Geology				P: No impact is expected.
				C: No impact is expected.
				O: No impact is expected.
Soil Erosion		✓	✓	P: No impact is expected.
				C: Soil erosion is expected particularly during the monsoon period.
				O: The Project is expected to improve the conditions and thus reduce the risk of soil erosion as measures of slope protection and stabilization should prevent soil erosion.
Hydrology		✓	✓	P: No impact is expected.
				C: Construction work may cause minor and temporary impacts on hydrology because of cutting and filling.
				O: Cutting and/or filling should result in permanent changes of local hydrology.
Groundwater				P: No impact is expected.
				C: The project does not envision the use of groundwater. There is no tunneling works.
				O: No impact is expected during the operation and maintenance stages.
Ecosystem, Flora, Fauna and Biodiversity		✓	✓	P: No impact is expected.
				C: During the construction period, mountain ecosystem including local flora and fauna as well as forest/wooded areas will be damaged to some extent.
				O: Increase of traffic volume will cause negative impacts on ecosystem including fauna and flora along the road.
Protected Area/ Forest Reserve			✓	P: No impact is expected.
				C: There is no protected area adversely affected. However, significant area of forest has to be cleared for bypasses.
				O: Increase in emissions due to growing traffic volume will negatively affect the existing forest and surrounding ecosystem. Compensatory afforestation program will be a part of the Project.
Coastal Zone				P/C/O: There is no coastal zone subject to project intervention.

Item	Scoping Analysis of the Anticipated Environmental Impacts			
	Pre-construction	Construction Stage	Operation Stage	Rational of the Impact Assessment
Landscape			✓	P: No impact is expected.
				C: Changes in landscape during the construction work would cause significant landscape changes while it would be temporary to the construction period.
				O: The project should explore possibilities to develop scenic view points along the road.
Natural Disaster		✓	✓	P: No impact is expected.
				C: Many areas of the project area are prone to landslide during the construction period.
				O: Slope protection/stabilization measures and drainage are expected to significantly reduce the risk of natural disaster.
Pollution				
Air Pollution		✓	✓	P: No impact is expected.
				C: Some negative impacts are expected due to operation of construction equipment and vehicles. One of these is the dust incidental to earthwork especially during the dry season.
				O:Air pollution is expected to increase due to increase traffic volume on the road.
Offensive Odor				P/C/O: No impact is expected.
Water Pollution		✓	✓	P: No impact is expected.
				C: Turbid water due to the earthworks, bridge pier construction work and wastewater effluents from construction workers' camps/yards are expected to pollute the surrounding rivers/canals to some extent.
				O: Some impacts on water quality in surrounding water bodies are expected due to water discharge from road users and wastewater from maintenance activities.
Bottom Sediment Contamination		✓		P: No impact is expected.
				C: Some construction materials such as cement and sand are expected to be washed out mainly by rain.
				O: Some wastewater will be generated from maintenance activities along the road, the impact on bottom sediment from the wastewater will be negligible.
Soil Contamination		✓		P: No impact is expected.
				C: Impacts on soil from deposition of pollutants from construction materials in the construction site are expected to be small. Since there is no major industrial activity along the road, it is unlikely that soil along the road is already polluted.
				O: No impact is expected.
Ground Subsidence				P/C/O: No impact is expected.

Item	Scoping Analysis of the Anticipated Environmental Impacts			
	Pre-construction	Construction Stage	Operation Stage	Rational of the Impact Assessment
Noise and Vibration		✓	✓	P: No impact is expected. C: Noise and vibrations are generated by operation of construction equipment and vehicles, although they are temporary. Construction schedule should take into account the location of schools, hospitals and religious facilities that require silence in part of the day. O: Noise and vibration levels are likely to increase due to greater traffic volume along the road. Specific measures may be required to minimize impacts on schools, hospitals and religious facilities.
Sunshine Obstruction				P/C/O: No impact is expected.
Wastes/ Hazardous Materials		✓	✓	P: No impact is expected.
				C: Waste from construction workers' camps are expected to be generated. Waste generated from construction and demolition work may include hazardous materials that must be treated before final disposal.
				O: Waste will be generated from road users and workers of maintenance works.
Social Environment				
Involuntary Resettlement	✓			P: Land acquisition of approximately 142.688 ha of private land including residential and commercial facilities is required. Large-scale (387 people) involuntary resettlement will occur, including urban areas with structures on both sides of the road. Appropriate livelihood recovery support is required for the people to be relocated. Minimizing resettlement is a road design priority.
				C/O: There is a high possibility of resettlement to adjacent areas, and it is assumed that there will be little impact after resettlement due to compensation and rehabilitation support.
Land Use	✓	✓	✓	P: Land acquisition and involuntary resettlement are likely to cause changes in existing land use pattern.
				C: While changes in land use associated with construction work are relatively minor at expansion section of the existing road, land usage, including cultivation, shifting cultivation and agro-forestry, might be significantly affected at bypass sections.
				O: The development due to the Project will induce a change in land use along the alignment. Change in land use will be sparked off as a result of land speculation. Greater traffic volume may affect the use of road and surrounding area by local residents.
Utilization of Local Resources		✓	✓	P: No impact is expected.
				C: Mass-scale use of local resources such as sand and quarrying for construction activities may obstruct the utilization by the local people for other purposes.
				O: Improvement in road infrastructure may lead to over exploitation of the environmental resources (e.g. too much groundwater withdrawal, indiscriminate wastewater disposal, from industrial areas etc.).

Item	Scoping Analysis of the Anticipated Environmental Impacts			
	Pre-construction	Construction Stage	Operation Stage	Rational of the Impact Assessment
General, Regional /City Plans			✓	P: No impact is expected.
				C: No impact is expected.
				O: Better infrastructure network may trigger influx of outsiders and economic development in the region.
Social Institutions and Local Decision-making Institutions	✓	✓	✓	P: Land acquisition and involuntary resettlement are likely to affect social institutions such as social capital and local decision-making institutions.
				C: Social capital and local decision-making institutions will be affected by the influx of resettling population and construction workers.
				O: Social capital and local decision-making institutions will be affected by the influx of resettling population.
Social Infrastructure and Services	✓	✓	✓	P: Common property resources such as schools, hand pumps, wells, Tube wells, religious structures, etc. falling in RoW of the project road may be affected, which negatively affect social infrastructure and services.
				C: Access to social infrastructure and services may be temporarily affected due to construction of construction yard and accommodation for workers as well as traffic jams due to the operation of construction vehicles.
				O: The resettlement can result in prolonged disturbance in social infrastructure and services. In the long term, however, the project is expected to improve access to social infrastructure and services by providing better road network.
Local Economy and Livelihood	✓	✓	✓	P: Loss of income source and livelihood due to involuntary resettlement and change in land usage are expected to negatively affect the local economic and livelihood.
				C: Loss of income source and livelihood due to involuntary resettlement and change in land usage are expected to negatively affect the local economic and livelihood, especially cultivation and agro-forestry. On the other hand, the relatively short-lived economic impacts of the construction phase are likely to be experienced in local communities for the duration of the construction as workers will make everyday purchases from local traders. This is likely to give a short-lived stimulus to these traders that will disappear as soon as the construction is complete. Wider, flow-on economic impacts will be experienced in other sectors of the economy as a result of purchase of construction materials and the payment of wages and salaries.
				O: Over the long term, the project is expected to have positive impact on local economy as improved road network facilitates transport of cash crops, and ensures more stable supply of essential goods. On the other hand, the end of construction work may cause unemployment of construction workers. The project may trigger unintended side effects on the local community, e.g. influx of non-local people and more competition in business and pressure on local natural resources.

Item	Scoping Analysis of the Anticipated Environmental Impacts			
	Pre-construction	Construction Stage	Operation Stage	Rational of the Impact Assessment
Unequal Distribution of Benefit and Damage	✓	✓	✓	P: Land acquisition and involuntary resettlement will lead to unequal distribution of benefits and damages between groups who are directly affected by the project and who are not.
				C: While resettling households and households whose livelihood depends on affected lands will bear much of the damage, others may even enjoy benefits from new business opportunities created by construction work, resulting in unequal distribution of benefits and damages.
				O: People residing along the road may accrue greater benefits compared with others, potentially increasing rich-poor gap within the community.
Local Conflicts of Interests	✓	✓	✓	P/C/O: Unequal distribution of benefits and damages may trigger and/or intensify local conflicts of interests in the community.
Water Usage, Water Rights and Communal Rights	✓	✓		P: Water usage and water rights of the affected households may be curtailed due to resettlement.
				C: Disturbance to water usage, water rights and communal rights during construction work is expected to be minor and short-term in nature. However, communal rights and distribution should be carefully examined to avoid negative impacts.
				O: No impact is expected.
Cultural and Historical Heritage	✓	✓	✓	P: One of the impacts of the project road construction is interrupted access to the cultural properties on either side of RoW. There are chances that users of the cultural property may face difficulty in accessing the property during the period of pre- construction.
				C: Access to some cultural properties is likely to be lost during the construction period, due to movement of construction machinery, construction and labour camps or setting up of borrow areas, setting up of service stations, etc.
				O: Some heritages nearby the project road may be indirectly affected.
Religious Facilities	✓	✓	✓	P: Some religious facilities are located along the road. Though realigned route is carefully avoiding them, it may still affect them indirectly.
				C/O: Roadside religious facilities may be affected by noise and vibrations during construction and operation due to construction work and greater traffic volume.
Sensitive Facilities (ex. Hospital, school, precision machine factory)	✓	✓	✓	P: When widening road in a village, it may be necessary to relocate small-scale public facilities (community halls, etc.).
				C: Noise and vibrations during construction work may affect schools, public health centers and other medical facilities.
				O: These facilities can be affected due to noise and vibrations resulting from increase in traffic volume. Also, congestion may undermine the utility of such facilities.

Item	Scoping Analysis of the Anticipated Environmental Impacts			
	Pre-construction	Construction Stage	Operation Stage	Rational of the Impact Assessment
Poor People	✓	✓	✓	P: Given the limited coping capacity of the poor, it is necessary to assess their vulnerability and develop appropriate mitigation measures.
				C: The poor may bear disproportionally higher burden due to their limited coping capacity, although they can benefit from employment opportunities during construction work.
				P: Economic development achieved by the road improvement in the region is expected to benefit the poor.
Ethnic Minorities/ Indigenous People	✓	✓	✓	P/C/O: The alignment of NH127B in Assam state under the Project overlaps a little with the area under control of the Bodoland Territorial Council of Assam. It is predominantly inhabited by the Bodo tribe. Preparation of RAP and Indigenous People Plan, therefore, must take into account this matter.
Gender	✓	✓	✓	P: Project might affect gender-related work division such as cultivation, harvest and processing of crops.
				C: The general social and cultural norms need to be carefully studied to avoid gender-related conflicts. The Project can affect gender roles in cultivation, harvesting and processing.
				O: Project might affect gender-related work division such as cultivation, harvesting, and processing of crops.
Children's Rights	✓		✓	P: Some children are affected by the relocation. Children in households that have lost land and livelihoods may be forced to drop out of school.
				C: Child labor is unlawful according to article 24 of Indian Constitution. Only adults are eligible for potential employment opportunity created by the project.
				O: Access to social services is expected to improve throughout the year and educational opportunities are expected to improve.
Public Health (sanitation and infectious diseases)		✓	✓	P: No impact is expected.
				C: Influx of construction workers is likely to increase health risks, particularly that of STD/STI, HIV/AIDS, coronavirus, etc. The risk of malaria should be properly managed during construction in areas where malaria is prevalent.
				O: An increase in traffic volume and road users may have negative impact on public health.
Occupational Health and Safety (OHS)		✓	✓	P: No impact is expected.
				C: Occupational health and safety of construction work should be properly managed through adequate Environment Management Plan.
				O: Maintenance and repair work should take into account the occupational health and safety of the workers.

Item	Scoping Analysis of the Anticipated Environmental Impacts			
	Pre-construction	Construction Stage	Operation Stage	Rational of the Impact Assessment
Others				
Accidents		✓	✓	P: No impact is expected.
				C: An increase in the risk of accidents caused by the operation of construction machinery and the running of construction vehicles is expected.
				O: Increased traffic volume and increased risk of accidents due to speeding up are expected. On the other hand, it is considered that the accident risk can be reduced by rehabilitating the route and implementing accident prevention measures (such as installing a reflector on the curve).
Climate Change		✓	✓	P: No impact is expected.
				C: Although the impact is temporary and small, greenhouse gases (GHGs) are emitted by the operation of construction machinery and the running of construction vehicles.
				O: GHGs emission is expected to increase due to the increase in traffic volume. In addition, adaptation measures will be implemented by considering the effects of climate change (increase in precipitation, etc.) when considering measures for landslides and soil erosion.

Note: P: Pre-Construction; C: Construction; and O: Operation Period
Source: JICA Survey Team

7.6 Anticipated Environmental Impacts

7.6.1 Impacts on the Living Environment

(1) Ambient Air Environment

Present Condition

Air pollution is caused due to both natural and manmade processes. The main source of air pollution is human induced/manmade, which includes industrialization and its by products, burning of timber, heat and light, rapid urbanization, vehicular pollution, plastics, burning of polymers and processing of various materials emitting obnoxious gases, generation of smoke, dust and fine respirable particles due to construction activity and rapid burning etc. Vehicular emission is major source of air pollution now-a-day. Presently some patches of study area are in the locality of heavy traffic movement particularly at congested places i.e at major market areas, which may impact the ambient air quality of the area. During construction stage of the project, temporary air pollution arises due to the movement of construction vehicles, operation of plants & machineries, dust emission due to excavation and demolition etc. The air quality parameters considered for the construction phase includes PM_{10}, $PM_{2.5}$, Nitrogen Oxides (NOx) Sulphur Di-oxide (SO_2), and Carbon monoxide (CO).

Table 7-34: Ambient Air Quality Standard

Parameter	Technique	Technical Protocol	NAAQM Standards (24 hrs basis)	IFC EHS Guideline
Particulate Matter (Size less than 10µm) or PM10, µg/m3	Respirable Dust Sampler (Gravimetric method)	IS-5182 (Part-IV)	100	150 (24hr) 70 (year)
Particulate Matter (Size less than 2.5µm) or PM2.5 , µg/m3	PM 2.5 APM 550 Fine Particle Sampler (Gravimetric method)		60	75 (24hr) 35 (year)
Sulphur Dioxide (SO2), µg/m3	Improved West and Gaeke Method	IS-5182 (Part-II)	80	125 (24hr)
Nitrogen Dioxide (NO2), µg/m3	Jacob and Hochheiser	IS-5182 (Part-IV)	80	200 (1hr) 40 (Year)
Carbon Monoxide (CO), mg/m3	Non – dispersive Infrared (NDIR) Spectroscopy	IS-5182 (Part-IV)	4	-

Source: JICA Survey Team

- **Along the Project Road**

Ambient air quality monitoring has been conducted at 5 locations along the project road alignments. The air sampling locations is shown in figure below. SPM and RPM have been determined gravimetrically and as specified in IS 5182 (Part 23):2006.

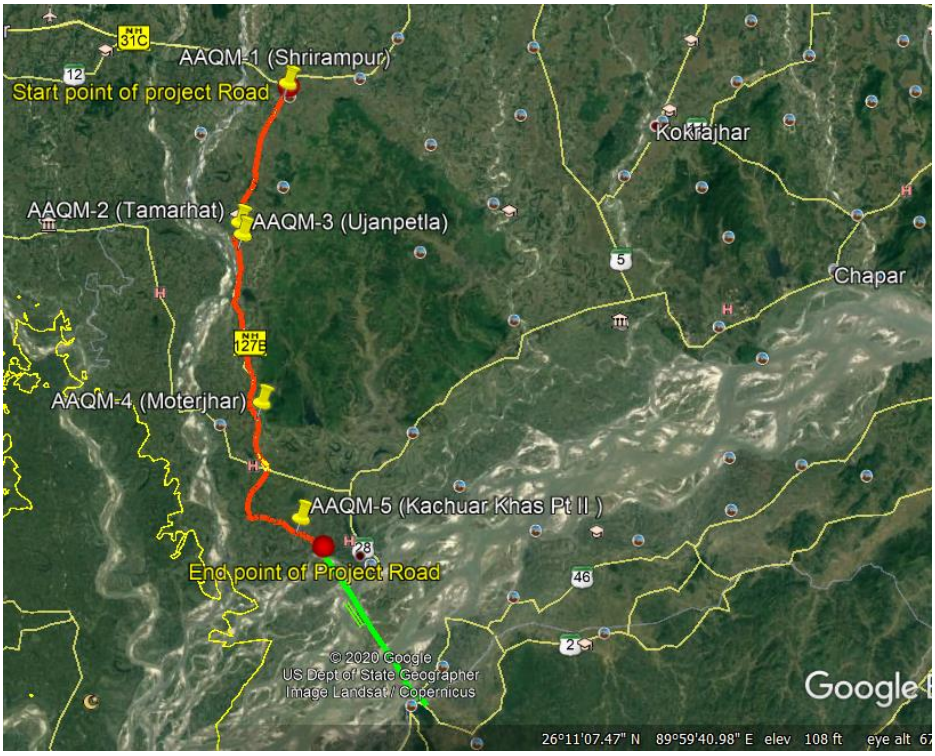
The concentration of NOx has been estimated using IS 5182 Part 2:2001 method and SOx has been estimated by IS 5182 Part 6:2006 method. CO was measured as perEPA Method 13.Sampling duration for SO2, NOx, PM2.5 and PM10 was 24 hourly as per NAAQS Standards requirements and CO sampling duration was 1 Hr.

The monitoring stations had been distributed throughout the project road so as to get a representative baseline of any variation in land use as well as road geometrics and traffic conditions across the project road. The purpose is also to establish a benchmark, which can form the reference for monitoring in the construction and operation period.

Table 7-35: Sampling Location Details of Ambient Air Quality

Location Area	Chainage	Latitude	Longitude	Distance from Alignment
Shrirampur (AAQM 1)	01+400 Km	26°25’34.04” N	89°53’53.80”E	20m
Tamarhat (AAQM 2)	16+200 Km	26°18'9.20"N	89°51'3.20"E	8m
Ujanpetla (AAQM 3)	17+500 Km	26°17'31.44"N	89°51'13.61"E	16m
Moterjhar (AAQM 4)	35+100 Km	26°08’35.19” N	89°52’21.87”E	12m
Kachuar Khas Pt II (AAQM 5)	51+000km	26° 2'26.77"N	89°54'41.46"E	15m

Source: JICA Survey Team



Source: JICA Survey Team made from google map

Figure 7-25: Air Quality Monitoring Stations along the Project Road

Table 7-36: Analysis of Ambient Air Quality Monitoring[9] along the Project Road

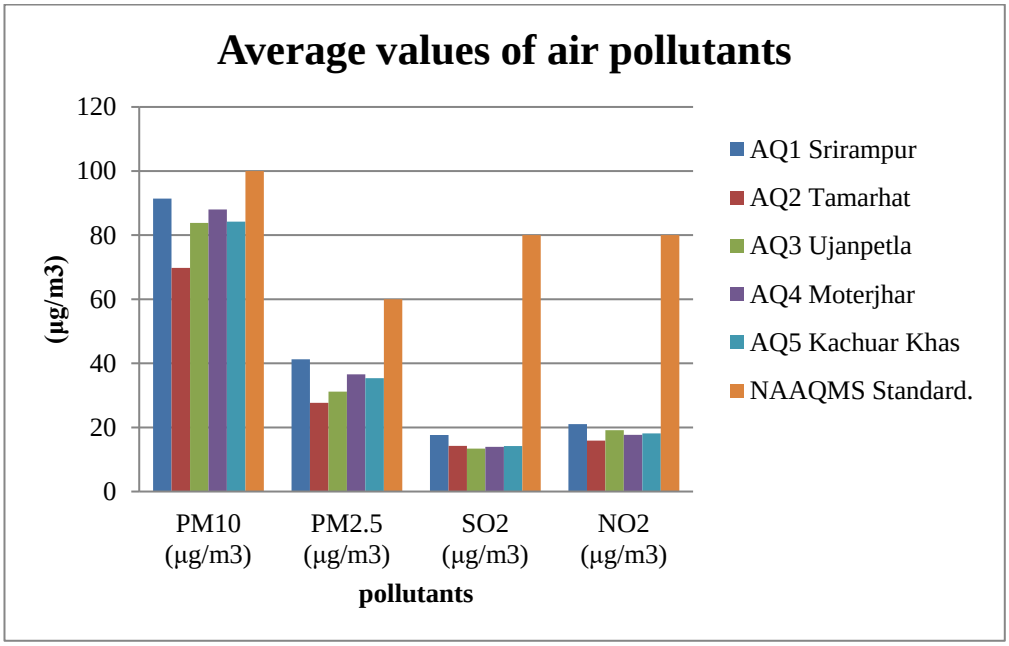
	S.N.	Description	PM_{10} (µg/m3)	$PM_{2.5}$ (µg/m3)	SO_2 (µg/m3)	NO_2 (µg/m3)	CO (mg/m3)
Location - Shrirampur (AAQM 1)							
Week 1	1	Day 1	92.3	41.2	11.5	18.2	BDL
	2	Day 2	95.3	47.2	16.8	19.2	BDL
Week2	3	Day 3	92.4	35.4	15.4	18.4	BDL
	4	Day 4	97.2	40.2	14.8	19.7	BDL
Week3	5	Day 5	86.2	42.1	17.6	21.2	BDL
	6	Day 6	85.2	46.1	18.1	22.4	BDL
Week4	7	Day 7	90.8	35.2	22.4	24.2	BDL
	8	Day 8	91.8	42.7	24.5	25.1	BDL
		Minimum	85.2	35.2	11.5	18.2	-
		Maximum	97.2	47.2	24.5	25.1	-
		Average	91.4	41.3	17.7	21.1	-
NAAQMS Standard			**100**	**60**	**80**	**80**	**02**
IFC EHS Guidelines			150 (24hr) 70 (year)	75 (24hr) 35 (year)	125 (24hr)	200 (1hr) 40 (Year)	**-**
Location –Tamarhat (AAQM 2)							
Week 1	1	Day 1	74.2	24.5	10.2	11.4	BDL
	2	Day 2	76.3	26.5	11.5	12.6	BDL
Week2	3	Day 3	68.5	27.3	12.5	13.2	BDL
	4	Day 4	70.2	28.2	16.4	17.2	BDL
Week3	5	Day 5	64.2	31.2	18.4	20.1	BDL
	6	Day 6	71.2	30.4	17.4	21.2	BDL
Week4	7	Day 7	68.2	28.7	14.2	16.2	BDL
	8	Day 8	65.4	24.8	13.5	15.2	BDL
		Minimum	64.2	24.5	10.2	11.4	-
		Maximum	74.2	31.2	17.4	21.2	-
		Average	69.8	27.7	14.3	15.9	-
NAAQMS Standard			**100**	**60**	**80**	**80**	**02**
IFC EHS Guidelines			150 (24hr) 70 (year)	75 (24hr) 35 (year)	125 (24hr)	200 (1hr) 40 (Year)	**-**

[9] Disclaimer: Although MoEF/CPCB does not recommend conduct of environmental monitoring during 15th June to 30th September in India. However this particular project is being developed in accordance with the JICA requirement, Terms of Reference for which require collection and compilation of baseline environmental status during this project (July 2020). Accordingly this collected baseline data is not prescribed to be used for compliane against Indian statutary requirement.

	S.N.	Description	PM_{10} (µg/m3)	$PM_{2.5}$ (µg/m3)	SO_2 (µg/m3)	NO_2 (µg/m3)	CO (mg/m3)
Location – Ujanpetla (AAQM 3)							
Week 1	1	Day 1	88.2	31.2	10.5	16.2	BDL
	2	Day 2	77.4	30.5	11.6	14.2	BDL
Week2	3	Day 3	84.2	31.2	13.2	17.2	BDL
	4	Day 4	83.4	31.1	11.5	16.8	BDL
Week3	5	Day 5	85.2	30.4	18.2	21.4	BDL
	6	Day 6	91.4	32.4	14.5	22.3	BDL
Week4	7	Day 7	84.4	32.5	12.5	24.1	BDL
	8	Day 8	76.3	30.2	15.2	20.8	BDL
		Minimum	76.3	30.2	10.5	14.2	-
		Maximum	91.4	32.5	18.2	24.1	-
		Average	83.8	31.2	13.4	19.1	-
NAAQMS Standard			**100**	**60**	**80**	**80**	**02**
IFC EHS Guidelines			150 (24hr) 70 (year)	75 (24hr) 35 (year)	125 (24hr)	200 (1hr) 40 (Year)	-
Location – Moterjhar (AAQM 4)							
Week 1	1	Day 1	84.6	37.2	14.4	19.2	BDL
	2	Day 2	82.4	41.2	13.1	14.5	1.2
Week2	3	Day 3	93.4	34.5	15.4	18.4	BDL
	4	Day 4	88.2	31.2	11.1	18.4	BDL
Week3	5	Day 5	94.1	38.3	18.5	22.2	1.3
	6	Day 6	88.4	36.2	14.8	19.2	BDL
Week4	7	Day 7	91.4	37.8	11.5	13.2	BDL
	8	Day 8	81.5	36.2	12.8	16.4	BDL
		Minimum	81.5	31.2	11.1	13.2	-
		Maximum	94.1	41.2	15.4	22.2	-
		Average	88	36.6	13.9	17.6	-
NAAQMS Standard			**100**	**60**	**80**	**80**	**02**
IFC EHS Guidelines			150 (24hr) 70 (year)	75 (24hr) 35 (year)	125 (24hr)	200 (1hr) 40 (Year)	-

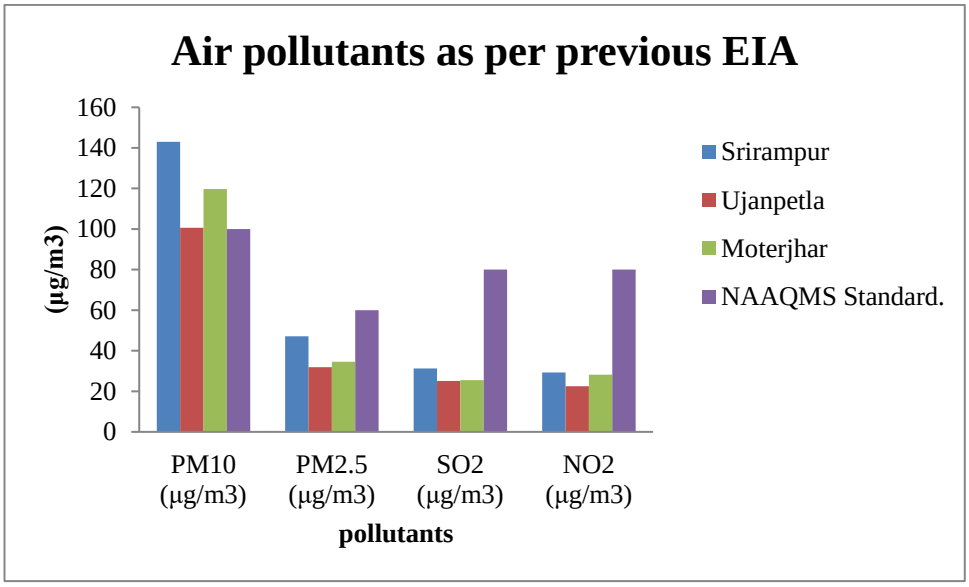
	S.N.	Description	PM_{10} (µg/m3)	$PM_{2.5}$ (µg/m3)	SO_2 (µg/m3)	NO_2 (µg/m3)	CO (mg/m3)
Location - Kachuar Khas Pt II (AAQM 5)							
Week 1	1	Day 1	82.2	36.2	15.4	18.5	BDL
	2	Day 2	78.5	34.2	14.2	18.3	BDL
Week2	3	Day 3	86.4	31.2	12.4	16.7	BDL
	4	Day 4	82.4	38.4	13.2	16.2	BDL
Week3	5	Day 5	89.3	37.8	14.5	18.1	BDL
	6	Day 6	81.1	40.1	14.2	19.2	BDL
Week4	7	Day 7	89.7	32.4	14.5	18.6	BDL
	8	Day 8	84.2	32.5	15.1	19.4	BDL
		Minimum	78.5	31.2	12.4	16.2	-
		Maximum	89.3	40.1	15.4	19.4	-
		Average	84.2	35.3	14.2	18.1	-
NAAQMS Standard.			**100**	**60**	**80**	**80**	**02**
IFC EHS Guidelines			150 (24hr) 70 (year)	75 (24hr) 35 (year)	125 (24hr)	200 (1hr) 40 (Year)	-

Source: JICA Survey Team
Note: All monitoring was conducted between 1stJuly, 2020 to 30thJuly, 2020.



Source: JICA Survey Team

Figure 7-26: Average Values of Air Pollutants in All Locations (July 2020)



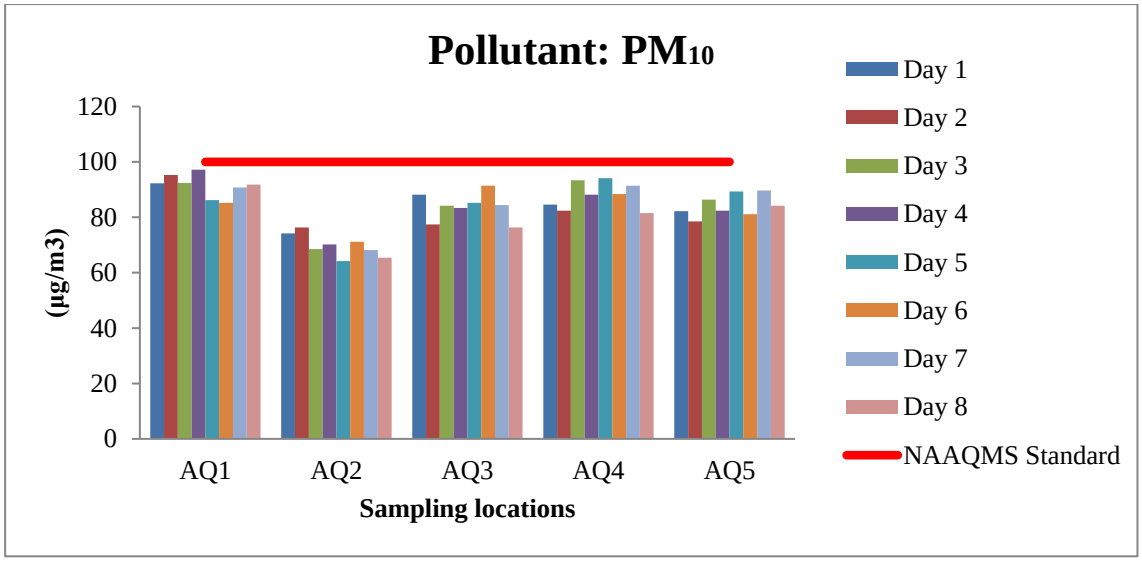
Source: JICA Survey Team

Figure 7-27: Air Monitoring Analysis as per Previous EIA Report

➢ **Comparison of Air monitoring baseline analysis with previous EIA report**

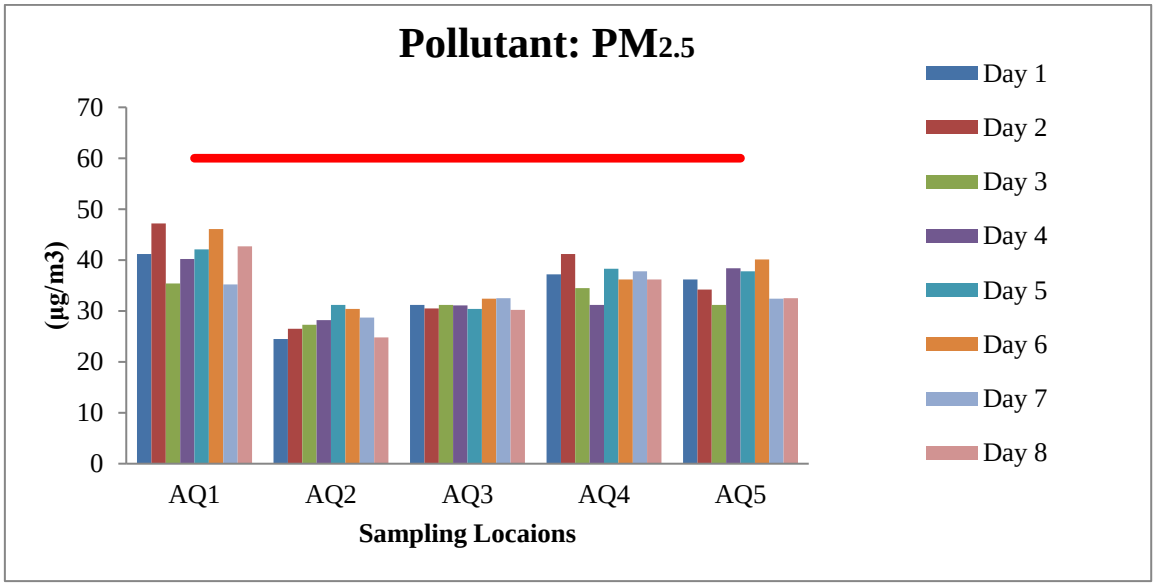
In the previous EIA report (March, 2020) 4 air quality monitoring locations were selected. Whereas, in this SEIA 5 locations (3 previous monitoring locations i.e. Srirampur, Ujanpetla and Moterjhar and 2 new monitoring locations i.e.Tamarhat , Kachuar Khas) are considered.

The PM_{10} concentrations in the common locations were found to be above the NAAQMS standard value (100ug/m3) previously; whereas, the concentrations were below the NAAQMS standard during the current monitoring (i.e. month of July, 2020). This decrease in concentration could be attributed to the monsoon time when PMs are trapped in raindrops falling on the ground.



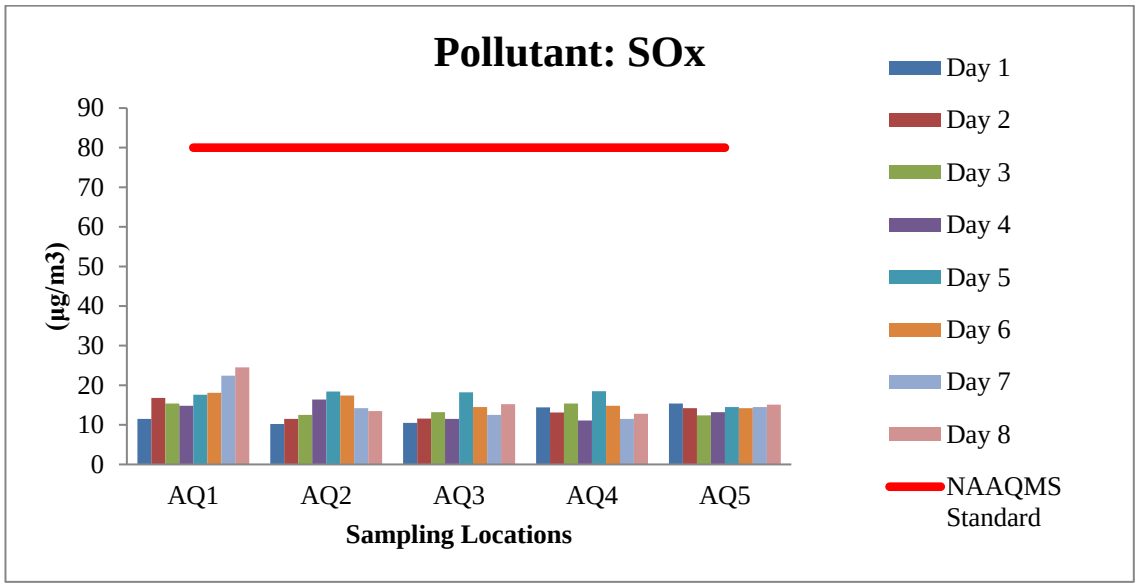
Source: JICA Survey Team

Figure 7-28: PM_{10} Values in All Locations along with NAAQMS Standard



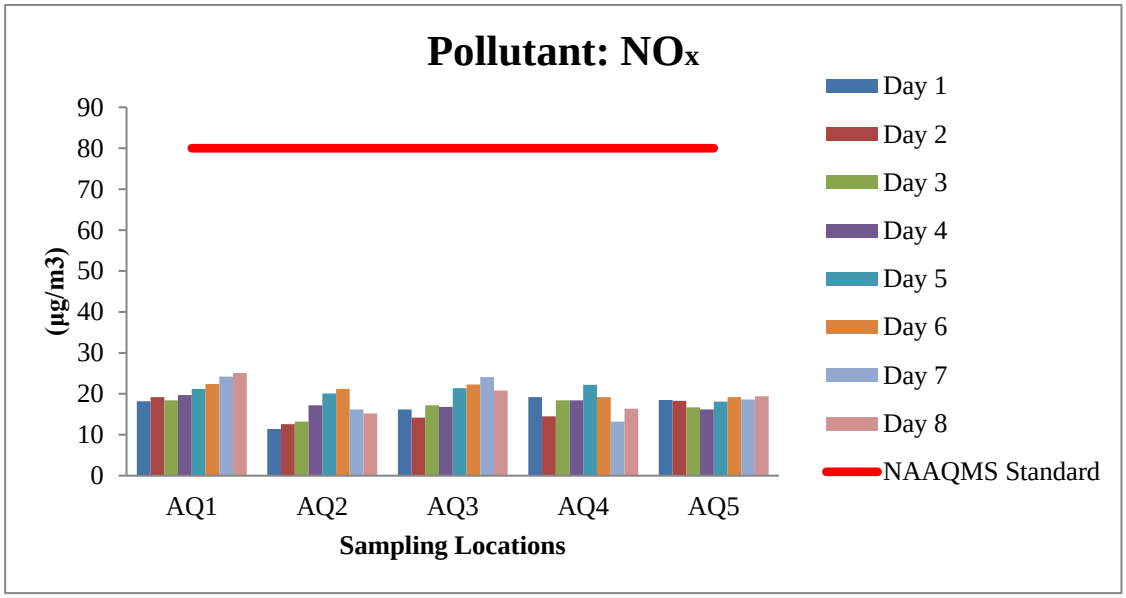
Source: JICA Survey Team

Figure 7-29: PM2.5 Values in All Locations along with NAAQMS Standard



Source: JICA Survey Team

Figure 7-30: SOx Values in All Locations along with NAAQMS Standard



Source: JICA Survey Team

Figure 7-31: NOx Values in All Locations along with NAAQMS Standard

The analysis shows that measured PM_{10} and $PM_{2.5}$ concentrations are mostly below the NAAQS standard in all 5 locations. The SOx and NOx values along the project road are also within the NAAQS standard.

Air Dispersion Modeling Methodology

Operation phase impact to ambient air will be primarily because of emissions from vehicles plying on the project road. In order to assess the impact from vehicular emission, an air dispersion model was run using ADMS-Roads – an internationally recognized dispersion model to predict impacts on air environment due to vehicular movements. The model was run for the criteria pollutants NOx, PM_{10} and CO. Although VOC is not a criteria pollutant but it was also modeled as it has significant impact on health and climate change. The SO_2 was not modeled as the ambient concentration of this was found very low.

The model set-up and outputs are presented below for the projected traffic in the year 2020 and 2034. For the purpose of modeling, Atmospheric Dispersion Modeling System (ADMS) ROAD uses vehicular emission rates provided in the Design Manual for Roads and Bridges, UK database. The Project emission rates are calculated based on the vehicle class and speed in accordance with following equation.

$$E = (a + b.v + c.v2 + d.ve + f.ln(v) + g.v3 + h/v + i/v2 + j/v3).x$$

Where:
E is the emission rate expressed in g/km
v is the average vehicle speed in km/hr.[The valid speed ranges are 5 km/h to 130 km/h for light duty vehicles, and 5 km/h to 100 km/h for heavy-duty vehicles.]
a to j, and x are coefficients

The projected traffic was split into 2 categories: i) vehicles weighing less than 3.5 ton; and ii) vehicles weighing more than 3.5 ton.

Table 7-37: Vehicle Exhaust Emission Rates

Emission rate for Passenger Car(Gross Vehicle Weight < 3.5 ton)[10]				
	CO(g/kmhr)	**HC (g/kmhr)**	**NOx (g/kmhr)**	**PM(g/kmhr)**
Gasoline (Petrol) Vehicles				
Bharat Stage-IV (2017)	1	0.1	0.08	-
Bharat Stage-VI (2020)	1	0.10	0.06	0.0045
Diesel Vehicles				
Bharat Stage-IV (2017)	0.5	-	0.25	0.025
Bharat Stage-VI (2020)	0.5	-	0.08	0.0045
Emission rate for Heavy – duty diesel vehicles(GVW > 3.5 ton)[11]				
	CO(g/kmhr)	**HC (g/kmhr)[12]**	**NOx (g/kmhr)**	**PM(g/kmhr)**
Bharat Stage-VI (2020)	4	0.16	0.46	0.01

Source: JICA Survey Team

Till April, 2020 vehicles in India were manufactured to comply with Bharat stage –IV (2017) emission standard. Hence, BS-IV is considered as vehicle exhaust emission rates during calculation of 2020. Bharat stage –VI is implemented in India from April, 2020. Although being cognizant that there might be an enhanced emission standard in future but in want of any specific standard, BS-VI has been considered as vehicle exhaust emission rates for modelling of the year 2034.

It is pertinent to note here that significant reduction in vehicle exhaust parameters are expected with change from BS-IV to BS-VI, especially in case of diesel driven vehicles.

Details of Input data:

1) Traffic details: - Refer Chapter 3, Section D
2) Meteorology – Bongaigaon District, 2019

Treatment of Oxides of Nitrogen Concentrations

The key element in assessing the potential environmental impacts from ground level NO_2 concentrations is estimating the NO_2 concentrations from modelled NO_X emissions. The final NO_2 concentration is a combination of the NO_X emitted as NO_2 from vehicles the amount of NO_X that is converted to NO_2 by oxidation in the exhaust after release.

Generally, after NO_X is emitted from the vehicle, additional NO_2 is formed as the exhaust and reacts with the surrounding air. There are several reactions that both form and destroy NO_2, but the primary reaction is oxidation with ozone according to the following equation:

$$NO + O_3 \longrightarrow NO_2 + O_2$$

This reaction is essentially instantaneous as the exhaust entrains the surrounding air. It is limited by the amount of ozone available and by how quickly the exhaust mixes with the surrounding air. Thus, the ratio of NO_2 to NO_X increases as the plume disperses downwind.

[10] It is assumed that 50% of light passenger vehicles are run on gasoline (Petrol) and rest of 50% on diesel
[11] 100% of heavy vehicles run on diesel
[12] It is assumed that 100% of HC emissions are in the form of VOC

There are four common methods used to estimate the final ratio of NO_2 to NO_X:

- Total Conversion: This method conservatively assumes all NO_X is converted to NO_2.
- USEPA Tier 2 Assumption: This method assumes a national default ration of NO_2 to NO_X of 0.75;
- Ozone Limiting Method (OLM): This method commonly assumes 10% of the Vehicle NO_X emission is NO_2 and that ozone is the limiting reagent for the above equation. The estimated NO_2 concentration can be calculated using the following equation:

$$NO_2 = (0.1 \times NOx) + O_3$$

  Where:
  NO_2 = estimated ground level concentrations (GLC) of nitrogen dioxide (ppm)
  NOx = predicted GLC of oxides of nitrogen (ppm)
  O_3 = measured background concentration of zone (ppm)
- Ambient Ratio Method (ARM): This method typically relies on at least a year worth of ambient monitoring data and assumes the final exhaust NO_2 to NO_X ratio will be equal to the existing ambient NO_2 to NO_X ratio.

The total Conversion assumption were considered overly conservative and the OLM and ARM requires detailed baseline conditions which are not available for the study area.
Accordingly, the USEPA Tier 2 assumption was considered the most appropriate method while still remaining conservative enough that the actual NO_2 concentrations are likely less than those predicted by the modeling.

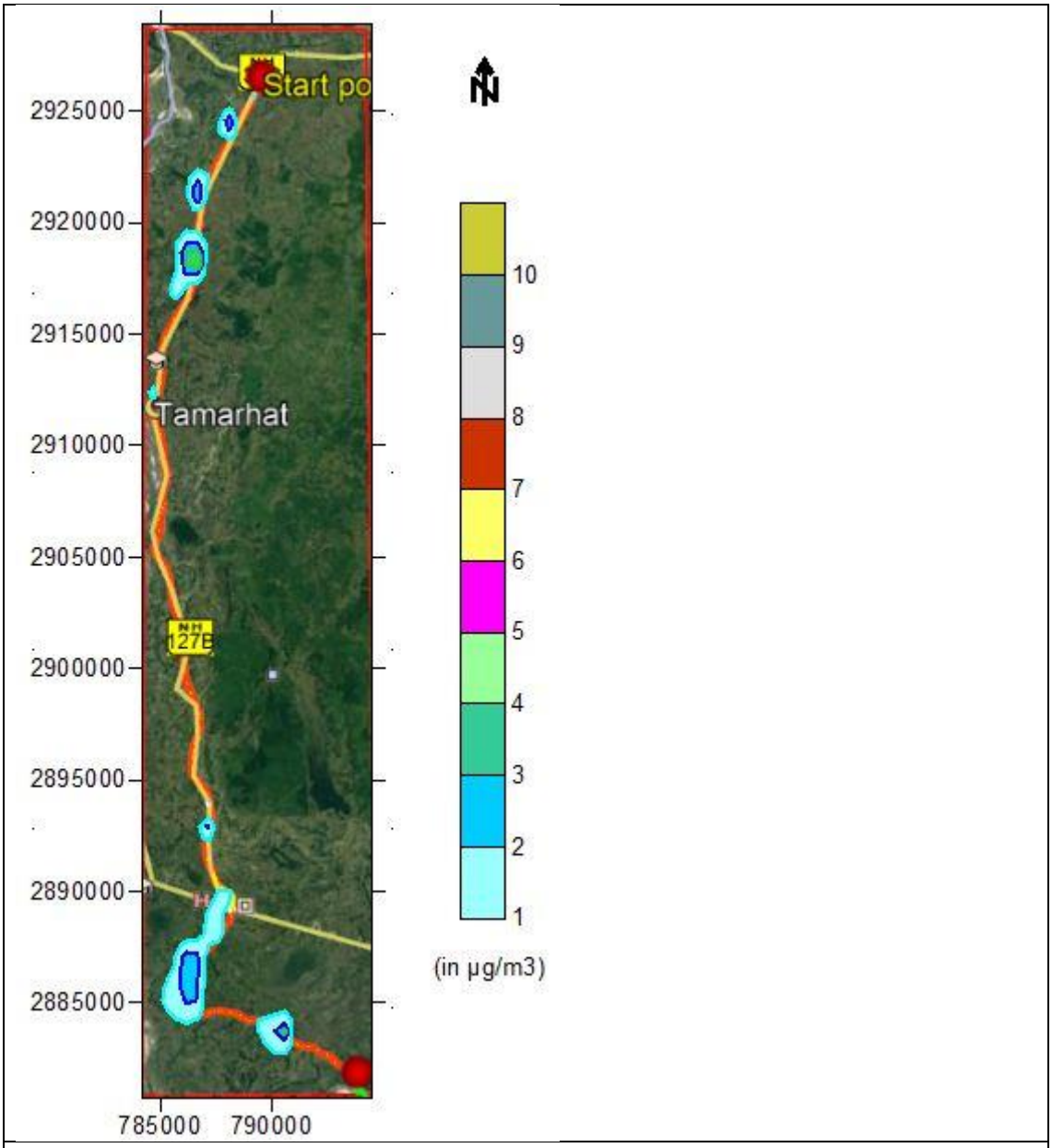
Table 7-38: Air Pollutant Dispersion Mondeling Details

Model Year:	**2020**			**IFC EHS Guideline**
Scenario:	1 hr. Averaging Period.			
Assumptions:	The average vehicle speed for light duty vehicles – 100 km/hr. The average vehicle speed for heavy duty vehicles – 80 km/hr. The height of canyon – 0m			
Maximum Predicted GLC in µg/m^3				
Parameters	Easting	Northing	Predicted Conc.	
NOx	786475	2918354	12.49 (15 meter from the centre line of the road)	—
PM_{10}	786475	2918354	0.39 (15 meter from the centre line of the road)	150 (24hr) 70 (year)
CO	786475	2918354	14.32 (15 meter from the centre line of the road)	—
VOC	786475	2918354	1.86 (15 meter from the centre line of the road)	—
Scenario:	24 hr. Averaging Period.			
Maximum Predicted GLC in µg/m^3				
Parameters	Easting	Northing	Predicted Conc.	
NOx	786475	2918354	5.87 (15 meter from the centre line of the road)	—
CO (8 hrs.)	786475	2918354	6.84 (15 meter from the centre line of the road)	—

Source: JICA Survey Team
Note: As PM_{10} value for 2020 was found to be insignificant, this parameter was not modeled further for future years

Result of the modeling

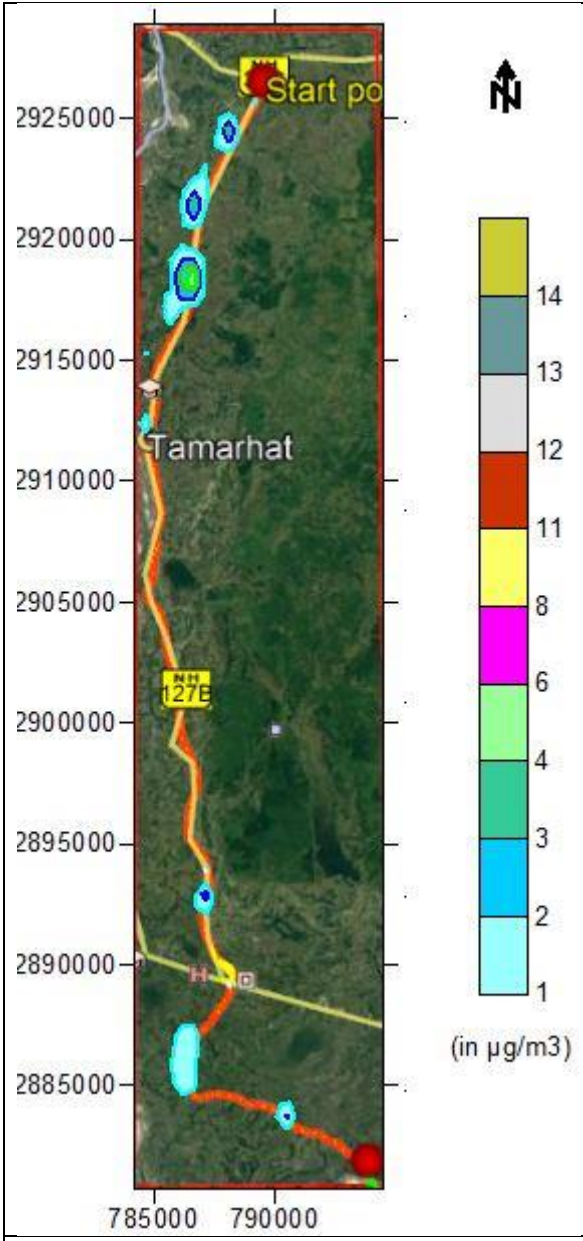
The 1 hr. avg. as well as 24-hr avg. predicted GLC for NOx and CO along the project road during the year 2020, is presented below;



Comments:
Hourly Vehicle Count (2020) - 1st Homogenous Section Ch 0 – 38.4km
- Vehicles with Tonnage <3.5 Ton : 154
- Vehicles with Tonnage >3.5 Ton : 19
Hourly Vehicle Count (2020) - 1st Homogenous Section Ch 38.8 – 54.154km (End of Road)
- Vehicles with Tonnage <3.5 Ton : 183
- Vehicles with Tonnage >3.5 Ton : 94

Source: JICA Survey Team

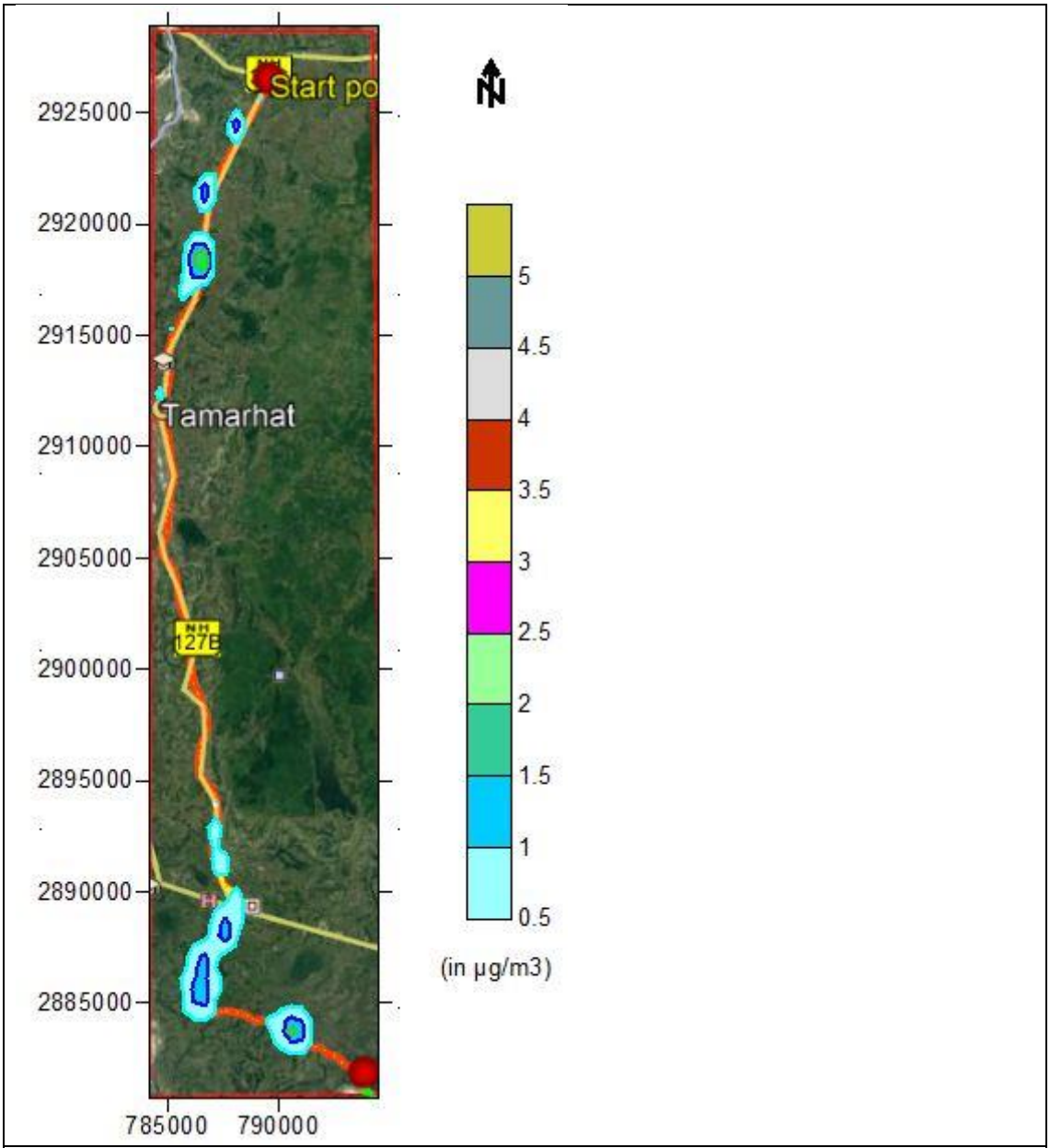
Figure 7-32: Predicted Ground Level Concentration for NOx – 1 hr. Averaging Period, 2020



Comments:
Hourly Vehicle Count (2020) - 1st Homogenous Section Ch 0 – 38.4km
- Vehicles with Tonnage <3.5 Ton : 154
- Vehicles with Tonnage >3.5 Ton : 19
Hourly Vehicle Count (2020) - 1st Homogenous Section Ch 38.8 – 54.154km (End of Road)
- Vehicles with Tonnage <3.5 Ton : 183
- Vehicles with Tonnage >3.5 Ton : 94

Source: JICA Survey Team

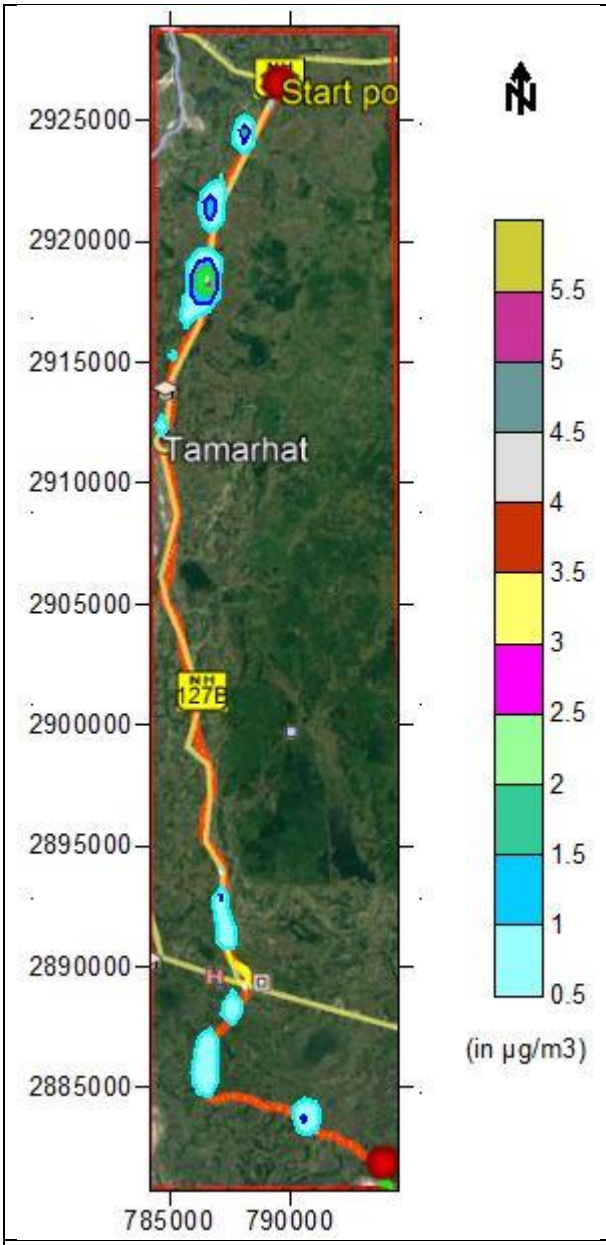
Figure 7-33: Predicted Ground Level Concentration for CO – 1 hr. Averaging Period, 2020



Comments:
Hourly Vehicle Count (2020) - 1st Homogenous Section Ch 0 – 38.4km
- Vehicles with Tonnage <3.5 Ton : 154
- Vehicles with Tonnage >3.5 Ton : 19
Hourly Vehicle Count (2020) - 1st Homogenous Section Ch 38.8 – 54.154km (End of Road)
- Vehicles with Tonnage <3.5 Ton : 183
- Vehicles with Tonnage >3.5 Ton : 94

Source: JICA Survey Team

Figure 7-34: Predicted Ground Level Concentration for NOx – 24 hr. Averaging Period, 2020



Comments:
Hourly Vehicle Count (2020) - 1st Homogenous Section Ch 0 – 38.4km
- Vehicles with Tonnage <3.5 Ton : 154
- Vehicles with Tonnage >3.5 Ton : 19
Hourly Vehicle Count (2020) - 1st Homogenous Section Ch 38.8 – 54.154km (End of Road)
- Vehicles with Tonnage <3.5 Ton : 183
- Vehicles with Tonnage >3.5 Ton : 94

Source: JICA Survey Team

Figure 7-35: Predicted Ground Level Concentration for CO – 8 hr. Averaging Period, 2020

Anticipated Residual Impact- Year 2020

The ambient concentration of the air pollutants found at chainage 9+750km being found as minimum is treated as the background. Hence the cumulative concentrations of air pollutants are expected to be as follows for the year 2020:

Table 7-39: Cumulative Conecntrations of p and CO in 2020

Parameters	Easting	Northing	Background Conc. (AAQM2*, 24-hr Avg.)	Predicted Incremental Conc. (24-hr Avg.) µg/m^3	Anticipated cumulative Concentration. µg/m^3	Regulatory Limits (NAAQS, 2009) µg/m^3	IFC EHS Guideline
NO_2	786475	2918354	15.9	4.40[13]	20.30	80	200 (1hr) 40 (Year)
CO**	786475	2918354	BDL	0.006	0.006	2	-

* Nearest Air monitoring location is AAQM2
**In case of CO the unit is mg/m^3; other parameters unit is µg/m^3
***smallest unit of BDL = 1.14 mg/m^3
Source: JICA Survey Team

Therefore, based on the above, it can be concluded that the operation of the project road in the year 2020 is not likely to cause any exceedances for the selected criteria pollutants. Since there is no standard for VOC concentration in ambient air in India, the EU limit for the same has been used for comparison purpose.

Using the Air Dispersion Modelling Guideline for Ontario, the annual average concentration (converted from 1-hr predicted value) for VOC is estimated as 0.15 µg/m^3, which is way lower than the presently existing EU limit for VOC.Hence, the impact is categorized as minor due to some negative residual impact. However, the impact is very small and negligible.

Anticipated Residual Impact- Year 2034

The predicted 1 hr avg. and 24hr avg. value of NOx and CO in the year 2034 is shown below and it is very insignificant compared to 2020. Therefore, based on the above, it can be concluded that the operation of the project road in the year 2034 is not likely to cause exceedances for the selected criteria pollutants. Further, it might be concluded that implementation BS-VI is likely to result in significant reduction in vehicle emission concentration.

Hence, the impact is measured as nil in both positive and negative and categorized as insignificant due to predicted future impact.

Table 7-40: Cumulative Conecntrations of NO2 and CO in 2034

Model Year:	**2034**			
Scenario:	1 hr. Averaging Period.			
Assumptions:	The average vehicle speed for light duty vehicles – 100 km/hr. The average vehicle speed for heavy duty vehicles – 80 km/hr. The height of canyon – 0m			
Maximum Predicted GLC in µg/m^3				
Parameters	Easting	Northing	Predicted Conc.	IFC EHS Guideline
NOx	786475	2918354	0.009 (15 meter from the centre line of the road)	-

[13] NOx to No2 conversion factor = 0.75; NOx = 5.87, so, NO2 = 5.87* 0.75 = 4.40 µg/m3

Model Year:	**2034**			
NO2	786475	2918354	0.00675 (15 meter from the centre line of the road)	200 (1hr) 40 (Year)
PM_{10}	786475	2918354	0.001 (15 meter from the centre line of the road)	150 (24hr) 70 (year)
CO	786475	2918354	0.145 (15 meter from the centre line of the road)	-
VOC	786475	2918354	0.010 (15 meter from the centre line of the road)	-
Scenario:	24 hr. Averaging Period.			
Maximum Predicted GLC in $\mu g/m^3$				
Parameters	Easting	Northing	Predicted Conc.	
NOx	786475	2918354	0.004 (15 meter from the centre line of the road)	-
NO2	786475	2918354	0.003(15 meter from the centre line of the road)	200 (1hr) 40 (Year)
CO (8 hrs.)	786475	2918354	0.068 (15 meter from the centre line of the road)	-

Source: JICA Survey Team

(2) Noise Environment

Present condition

Noise impacts can be of concern during construction and operational phases of the project. Noise attributed to roads depends on factors such as traffic intensity, the type and condition of the vehicles plying on the roads, acceleration/deceleration/gear changes by the vehicles depending on the level of congestion and smoothness of road surface. High noise levels are a concern for sensitive receptors, i.e., hospitals, educational institutions, etc.

Silence zone is defined as an area up to 100 meters around such premises as hospitals, educational institutions, and courts. The silence zones are to be declared by the competent authority.

The Central Pollution Control Board has specified ambient noise levels for different land uses for day and night times, and these are given in the table below. Importance was given to the timing of exposure and areas designated as sensitive.

Table 7-41: National Ambient Noise Level Standards

Area Code	Category	Limits in Decibels (dB A)	
		Day Time	Nighttime
A	Industrial	75	70
B	Commercial	65	55
C	Residential	55	45
D	Silence Zones	50	40

Source: Central Pollution Control Board, New Delhi

1) Day-time: 6 AM to 10 P.M., Night-time: 10 PM to 6 AM;
2) Silence zone is an area up to 100 m around premises as hospitals, educational institutions and courts.

Locations for noise monitoring along the project road were identified based on the criteria same as those used for air monitoring, but the relative importance of each standard carries a weightage in arriving at the final set of locations. In the case of noise monitoring locations, sensitive land

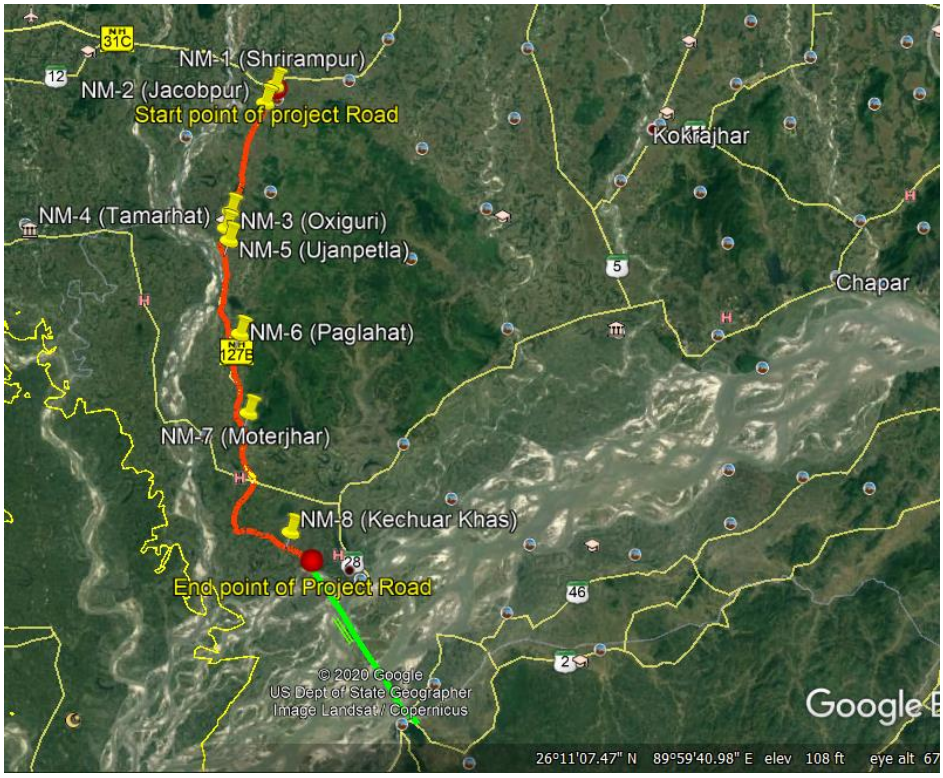
use such as schools, hospitals, and religious places gains more importance due to ill effects of noise. The noise levels were monitored with Integrated Noise Level Meter.
Locations of noise monitoring is shown in Figure 7-36.

Table 7-42: Sampling Location Details

Location Area	Chainage	Latitude	Longitude	Category
Shrirampur (NM 1)	1+400 Km	26°25'34.04" N	89°53'52.80"E	Resi.+Comm.
Jacobpur (NM 2)	3+350km	26024′39.25″N	89053′ 19.08″E	Rural Area
Oxiguri (NM 3)	14+500km	26019′ 01.35" N	89051′ 19.27″E	Commercial
Tamarhat (NM 4)	16+200km	26°18'9.20"N	89°51'3.20"E	Resi.+Comm.
Ujanpetla (NM 5)	17+500 Km	26°17'31.44"N	89°51'13.61"E	Residential
Paglahat (NM 6)	27+000km	26°12'40.93"N	89°51'51.84"E	Residential
Moterjhar (NM 7)	35+100km	26008′35.19″N	89052′21.87″E	Sensitive
Kechuar Khas (NM 8)	51+200km	26° 2'24.44"N	89°54'47.61"E	Resi + Rural Area

Source: JICA Survey Team

All monitoring was conducted between 1st July, 2020 to 29th July, 2020.



Source: JICA Survey Team made from google map

Figure 7-36: Noise Monitoring Locations along the Project Road

EHS standards also have the same range for residential one in India. Compared to Indian standard, at the maximum level, only 3 locations are below limit during daytime.

Table 7-43: Analysis of Noise Monitoring[14] in All Locations

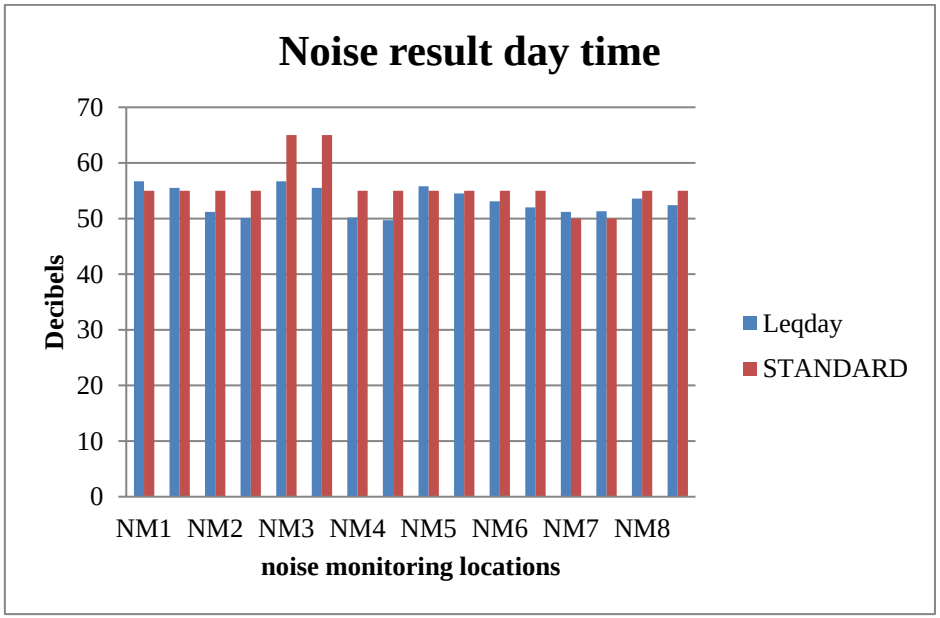
	Shrirampur (NM 1)		Jacobpur (NM 2)		Oxiguri (NM 3)		Tamarhat (NM 4)		Ujanpetla (NM 5)		Paglahat (NM 6)		Moterjhar (NM 7)		Kechuar Khas (NM 8)	
Classification	Resi.+Comm		Resi+rural Area		Commercial		Resi.+Comm.		Residential		Residential		Sensitive		Resi + Rural Area	
Date	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2
Maximum	**62.4**	**61.5**	**54.2**	**53.1**	**62.4**	**61.5**	**53.4**	**52.9**	**62.1**	**60.1**	**57.2**	**58.4**	**54.2**	**54.2**	**60.1**	**59.2**
Minimum	**35.4**	**35.2**	**34.2**	**34.1**	**35.4**	**35.2**	**34.6**	**34.5**	**38.4**	**36.4**	**35.4**	**35.4**	**36.4**	**35.4**	**36.8**	**35.1**
Leqday	**56.7**	**55.5**	**51.2**	**50.1**	**56.7**	**55.5**	**50.2**	**49.7**	**55.8**	**54.5**	**53.1**	**52.0**	**51.2**	**51.3**	**53.6**	**52.4**
Leqnight	**38.3**	**36.9**	**35.4**	**34.8**	**38.3**	**36.9**	**35.9**	**35.4**	**40.6**	**37.5**	**36.4**	**37.1**	**38.0**	**36.4**	**37.8**	**37.0**
Leq	**55.2**	**54.0**	**50.0**	**49.0**	**55.2**	**54.0**	**49.2**	**48.7**	**54.7**	**53.2**	**51.8**	**50.8**	**50.4**	**50.2**	**52.3**	**51.2**
STANDARD	**Day - 55**	**Night - 45**	**Day - 55**	**Night - 45**	**Day - 65**	**Night - 55**	**Day - 55**	**Night - 45**	**Day - 55**	**Night - 45**	**Day - 55**	**Night - 45**	**Day - 50**	**Night - 40**	**Day - 55**	**Night - 45**

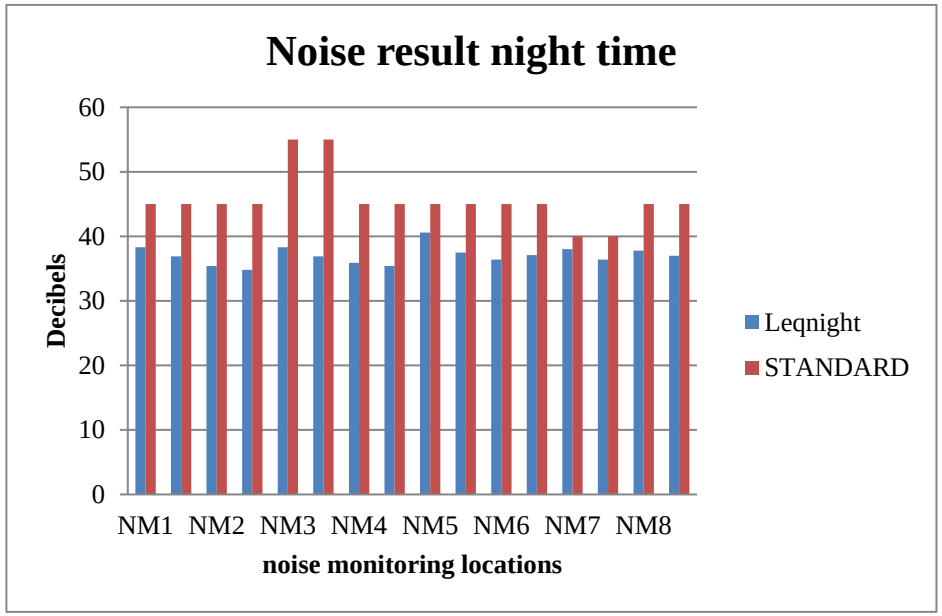
Source: JICA Survey Team

Receptor	Day 07:00-22:00	Night 22:00-07:00
Residential, institutional, educational area	55	45
Industrial, commercial area	70	70

Source: IFC/EHS General Guidelines

[14] Disclaimer: Although MoEF/CECB does not recommend conduct of environmental monitoring during 15th June to 30th September but due to insistence of client, monitoring of these environmental parameters were conducted in this period. These data may not be used for demonstration of statutory compliance.





Source: JICA Survey Team

Figure 7-37: Graphical Representation of Noise Monitoring Data in Day and Night Time along the Project Road

An analysis of the results indicates that the Day & Nighttime noise levels in all eight locations were mostly within the permissible limit. However, at NM1, NM5, and NM7 area, there were few instances when the noise level slightly exceeded the standard value -mostly due to the background noise.

Noise and Vibration Modelling

Noise level may increase temporarily in the close vicinity of construction activities, maintenance workshops and earth work site. These construction activities are expected to produce noise levels in the range of 80 - 95 dB(A) (at a distance of about 5 m from the source). Although this level of noise is higher the permissible limit for ambient noise level for residential/commercial levels but will occur only intermittently and temporary. This noise level will attenuate fast with increase in distance from noise source. Since the project road is passing through considerable built-up area, impact of noise on sensitive structures such as schools, hospitals is highly anticipated. There are several noise sensitive receptors such as educational institutes, health centres alongwith residential areas. Noise barriers shall be provided in those sensitive noise receptors to avoid detrimental impact due to noise pollution.

Impacts on Noise Level

The assessment of potential road noise impacts helps in understanding one of the most significant pollution, the noise pollution. Some salient features related to potential noise impact of a road development include: (i) the road noise impact is greatest where busy road passes through densely populated areas, townships and markets (ii) the range of noise level should be understood in relation to the habitation type also; for example, road noise in industrial area is not likely to be problematic but at sensitive location like schools and hospitals; its impact may be significant, (iii) mitigation of noise in urban areas is rather difficult, especially at the road intersections.

Construction Phase

Noise will be generated due to different construction activities in the project stretch and at plant areas. Piling, if necessary, will cause vibration. Noise and vibration from this source will be unavoidable but the impact will only be temporary and affect people living or working near the project locations. The different sources of noise are as below

(i) Movement and operation of heavy construction machineries, equipments & vehicles.
(ii) Construction and demolition activities
(iii) Operation of plants & crusher
(iv) Excavation work for foundations and grading

Mitigation Measures:

- New machineries and equipments shall be used for the project.
- DG sets shall be fitted with acoustic enclosures or kept within a room.
- PPEs (ear plugs) shall be provided to all the staffs/workers at construction sites.
- Machineries, equipments, plants and vehicles need to be maintained on regular basis.
- Noise barrier (Vegetative) needs to be provided at sensitive (Noise) locations.
- Construction activities should be limited to day time only.
- No horn board shall be provided at sensitive (Noise) locations.
- Avenue plantation may form an effective sound buffer during the operation stage.
- Regular noise monitoring shall be done to check the noise limit with respect to the standard prescribed limit of CPCB.

Table 7-44: Impact on Noise Environment and Mitigation Measures

Parameters	Potential Impact	Mitigation Measures Suggested
Noise Environment	• Noise level may likely to increase during construction phase	• Properly maintained equipment to be used • Noise levels of machineries used shall confirm to relevant standard prescribed in Environment (Protection) Rules, 1986. • Ear plugs and muffs will be used by the workers as per requirement during construction activities. • Regulation of timing of construction work generating noise pollution near the sensitive areas.

Source: JICA Survey Team

Estimation of Construction Phase Noise

At the outset, it should be noted that unavailability of exact information on the construction methodology, hours of work, no. of equipment and their ratings / fuel consumption, construction schedule, etc. are the limiting factors while estimate the construction noise for this subject project; however, to represent the possible worst case scenario, an effort has been made based on our knowledge on the construction of similar project using QUESTOR Construction Noise Tool.

The QUESTOR Construction Noise Tool is a simple application capable of calculating noise levels for construction sites. It is based on the construction site noise calculation model documented in PR70 "How much noise do you make? A guide to assessing and managing noise on construction sites" by Dr Alan Wills (KVÆRNER) and David Churcher (CIRIA). The tool itself works on a relationship of one receiver to many sources.

'QUESTOR Construction Noise Tool' provides a library of sample plants and the activities they are performing from the **BS 5228 standard: The British Standard on Noise**. The total noise level calculated by the application is the noise level at the receiver.

Table 7-45: BS 5228 standard: The British Standard on Noise

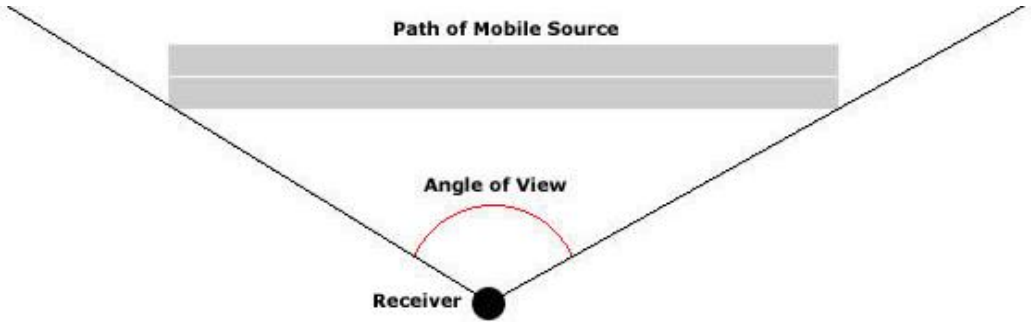
ID	Type	Noise pressure (dB), 1m from the source	Distance (m)	Barrier	Reflection	On Time (%)	Angle of View (^{0})	Traffic Volume / hour	Speed (km/hr)	Total (dB(A))
Site Clearing										
1	Dozer	116	50	None	None	20	90	10	10	46
2	Tracked excavator	113				20	90			76
3	Tracked loader	113				20	90			76
4	Wheeled loader	108				20	90			71
									Total noise from site at receiver	80
Ground Excavation										
1	Dozer	114	50	None	None	20	90	10	10	44
2	Tracked excavator idling	96				20	90			59
3	Tracked excavator	113				20	90			76
4	Wheeled loader	104				20	90			67
5	Tracked loader	112				20	90			75
									Total noise from site at receiver	79
Tipping Fill										
1	Dump Truck	110	50	None	None	100	90	10	10	57
									Total noise from site at receiver	57
Spreading Fill										
1	Wheeled excavator / loader	104	50	None	None	50	90	10	10	81
2	Dozer	117				50	90	10	10	61
									Total noise from site at receiver	81
Spreading Fill										
1	Wheeled excavator / loader	104	50	None	None	50	90	10	10	81
2	Dozer	117				50	90	10	10	61
									Total noise from site at receiver	81
Ground leveling										
1	Dozer	114	50	None	None	50	90	10	10	58

ID	Type	Noise pressure (dB), 1m from the source	Distance (m)	Barrier	Reflection	On Time (%)	Angle of View (^{0})	Traffic Volume / hour	Speed (km/hr)	Total (dB(A))
2	Grader	111				50	90	10	10	55
									Total noise from site at receiver	60
Unloading										
1	Tipper lorry	113	50	None	None	50	90	10	10	57
2	Tracked loader	112				50	90	10	10	89
									Total noise from site at receiver	89
Rolling gravel / bricks										
1	Road roller	108	50	None	None	100	90	10	10	55
									Total noise from site at receiver	85
Compacting fill										
1	Vibratory roller	106	50	None	None	50	90	20	15	84
2	Compactor rammer	108	50	None	None	50	90	20	15	86
									Total noise from site at receiver	88
Compacting sub-base										
1	Compactor rammer	108	50	None	None	100	90	20	15	89
									Total noise from site at receiver	89
Compacting earth										
1	Compactor rammer	108	50	None	None	100	90	20	15	89
									Total noise from site at receiver	89
Road surfacing										
1	Asphalt melter (Stationary)	103	50	None	None	70	NA	NA	NA	59
2	Asphalt spreader	110	50	None	None	70	90	10	10	88
3	Road roller and lorry	96	50	None	None	80	90	10	10	42
									Total noise from site at receiver	88
Installation of traffic light controls										
1	Groove cutter	115	50	None	None	100	NA	NA	NA	73
									Total noise from site at receiver	73

Source: JICA Survey Team

Assumptions

- Receiver Distance: The minimum distance in meters between the source plant and the receiver – considered as 50m.
- On Time (%): The percentage of time (of the overall time period in question) for which this plant is on.
- Barrier: If there is a barrier between the source and the receiver (None - To reflect the worst-case scenario)
- Reflection: If the receiver is within 1m of a wall then select this option
- Angle of view: 90^0
- Traffic Volume (veh/hour): Total number of return journeys that is made by the mobile plant in an hour
- Speed: Average speed of the plant in kilometers per hour



As depicted in the above picture, it is considered that for particular construction zone, the source is located at a distance of 50m with 90^0 angle of view. Accordingly, the sound pressure levels are predicted at the receptor location during different activities.

Assessment of Impact:

Based on the calculations presented below, it is anticipated that whenever the construction will happen in any zone other than industrial, the ambient noise level will exceed the statutory level at a distance of 50m away from the construction zone, if no barrier is put. Hence, the impact is categorized as minor-negative due to a minor impact of transient nature.

Mitigation Measures:

In view of above, following mitigation measures are proposed:

- All construction equipment used for an 8 hour shift shall conform to a standard of less than 90 dB(A). If required, machinery producing high noise as concrete mixers, generators etc., must be provided with noise shields;
- At construction sites within 500m of human settlements, noisy construction activities shall be stopped between 9.00 PM and 6.00 AM;
- Vehicles and construction machinery shall be monitored regularly with particular attention to silencers and mufflers to maintain noise levels to minimum;
- Workers in the vicinity of high noise levels must wear ear plugs and should be engaged in diversified activities to prevent prolonged exposure to noise levels of more than 85 dB(A) per 8-hour shift.

Operation Phase

The noise from traffic plying on the highway is one of the environmental impacts that most people relates to. In order to assess the estimated noise due to projected traffic on this highway, internationally recognized –Sound Plan software was used.

Noise Prediction:

The following table lists the various assumptions used in modeling along with justification.

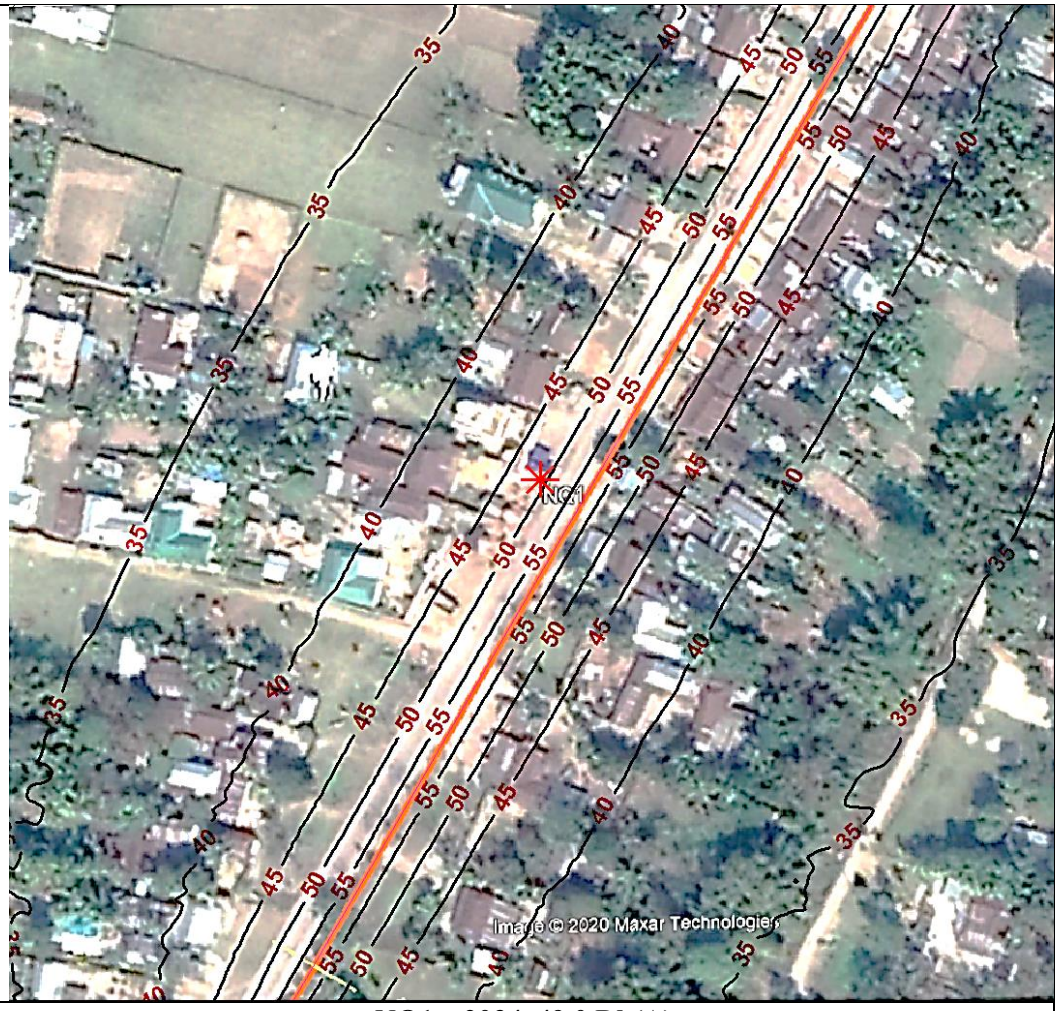
Table 7-46: Noise Modelling Assumption and Justification

Topic	Assumptions and Justification
Standards followed	ISO 9613 Acoustics – Attenuation of Sound during Propagation Outdoors (Part 1: Calculation of the absorption of sound by the atmosphere, and Part 2: General Method of Calculation). Road Noise: TNM 3.0
Modelling software	SoundPLAN, SoundPLAN GmbH.
Source noise emission levels.	Calculated from: • Traffic Monitoring Data (Traffic Projection of Project Road for Homogeneous Section-1 from Km 0+000 to Km 38+990 and Section-2 from Km 38+990 to Km 54+523. • Road design data (Speed limit, cross section, type, etc.)
Partial screening.	Structural features which might provide partial screening, such as buildings, trees, etc. are not considered as barriers in the model run to model the worst-case scenario.
Noise receptors.	The isophones has been developed at 1.5 m height above ground. This height represents the average hearing height of personnel.
Noise acceptance criteria.	CPCB standards are applied for the maximum permissible limits. These are the default regulatory standards applicable to all group companies.

Source: JICA Survey Team

The outcome of the modeling exercise is presented below.

NQ1 – 2020, 46.0 Db(A)

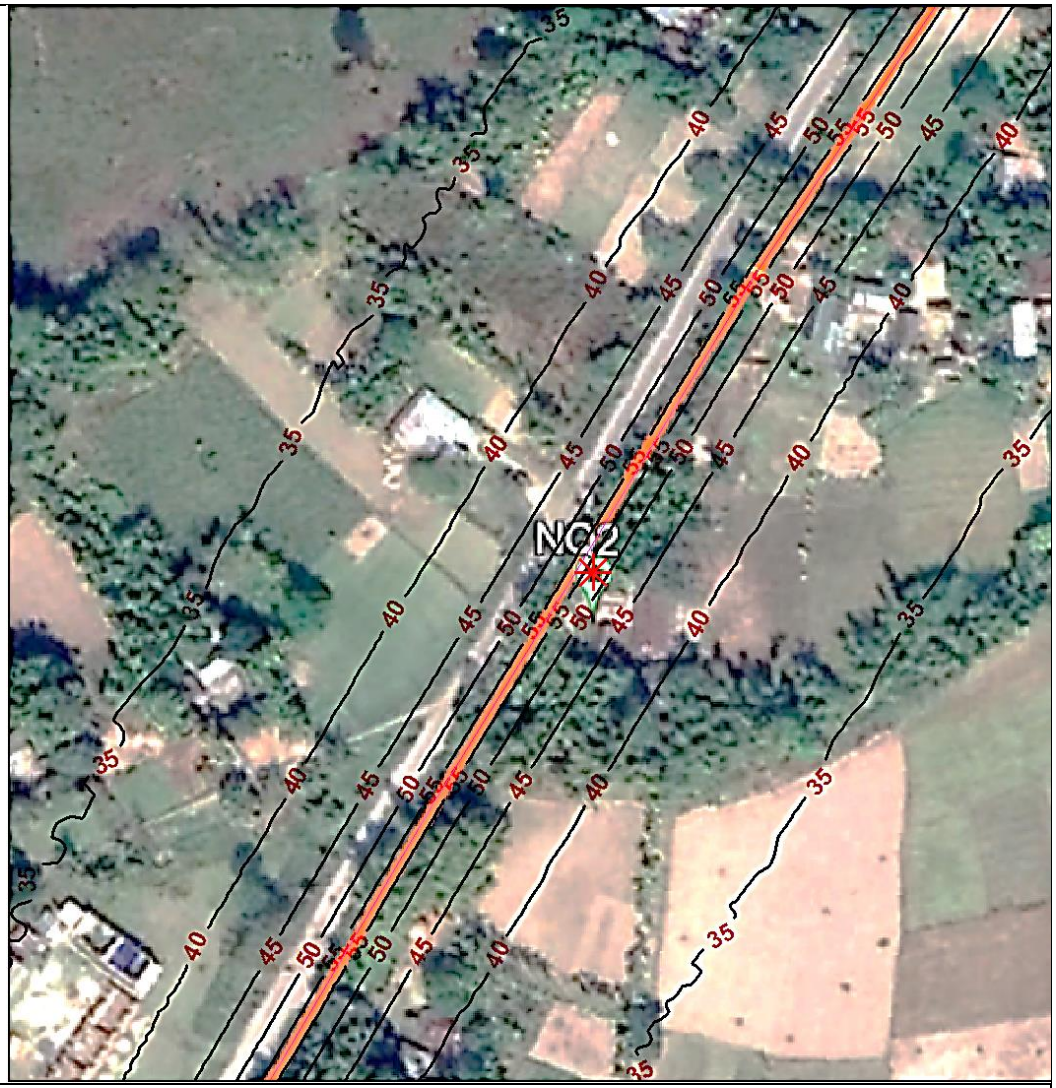


NQ1 – 2034, 49.0 Db(A)

Source: JICA Survey Team

Figure 7-38: Site-wise Noise Levels (Project Contribution) around the Shrirampur

NQ2 – 2020, 49.5 Db(A)



NQ2 – 2034, 52.0 Db(A)

Source: JICA Survey Team

Figure 7-39: Site-wise Noise Levels (Project Contribution) around the Jacobpur

NQ3 – 2020, 43.5 Db(A)

NQ3 – 2034, 46.0 Db(A)

Source: JICA Survey Team

Figure 7-40: Site-wise Noise Levels (Project Contribution) around the Oxiguri

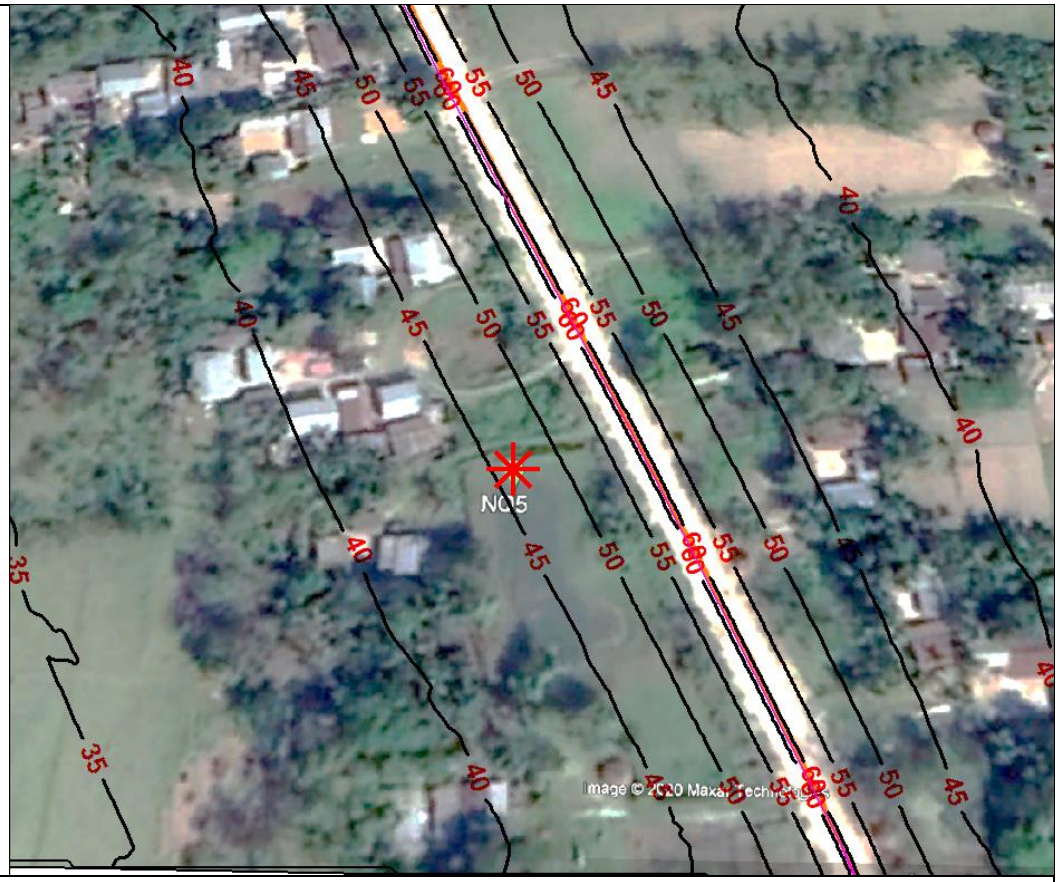
NQ4 – 2020, 50.0 Db(A)

NQ4 – 2034, 54.5 Db(A)

Source: JICA Survey Team

Figure 7-41: Site-wise Noise Levels (Project Contribution) around the Tamarhat

NQ5 – 2020, 44.0 Db(A)



NQ5 – 2034, 46.0 Db(A)

Source: JICA Survey Team

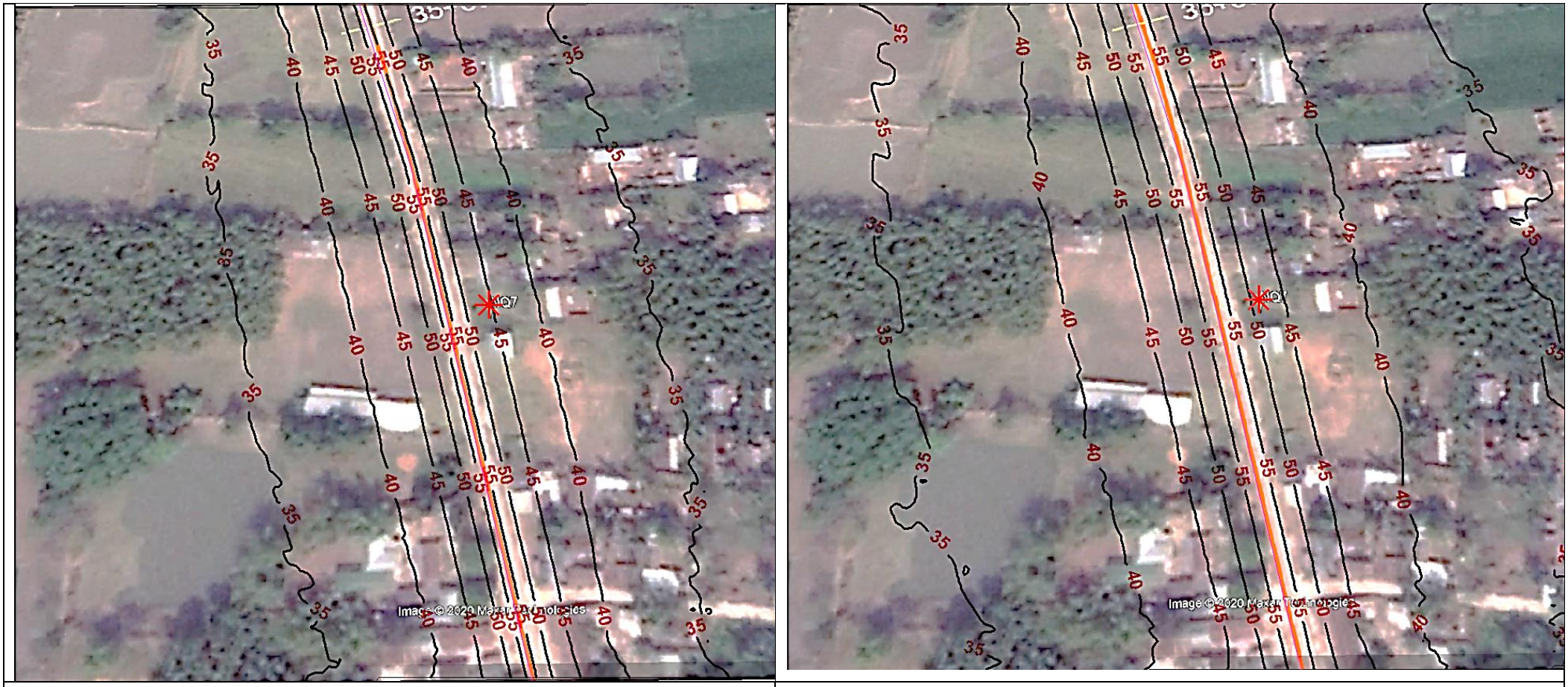
Figure 7-42: Site-wise Noise Levels (Project Contribution) around the Ujanpetla

NQ6 – 2020, 36.5 Db(A)

NQ6 – 2034, 39.5 Db(A)

Source: JICA Survey Team

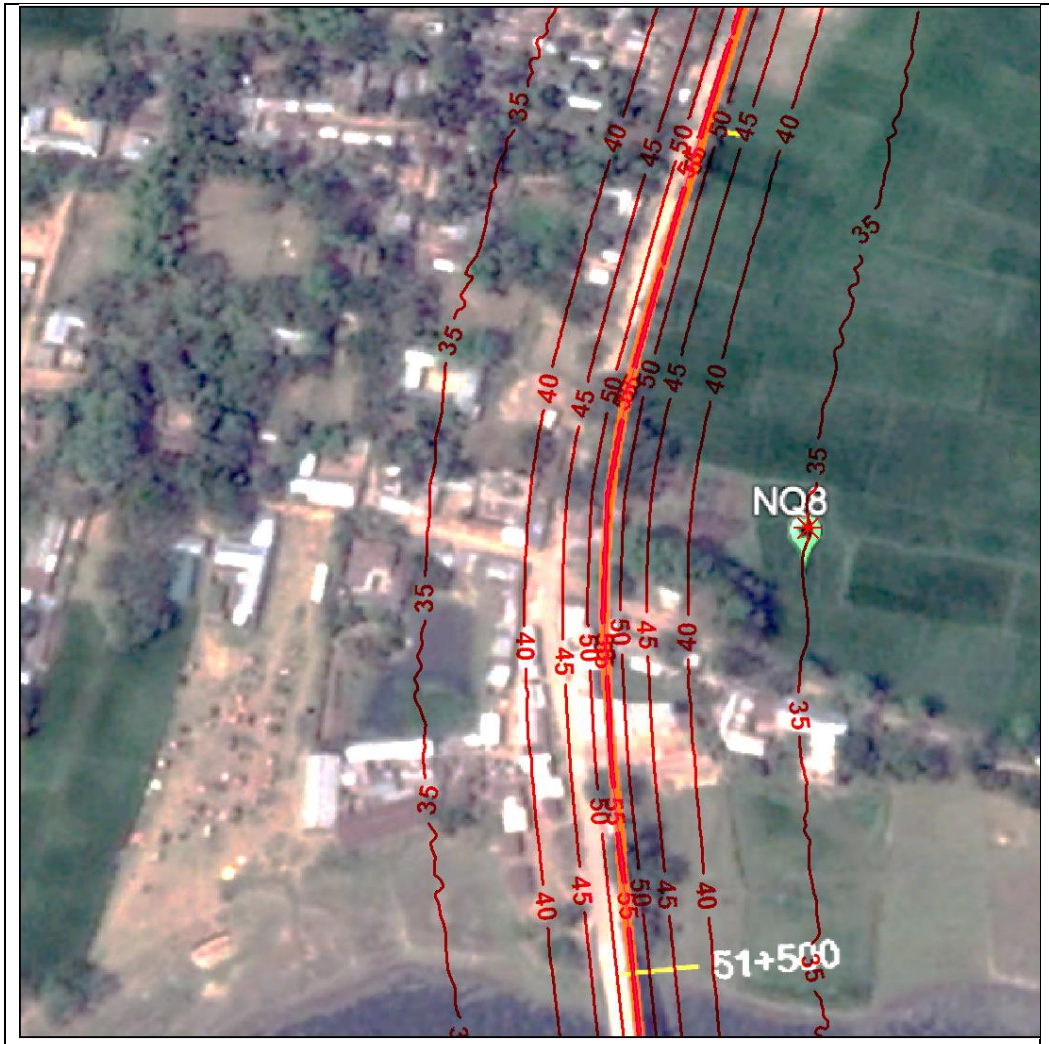
Figure 7-43: Site-wise Noise Levels (Project Contribution) around the Paglahat



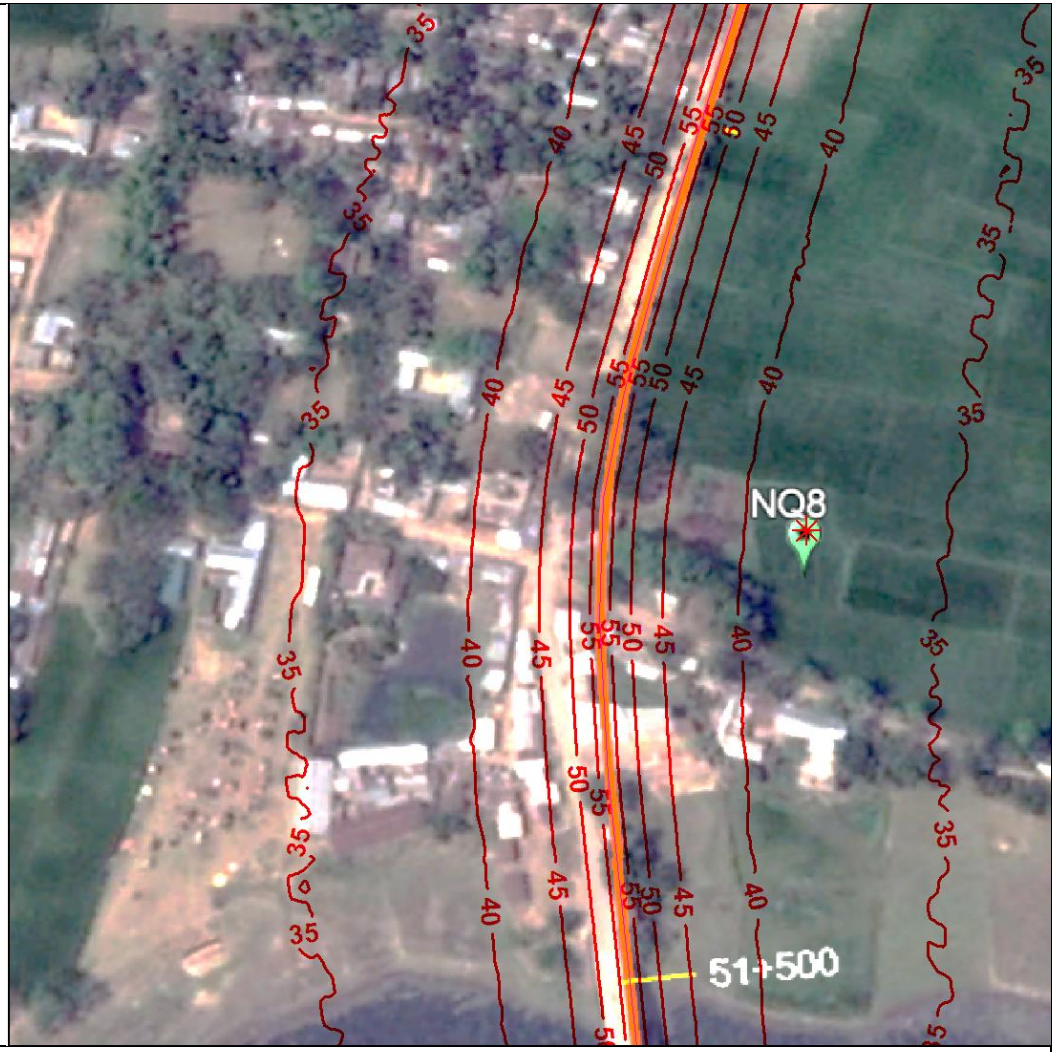
NQ7 – 2020, 45.0 Db(A) | **NQ7 – 2034, 49.0 Db(A)**

Source: JICA Survey Team

Figure 7-44: Site-wise Noise Levels (Project Contribution) around the Moterjhar



NQ8 – 2020, 35.0 Db(A)



NQ8 – 2034, 38.0 Db(A)

Source: JICA Survey Team

Figure 7-45: Site-wise Noise Levels (Project Contribution) around the Kechuar Khas

Table 7-47: Noise model Location and Noise modelling result

Site Number	Location	Environmental Setting	Project Contribution, dB(A)	
			2020	2034
N-1	Shrirampur	Resi.+Comm.	46.0	49.0
N-2	Jacobpur	residential	49.5	52.0
N-3	Oxiguri	Commercial	43.5	46.0
N-4	Tamarhat	Sensitive	50.0	54.5
N-5	Ujanpetla	Resi.+Comm.	44.0	46.0
N-6	Paglahat	Residential	36.5	39.5
N-7	Moterjhar	Sensitive	45.0	49.0
N-8	Kechuar Khas	Rural Area	35.0	38.0

Source: JICA Survey Team

From the data presented above it can be inferred that, predicted incremental noise level is unlikely to exceed CPCB noise standard at all monitored locations for year 2034. However when compared with the predicted noise level for 2034 against that of 2020 at two location (i.e. N-4 and N-7) the incremental noise value may exceed by more than 3 dB(A).

Based on the above, it may be concluded that the project road may have insignificant impact on noise environment during operation. Hence, the impact is categorized as medium-negative due to a minor impact of irreversible nature.

The mitigation measures to reduce impacts of noise are given below.

Mitigation Measures:

Based on the noise modeling outcome, requirement of constructed noise barrier is envisaged. As relatively higher noise level in N-4 and N-7. The result of the modeling is that very small level of the noise is expected.

Proposed tree and shrub plantations planned for avenue plantation especially close to settlements, may form an effective sound buffer during the operation stage.

(3) Water Resource and Hydrology

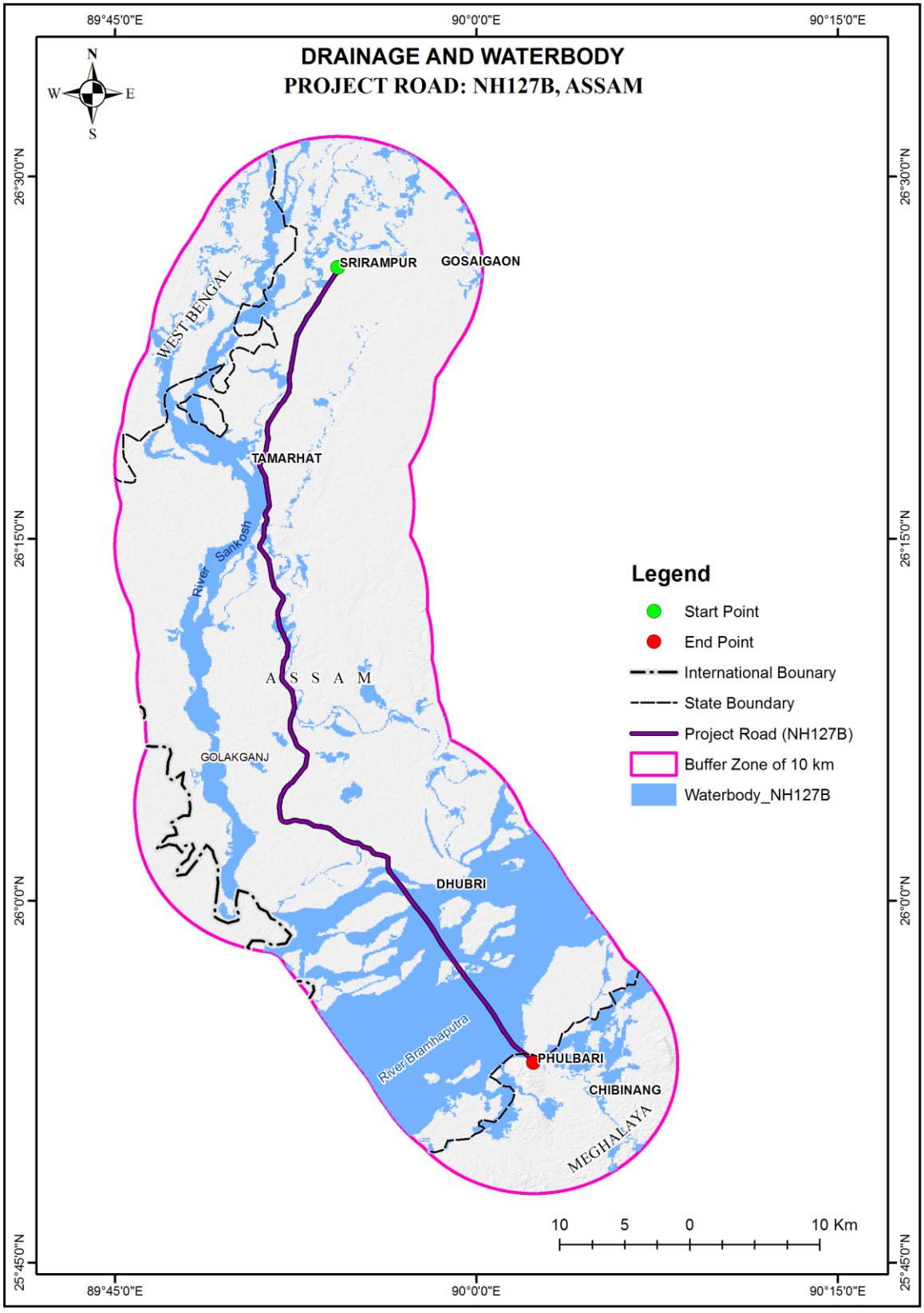
Water resources of the study area are classified into the following categories:

(i) Surface Water Resource: River, Nallah, Ponds, etc.
(ii) Ground Water Resources: Accumulation of water in deeper strata of ground.

The only source of recharging for surface water and ground water is from the atmospheric precipitation, which is in the form of rainfall.

- **Surface Water Resource:**

There are 2 rivers and 237 nos. of other water bodies (i.e. ponds, lakes etc along the project road). Satellite image of water bodies along the project road is shown in Figure below. Detailed road strip plan is attached in EMP.



Source: JICA Survey Team

Figure 7-46: Water Bodies along the Project Road

Some photographs of road side ponds and rivers are shown in Figure 7-47.

Source: JICA Survey Team

Figure 7-47: Photographs of Few Surface Water Bodies along the Project Road

- **Ground Water Resource:**

Kokrajhar district: Major Drainage Rivers of the district are Saralaganga, Paponi, Gangia, Saumukha and Lonya rivers including their tributaries. The drainage density is very high along with more or less parallel drainage patterns. The net ground water which is available in the district as estimated in the year 2009 is 1609.70 mcm. In Kokrajhar district stage of ground water development is around 9%. In this district, ground water occurs under unconfined condition to semi-confined conditions and it is a mono aquifer system, thus the water level is almost directly proportional to the amount of precipitation received. Therefore the pre-monsoon average water level is 2.2 – 4.5 mbgl, while the post monsoon water level is 1.9 - 4.1 mbgl. The long term water level trend does not show any kind of significant change (**Ground Water Information Booklet** Kokrajhar **District, Assam, CGWB, 2013)**.

Dhubri district: There are a number of perennial streams flowing through the district from north to south and joining the Brahmaputra River. The major drainage rivers of the area are Sankosh, Silai, Gadadhar and Gouranga Rivers. The net ground water which is available in the district as estimated in the year 2009 is 1636 mcm. The pre-monsoon depth of water level is 1.2 to 16.8 mbgl, while the post monsoon depth of water level is 1.2 to 15.5 mbgl (Figure 7-48). The existing gross ground water draft 181.1 mcm and the stages of development are 11% only which is under the SAFE category. Future provision for domestic and Industrial use is 65.35mcm including for Irrigation use is 1432.9 mcm **(Ground Water Information Booklet Dhubri District, Assam, CGWB, 2013).**

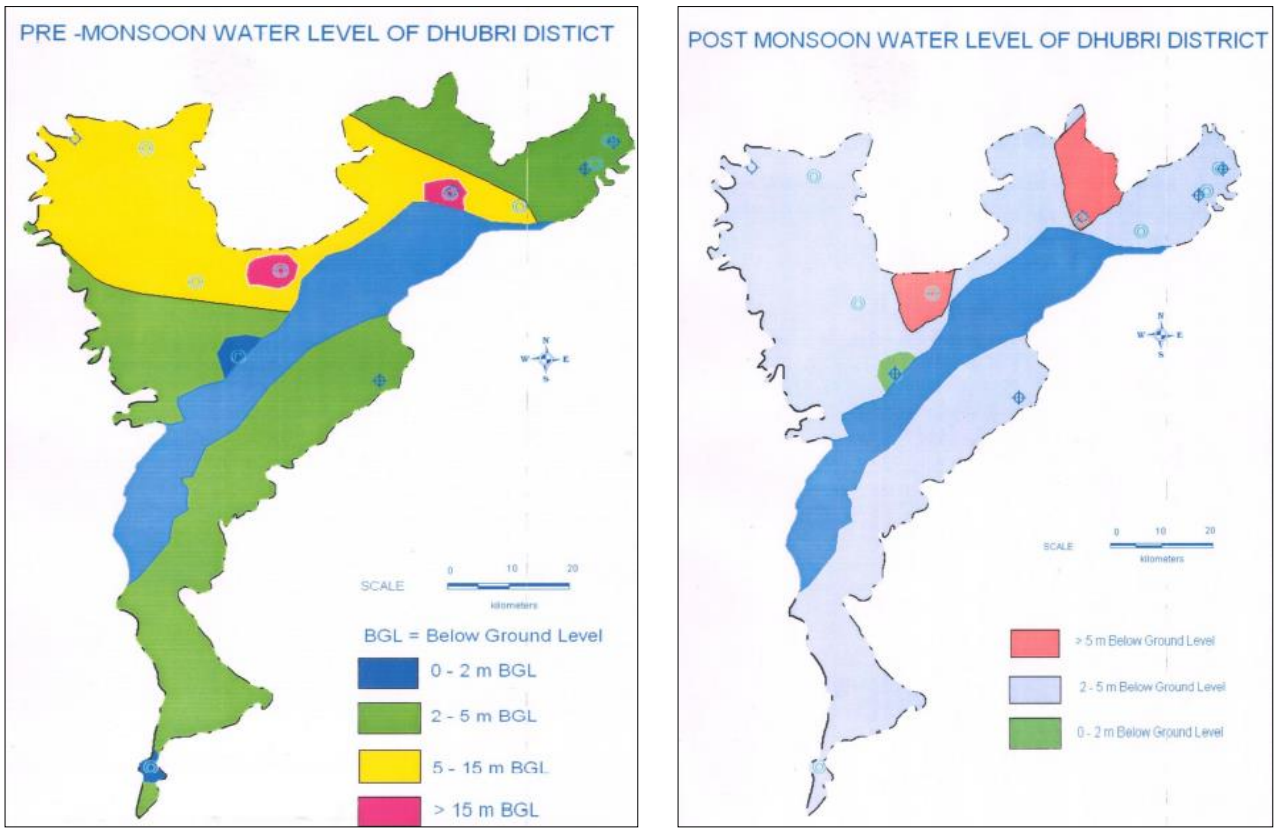
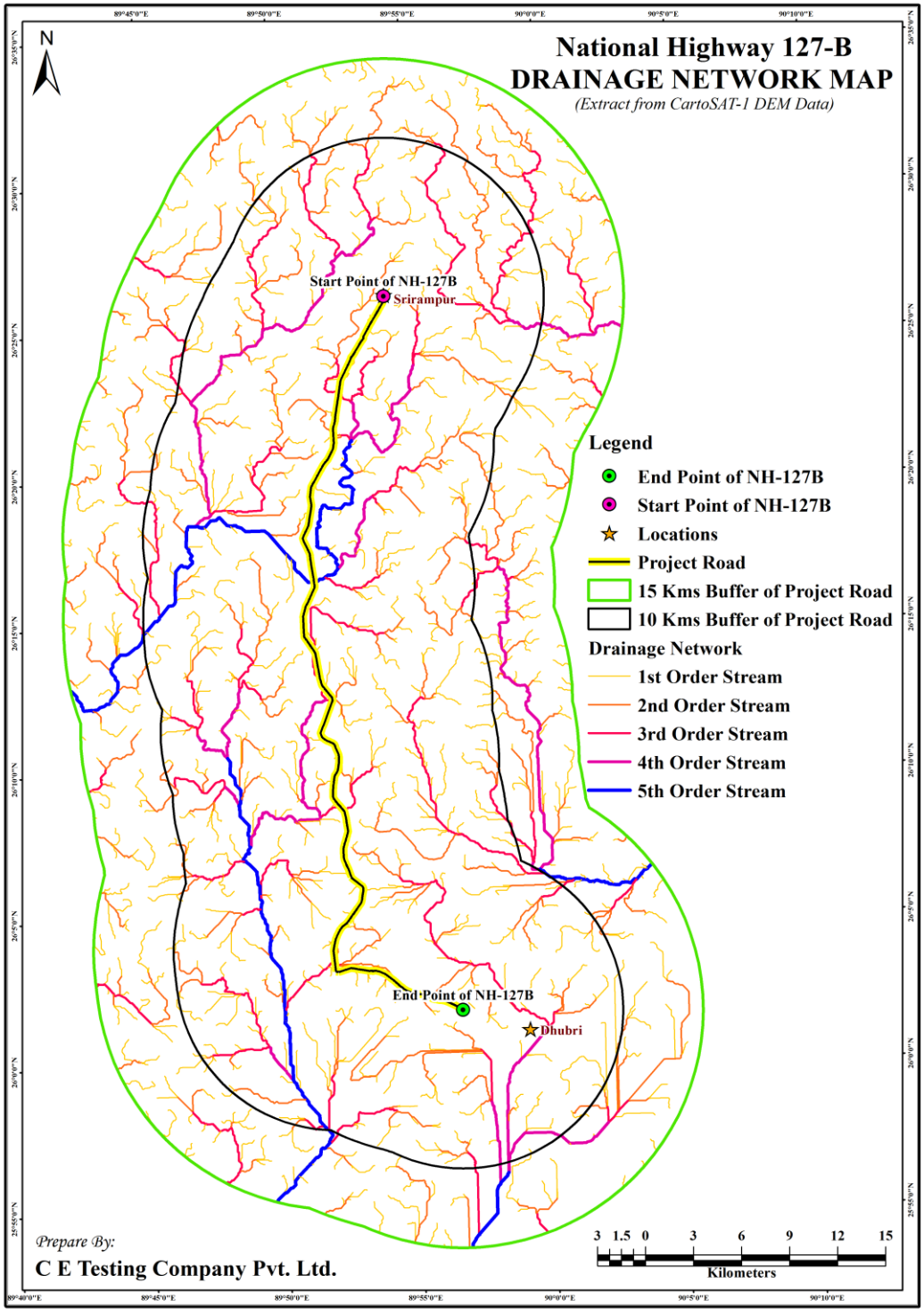


Figure 7-48: Map Showing Pre-Monsoon and Post-Monsoon Water Level of Dhubri District

(Source: http://cgwb.gov.in/District_Profile/Assam/Dhubari.pdf)

For ready reference of drainage pattern and elevation map has been prepared in a buffer of 10 km either side of project road alignment using IRS Resource SAT-1 LISS-III, the drainage network of study area has been shown in Figure 7-49.



Source: JICA Survey Team

Figure 7-49: Drainage Network of Project Study Area

- **Hydrogeology:**

Kokrajhar district: The major water bearing formation of the district is the sand and pebble aquifer zone which is down to 300 m depth along with weathered and fracture zones which are up to 100 m depth present in consolidated rocks. Hydrogeologically, the district is divided into 2 units namely, Piedmont plain (occupying in the north as well as elevated portion along the foothills of Himalayas) and Flood plain (present in the lower part comprising of newer alluvium forms in south). The district is underlain by thick alluvium which comprises of uniform porosity and permeability of around 10-15%. The ground water monitoring stations show very little variation in water level records. The average pre-monsoon water level of the district is 4.07 m bgl whereas post monsoon is 1.64 mbgl. The flood plain area constitutes a major portion of the district underlined by alluvial formation. The depth to water level varies from 2 to 4 mbgl and the seasonal fluctuation is in the range between 1 to 2 m. The movement of ground water is always towards the south. The ground water recharge by rainfall infiltration in the flood plain is much slower as compared to the piedmont zone. The average value of permeability of the shallow aquifer is about 40 m/day (**Ground Water Information Booklet** Kokrajhar **District, Assam, CGWB, 2013). and shown in** Figure 7-50.

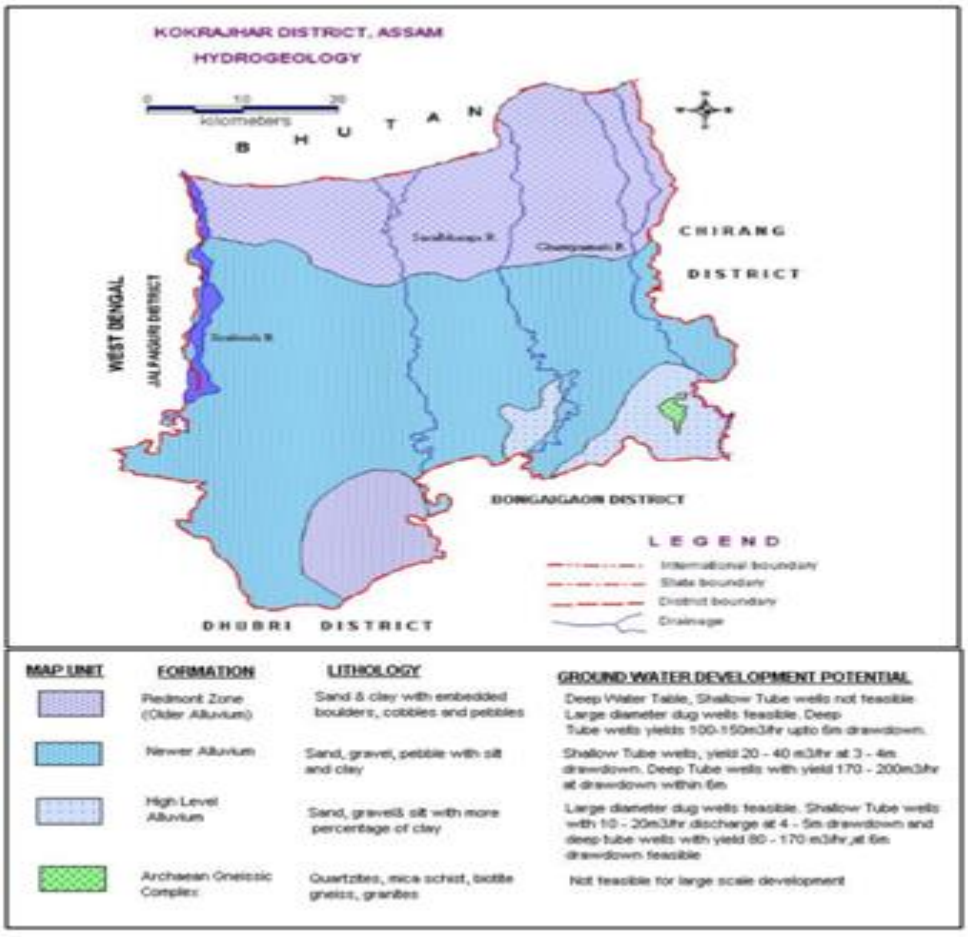


Figure 7-50: Map showing Hydrogeology of Kokrajhar District

(Source: http://cgwb.gov.in/District_Profile/Assam/Kokrajhar.pdf)

Dhubri district: Ground water conditions in the district are described under two different hydrogeological units namely, (i) conditions prevailing in consolidated formations and (ii) conditions prevailing in unconsolidated formations. Pre-Cambrian gneiss-schist complex which projects abruptly above the large stretch of alluvium referred as isolated hills forms the consolidated formation in the district. These rock formations had been subjected to faulting as well as fracturing at several places through which water percolates for facilitation of weathering. Weathered zone forms as such are restricted to about 10 m thickness and is mainly lateritic in character. Occurrence of ground water is limited in these formations and is confined to topographic lows along with weathered residuum. The ground water movement is controlled by the presence of fractures and fissures. Extraction of ground water in these zones is possible through large diameter dug wells as well as bore wells in hydrogeologically suitable areas. Ground water is present under water table conditions in the weathered zone. The unconsolidated formation is represented by the alluvial deposits of the recent age. This formation is found spreading on either side of the River Brahmaputra and comprises medium to coarse grained sand, cobbles, gravel, pebbles, etc. with intercalation of silt and clay. It is characterised by the presence of hard compact lateritic clay followed by coarse sand with pebbles and cobbles. Ground water is present under water table as well as semi-confined conditions. The water table contour follows topography of the area and also lies mainly parallel to the Brahmaputra River. The movement of ground water is from north to south in the north bank and south to north in the south bank of Brahmaputra. An artesian belt also present around Mancachar in the southern part of the district. There are promising aquifer zones down to the depth of maximum 200 m bgl in the northern bank of the River Brahmaputra and more than 100 m in the southern bank. Aquifer displays various degree of lateral and vertical variation of aquifer which indicates different degree of depositional environment both in space as well as time **(Ground Water Information Booklet Dhubri District, Assam, CGWB, 2013).**

(4) Water Quality

➢ Surface Water

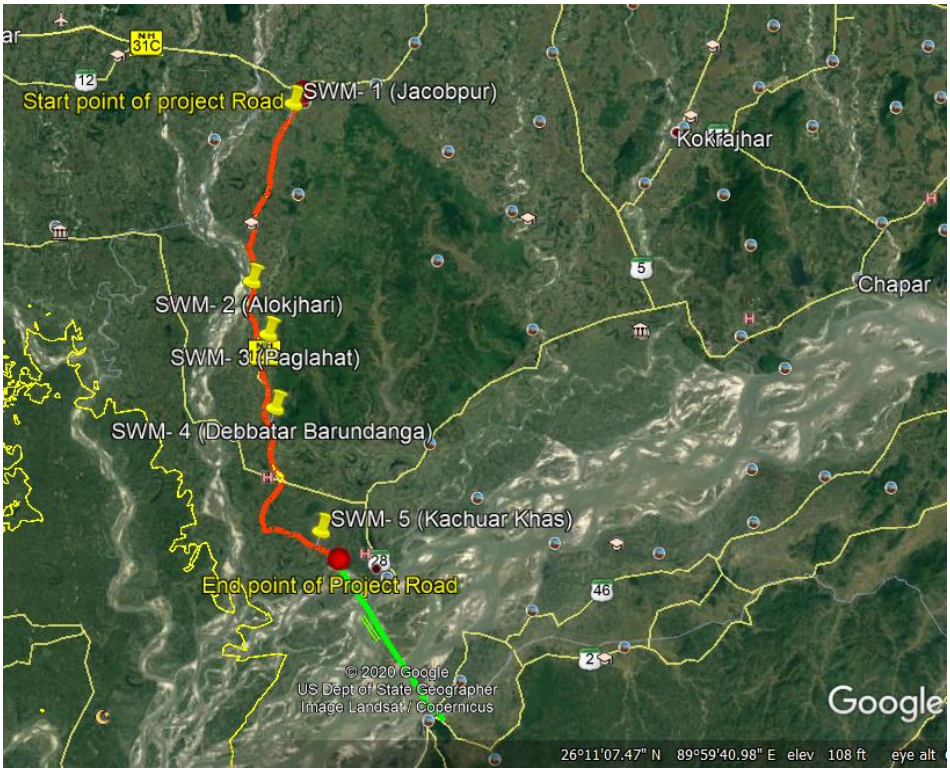
Surface water includes drainage channels (eg. rivers, streams, and canals) and stagnant water bodies (eg. lakes, ponds, tanks and other impounded water bodies). A highway project can significantly alter the hydrological setting of the project area by acting as an impediment to the natural drainage system of the region. It is, therefore, essential that all surface water resources and their characteristics be identified and examined along the project road.

To understand the surface water characteristics of the study area, 5 locations in the study area were selected for surface water sampling. The sampling locations are shown in Figure 7-51.

Table 7-48: Sampling Location Details of Surface Water

Location Area	Chainage	Latitude	Longitude	Distance from Alignment
Jacobpur (SWM 1)	3+100km	26°24’47.21” N	89°53’20.85”E	85m
Alokjhari (SWM 2)	21+500m	26°15’28.33” N	89°50’55.71”E	435m
Paglahat (SWM 3)	27+000km	26°12’41.94” N	89°51’53.17”E	30m
Debbatar Barundanga (SWM 4)	34+650km	26°08’50.49” N	89°52’17.22”E	117m
Kachuar Khas (SWM 5)	51+500km	26° 2'23.71"N	89°54'58.26"E	14m

Source: JICA Survey Team



Source: JICA Survey Team made from google map

Figure 7-51: Surface water Monitoring Locations

Analytical results of surface water quality along the project road are shown in Table 7-49.

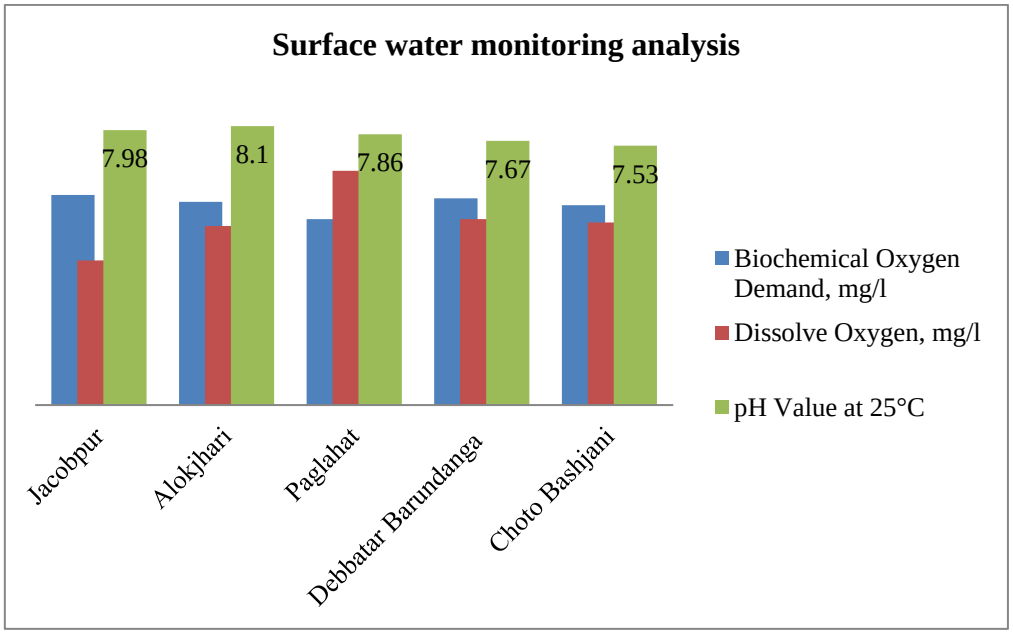
Table 7-49: Analytical Result of Surface Water Quality[15] along the Project Road

S. No.	Parameter(s)	Jacobpur 3+100km	Alokjhari 21+500m	Paglahat 27+000km	Debbatar Barundanga 34+650km	Kachuar Khas 51+500km	Acceptable Limit	Permissible Limit	WHO standards*1
1	pH Value at 25°C	7.98	8.1	7.86	7.67	7.53	6.5 – 8.5	No Relaxation	6.5-8.5
2	Conductivity at 25°C, µS/cm	541	511	304	289	314	-	-	-
3	Total Dissolve Solids, mg/l	352	332	198	188	204	500 Max	2000 Max	-
4	Turbidity, mg/l	21	18	16	18	14			-
5	Calcium (as Ca),mg/l	48.7	46.2	25.1	24.1	29.4	75 Max	200 Max	100
6	Magnesium (as Mg) , mg/l	22.4	21.4	13.4	12.1	14.2	30 Max	100 Max	50
7	Sodium (as Na) ,mg/l	19.4	18.4	11.2	9.8	8.6	-	-	50
8	Potassium (as K) ,mg/l	10.2	9.2	5.4	4.2	4.8	-	-	20
9	Total Alkalinity (as CaCO3) ,mg/l	185	224	138	128	141	200 Max	600 Max	-
10	Sulphate (as SO4) ,mg/l	24.6	28.4	13.4	12.1	16.4	200 Max	400 Max	250
11	Chloride (as Cl),mg/l	18.4	19.4	10.2	9.4	10.2	250 Max	1000 Max	250
12	Nitrate (as NO3) ,mg/l	11.5	12.4	11.2	8.4	9.3	45 Max	No Relaxation	50
13	Fluoride as F, mg/l	0.1	0.4	0.1	0.2	0.1			1.5
14	Sodium Absorption Ratio (SAR)	3.25	3.16	2.55	2.30	1.84			-
15	Iron (as Fe),mg/l	0.12	0.14	0.18	0.21	0.17	0.3 Max	No Relaxation	0.3-1.0
16	Dissolve Phosphate (as PO4) ,mg/l	0.18	0.16	0.21	0.27	0.22	-	-	-
17	Total Hardness (as CaCO3) ,mg/l	282	203	118	110	132	200 Max	600 Max	-
18	Biochemical Oxygen Demand, mg/l	6.1	5.9	5.4	6.0	5.8	-	-	-
19	Dissolve Oxygen, mg/l	4.2	5.2	6.8	5.4	5.3	-	-	-
20	Chemical Oxygen Demand, mg/l	21	19	18	16	22	-	-	-
21	Phenolic compound (as C6H5OH), mg/l	BDL	BDL	BDL	BDL	BDL			-

[15] Disclaimer: Although MoEF/CPCB does not recommend conduct of environmental monitoring during 15th June to 30th September in India. However this particular project is being developed in accordance with the JICA requirement, Terms of Reference for which require collection and compilation of baseline environmental status during this project (July 2020). Accordingly this collected baseline data is not prescribed to be used for compliane against Indian statutary requirement

S. No.	Parameter(s)	Jacobpur 3+100km	Alokjhari 21+500m	Paglahat 27+000km	Debbatar Barundanga 34+650km	Kachuar Khas 51+500km	Acceptable Limit	Permissible Limit	WHO standards*1
22	Lead (as Pb), mg/l	BDL	BDL	BDL	BDL	BDL	0.01	No Relaxation	0.01
23	Nickel (as Ni), mg/l	BDL	BDL	BDL	BDL	BDL	0.02	No Relaxation	0.07
24	Copper (as Cu), mg/l	BDL	BDL	BDL	BDL	BDL	0.05	1.5	2
25	Zinc (as Zn), mg/l	1.2	0.9	1.2	1.2	1.8	5	15	0.01-3
26	Cadmium (as Cd), mg/l	BDL	BDL	BDL	BDL	BDL	0.003	No Relaxation	0.003
27	Arsenic (as As), mg/l	BDL	BDL	BDL	BDL	BDL	0.01	0.05	0.01
28	Manganese (as Mn), mg/l	BDL	BDL	BDL	BDL	BDL			0.1-0.5
29	Boron (as B), mg/l	0.11	0.1	0.06	0.16	0.1			2.4
30	HexaChromium (as Cr6+, mg/l	BDL	BDL	BDL	BDL	BDL			-
31	Faecal Coliform MPN/100 ml	348	542	426	278	253			-

Source: JICA Survey team
Note: *1 WHO Guidelines for drinking water 2017



Source: JICA Survey Team

Figure 7-52: Graphical Representation of Surface Water Quality Analysis

From the above monitoring result it can be concluded that, the pH value varies from 7.53 to 8.1. Whereas BOD and DO values are almost close in all locations and COD value ranges between 16-22. Furthermore, in Jacobpur and Alokjhari total hardness is slightly exceeded compared to the acceptable limit.

CPCB and MOEF&CC has categorized the surface water in 5 different categories namely A, B, C, D and E (Ref: http://cpcb.nic.in/water-quality-criteria/) as presented in Table 7-50.

Table 7-50: Categorisation of Surface Water by CPCB and MOEF&CC

Designated-Best-Use	Class of water	Criteria
Drinking Water Source without conventional treatment but after disinfection	A	• Total Coliforms Organism MPN/100ml shall be 50 or less • pH between 6.5 and 8.5 • Dissolved Oxygen 6mg/l or more • Biochemical Oxygen Demand 5 days 20C 2mg/l or less
Outdoor bathing (Organised)	B	• Total Coliforms Organism MPN/100ml shall be 500 or less pH between 6.5 and 8.5 Dissolved Oxygen 5mg/l or more • Biochemical Oxygen Demand 5 days 20C 3mg/l or less
Drinking water source after conventional treatment and disinfection	C	• Total Coliforms Organism MPN/100ml shall be 5000 or less pH between 6 to 9 Dissolved Oxygen 4mg/l or more • Biochemical Oxygen Demand 5 days 20C 3mg/l or less
Propagation of Wild life and Fisheries	D	• pH between 6.5 to 8.5 Dissolved Oxygen 4mg/l or more • Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	• pH between 6.0 to 8.5 • Electrical Conductivity at 25C micro mhos/cm Max.2250 • Sodium absorption Ratio Max. 26 • Boron Max. 2mg/l

Source: JICA Survey Team

As per the categorization the surface water along the project road can be classified as Category D.

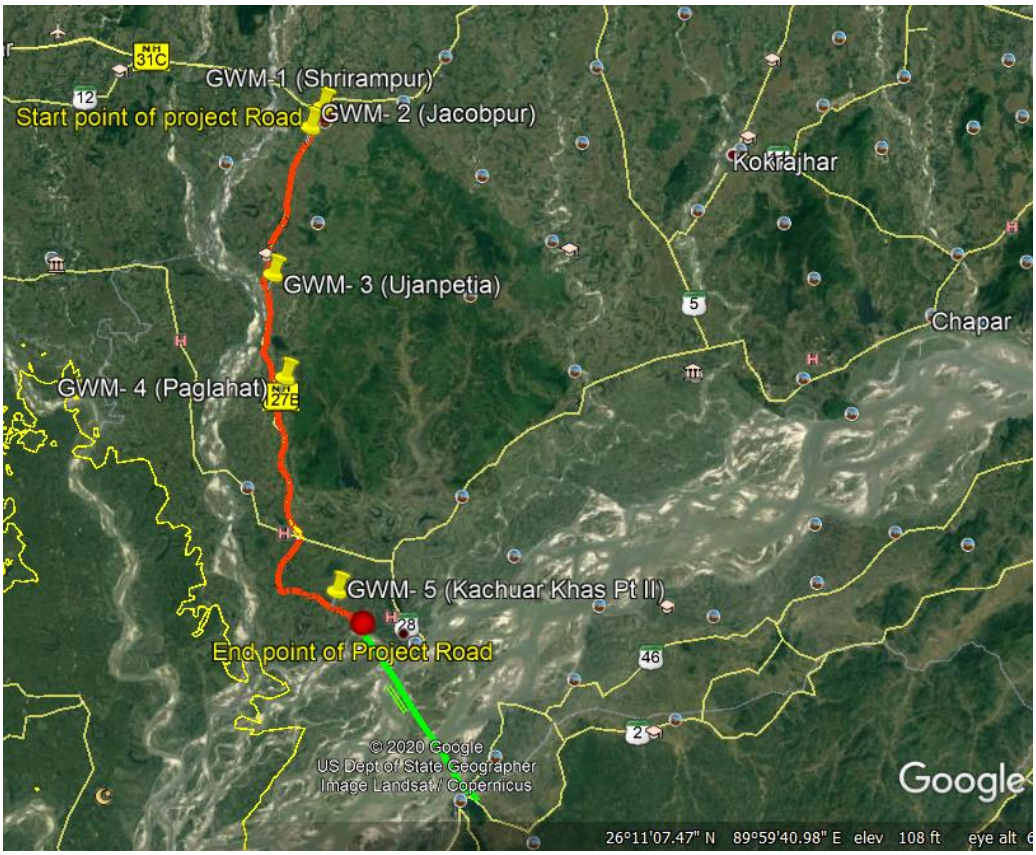
➢ Ground Water

Groundwater quality is a concern during road construction to establish baseline quality, ground water samples were drawn from 5 locations along the project road and analyzed as per IS 10500. The ground water quality is presented in Table 7-51 and the locations of ground water sampling is shown in Figure 7-53.

Table 7-51: Sampling Location Details of Ground Water

Location Area	Chainage	Latitude	Longitude	Distance from Alignment
Shrirampur (GWM 1)	1+400km	26°25'33.99"N	89°53'52.34"E	12m
Jacobpur (GWM 2)	3+500km	26°24'36.43"N	89°53'13.89"E	62m
Ujanpetia (GWM 3)	17+350km	26°17'34.80"N	89°51'14.58"E	48m
Paglahat (GWM 4)	27+000km	26°12'39.37"N	89°51'53.28"E	17m
Kachuar Khas Pt II (GWM 5)	51+000km	26° 2'27.56"N	89°54'38.63"E	21m

Source: JICA Survey Team



Source: JICA Survey Team made from google map

Figure 7-53: Ground Water Sampling Locations along the Project Road

Analytical results of ground water quality along project road alignment is shown in Table 7-52.

Table 7-52: Analytical Results of Ground Water Quality[16] along the Project Road

Sl no.	Parameter(s)	Shrirampur 1+400km	Jacobpur 3+500km	Ujanpetia 17+350km	Paglahat 27+100km	Kachuar Khas Pt II 51+000km	Acceptable Limit	Permissible Limit	WHO Standards
1	Colour, Hazen units	< 1	< 1	< 1	< 1	< 1	5 Max	15 Max	
2	Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	
3	Temperature, °C	20.2	20.2	20.2	20.2	20.2	-	-	
4	pH Value at 25°C	7.39	7.70	7.56	7.33	7.48	6.5 – 8.5	No Relaxation	6.5 – 8.5
5	Conductivity at 25°C, µS/cm	648	588	634	456	603	-	-	
6	Total Dissolve Solids, mg/l	421	382	412	296	392	500 Max	2000 Max	
7	Turbidity, mg/l	<1	<1	<1	<1	<1	1	5	
8	Calcium (as Ca), mg/l	56.3	48.2	51.2	36.4	42.1	75 Max	200 Max	100
9	Magnesium (as Mg), mg/l	32.1	30.2	32.4	24.1	36.1	30 Max	100 Max	50
10	Sodium (as Na),mg/l	15.4	14.5	17.4	11.2	16.2	-	-	50
11	Potassium (as K), mg/l	10.2	9.6	10.8	6.7	9.1	-	-	20
12	Total Alkalinity (as $CaCO_3$), mg/l	264	245	264	194	254	200 Max	600 Max	-
13	Sulphate (as SO_4), mg/l	45.2	41.2	43.2	24.8	36.7	200 Max	400 Max	250
14	Chloride (as Cl), mg/l	23.5	21.4	23.5	16.4	21.5	250 Max	1000 Max	250
15	Nitrate (as NO_3), mg/l	11.4	9.4	11.3	6.7	9.8	45 Max	No Relaxation	50
16	Fluoride as F, mg/l	0.09	0.12	0.14	0.15	0.11	1.0	1.5	1.5
17	Iron (as Fe), mg/l	0.24	0.27	0.19	0.18	0.25	0.3 Max	No Relaxation	0.3-1.0
18	Dissolve Phosphate (as PO4), mg/l	0.18	0.17	0.14	0.12	0.16	-	-	-
19	Total Hardness (as CaCO3) , mg/l	272	244	261	190	253	200 Max	600 Max	-
20	Phenolic compound (as C_6H_5OH), mg/l	BDL	BDL	BDL	BDL	BDL	0.001 Max	0.002 Max	-
21	Lead (as Pb), mg/l	BDL	BDL	BDL	BDL	BDL	0.01 Max	No Relaxation	0.01
22	Nickel (as Ni), mg/l	BDL	BDL	BDL	BDL	BDL	0.02 Max	No Relaxation	0.07
23	Copper (as Cu), mg/l	BDL	BDL	BDL	BDL	BDL	0.05 Max	1.5 Max	2
24	Zinc (as Zn), mg/l	1.2	1.4	1.2	1.4	1.3	5 Max	15 Max	0.01-3

[16] Disclaimer: Although MoEF/CPCB does not recommend conduct of environmental monitoring during 15th June to 30th September in India. However this particular project is being developed in accordance with the JICA requirement, Terms of Reference for which require collection and compilation of baseline environmental status during this project (July 2020). Accordingly this collected baseline data is not prescribed to be used for compliane against Indian statutary requirement.

Sl no.	Parameter(s)	Shrirampur 1+400km	Jacobpur 3+500km	Ujanpetia 17+350km	Paglahat 27+100km	Kachuar Khas Pt II 51+000km	Acceptable Limit	Permissible Limit	WHO Standards
25	Cadmium (as Cd), mg/l	BDL	BDL	BDL	BDL	BDL	0.003	No Relaxation	0.003
26	Arsenic (as As), mg/l	BDL	BDL	BDL	BDL	BDL	0.01 Max	0.05 Max	0.01
27	Aluminium (as Al), mg/l	BDL	BDL	0.1	BDL	BDL	0.03 Max	0.2 Max	-
28	Boron (as B), mg/l	0.12	0.10	0.09	0.11	0.16	0.5 Max	1.0 Max	2.4
29	Total Chromium (as Cr), mg/l	BDL	BDL	BDL	BDL	BDL	0.05 Max	No Relaxation	-
30	E. Coli, (MPN/100ml)	Absent	Absent	Absent	Absent	Absent	Absent	Shall not be detected in 100ml sample	-
31	Total Coliform, (MPN/100ml)	Absent	Absent	Absent	Absent	Absent	Absent	Shall not be detected in 100ml sample	-

Source: JICA Survey team
Note: *1 WHO Guidelines for drinking water 2017

Analysis results when compared with potable IS:10500 norms indicates that all parameters are within the permissible limit and maybe used as drinking water. Indian standard specification drinking water specification : II 10500:1991 is attached in annexure 5.

(5) Soil

Kokrajhar district:

The district forms a part of the vast alluvial plains of Brahmaputra River system and sub-basin of River Manas. Physiographically, it is characterised by the different land forms (a) inselbergs and (b) alluvial plains.

The inselbergs are Archaean inliers occurring in the form of disconnected hillocks in the alluvial plains. They are found occurring in the south-eastern part of the district. The hillocks are covered by a thick lateritic mantle and are occupied by evergreen mixed forests. The alluvial plains consists of older and newer alluvium. The older alluvium occupies the piedmont zone towards the north of the district bordering Bhutan. The high narrow zone at the Himalayan foothill is known as the Bhabar zone and supports dense forests. To the south of the Bhabar zone and parallel to it, there lies the flat Terai zone where the ground remains damp and sometimes springs oozes out. Tall grasses cover the Terai zone. The formation is composed of sand, clay with mixtures of pebble, cobble and boulders. The Newer alluvium includes sand, gravel, pebble with silt and clay.

Soil in greater parts of the district is sandy and silty loam, or clayey loam. The soils of the alluvium are partly new or recent and partly old. The variation in composition is mainly a result of the varying composition of the river borne materials deposited at different times and under different conditions. The younger alluvial soil has a high phosphorous content whereas in older alluvial soils, the content is very low. In general, the soil is acidic to slightly alkaline in nature and is moderately permeable and characterised by the presence of low organic carbon and low soluble salts. Soils restricted to inselberg areas are more clayey, lateritic and less permeable and are highly acidic in nature. From an agricultural point of view, the soils in major part of the district are suitable for all sorts of crops.

Dhubri district:

Physiographically, the district constitutes the vast alluvial plains of Brahmaputra River system. The monotony of the flat alluvial tract is interrupted by the presence of Archaean inliers in the form of disconnected hillocks referred to as inselbergs and these occur specially in the eastern and southern parts of the district. These hillocks are joined by the offshoots of Shillong plateau and are found on the north bank near Diple beel, Sitdanga beel and east of Bilasipara and on the south bank of the foothill portion of Garo Hills along the district boundary. The level difference between the valley and the peaks of the inselbergs ranges from 25 to 455 m. These hillocks are covered by a thick lateritic mante and are occupied by evergreen mixed forest. Terraced alluvial deposits occupy 80% of the district with conspicuous occurrence of buried channels, back swamps, etc. Soils in greater part of the district are sandy and silty loam, or clayey loam. It is found to be highly acidic to slightly alkaline in nature and is moderately permeable and characterised by the presence of low organic carbon and low soluble salts. Soils restricted to inselberg areas are more clayey, lateritic and less permeable and are highly acidic in nature. From agriculture point of view, the soils in major part of the area are suitable for all sorts of crops cultivation.

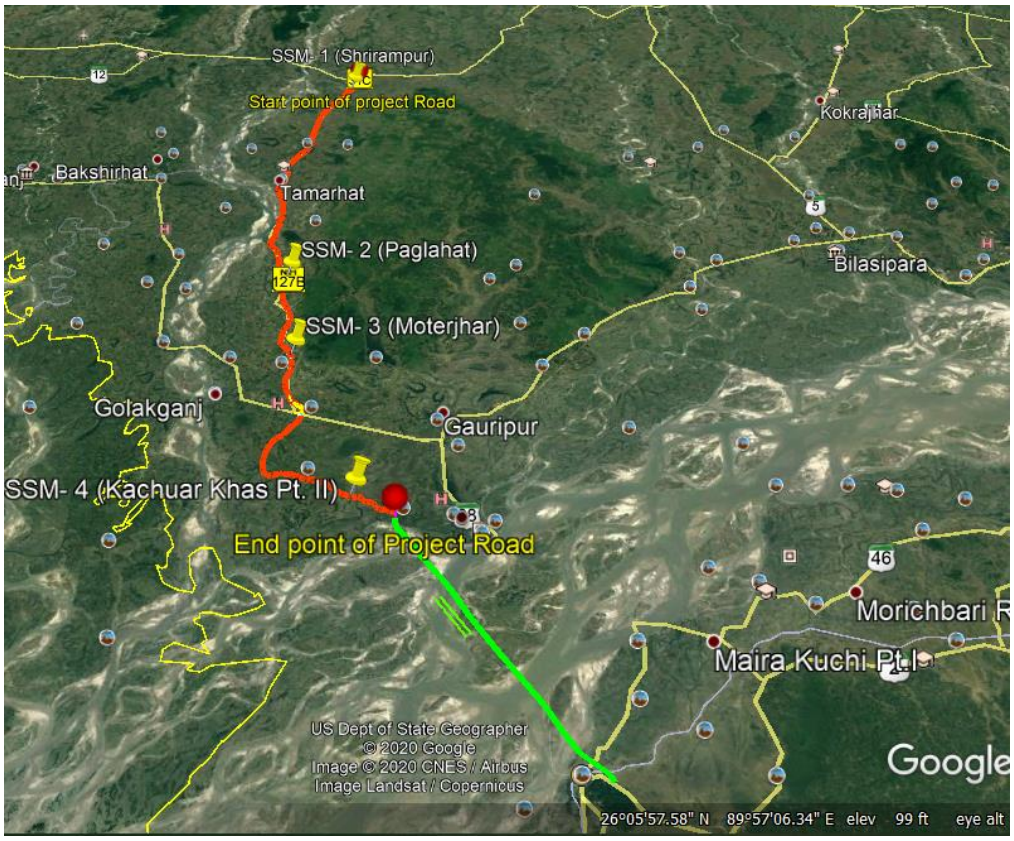
Soil Quality

To understand the soil characteristics of the study area, 4 locations in the study area were selected for soil sampling. The soil sampling locations are shown in Figure below.

Table 7-53: Soil Sampling Location Details

Location Area	Chainage	Latitude	Longitude	Distance from Alignment
Shrirampur (SSM 1)	1+580km	26°25'28.65"N	89°53'49.76"E	10m
Paglahat (SSM 2)	27+000km	26°12’41.94” N	89°51’53.17”E	30m
Moterjhar (SSM 3)	35+100km	26°08’35.19” N	89°52’21.87”E	10m
Kachuar Khas Pt. II (SSM 4)	51+300km	26° 2'24.76"N	89°54'50.11"E	15m

Source：JICA Survey Team



Source: JICA Survey Team

Figure 7-54: Soil Sampling Stations along the Project Road

The analysis results of soil quality are presented in Table 7-54.

Table 7-54: Physio-Chemical Analysis of Soil Quality[17]

Sl. No.	Parameters	Unit	Shrirampur 1+580km	Paglahat 27+000km	Moterjhar 35+100km	Kachuar Khas Pt. II 51+300km	US EPA*1 Standard of Soil
1	Soil Texture	-	Sandy Loam	Loam	Loam	Sandy Loam	—
2	Soil Colour		Whitish Brown	Whitish Brown	Whitish Brown	Whitish Brown	—
3	pH Value at 25°C	-	7.66	7.91	8.04	7.77	—
4	Conductivity at 25°C	µS/cm	681	604	708	633	—
5	Moisture	% by mass	12.4	12.4	12.4	11.6	—
6	Bulk Density	gm/cc	1.41	1.34	1.28	1.31	—
7	Water Holding Capacity	Inches/foot	1.17	1.14	1.12	1.16	—
8	Nitrogen as N	mg/Kg	28.2	26.4	21.4	22.8	7.8E+03
9	Phosphorus	mg/Kg	2.15	2.48	2.99	3.40	1.6E+00
10	Potassium (as K)	mg/Kg	58.4	51.2	60.4	57.6	—
11	Calcium as Ca	mg/Kg	41.3	41.0	48	45	7.8E+01
12	Nitrate as NO3	mg/Kg	78	69.4	81	76	—
13	Sulphate as SO4	mg/Kg	9.8	11.4	12.1	11.3	—
14	Chloride	mg/Kg	2.3	2.8	2.7	2.8	—
15	Organic Carbon	% by mass	4.4	4.4	4.8	4.4	—
16	Organic Matter	% by mass	3.6	3.2	3.7	3.4	
17	Total Soluble Solids	mg/Kg	12.4	11.7	10.8	11.9	
Particle size distribution							
A	Sand	% by mass	35.4	28.4	26.4	36.6	
B	Silt	% by mass	42.2	48.7	41.4	42.1	
C	Clay	% by mass	22.4	22.9	32.2	21.3	

Source: JICA Survey Team
Note: *1 PCB suggests international soil standards such as US EPA standards.

Soil texture of Shrirampur and Kachuar Khas Pt II is sandy loam, whereas the soil texture of Paglahat and Moterjhar is loam. The soil samples were alkaline, pH value at 25°C ranges between 7.66 to 8.04. The moisture content is medium.Bulk density in all locations varies from 1.28 to 1.41. The electrical conductivity is in the range of 633 - 708µs/cm. Based on above analysis, it can be inferred that all locations have moderate leaching potential and thus in case of any hydrocarbon/ chemical spill, there would be potential for groundwater contamination.

[17] Disclaimer: Although MoEF/CPCB does not recommend conduct of environmental monitoring during 15th June to 30th September in India. However this particular project is being developed in accordance with the JICA requirement, Terms of Reference for which require collection and compilation of baseline environmental status during this project (July 2020). Accordingly this collected baseline data is not prescribed to be used for compliane against Indian statutary requirement

7.6.2 Natural Environment

(1) Ecosystem

Assam is one of the essential biodiversity "hot spots" in the North-Eastern region of India.

The area harbours a wide variety of wildlife species in its diverse mosaic of natural habitats. The state sustained 33 endangered mammalian fauna, more than 20 endangered avian fauna under the Wildlife Protection Act, 1972, and 45 globally threatened avian fauna and 17 endemic birds. Also, the state supports more than 15 endangered reptilian and amphibian fauna each, and 43 endangered insect fauna.

Kokrajhar district:
Forest is one of the most prominent characteristics of this district. In the year 1990, Kokrajhar district became residence to Manas National Park, which has an area of 500 km^2 shared with four other districts. The major part of the district is covered by forest, both reserved as well as unreserved. The Chirang Reserved Forest, the Manas Reserved Forest, the Panbari Reserved Forest, the Bengtol Reserved Forest, and the Kachugaon Reserved Forest are the primary reserved forests which are covered by evergreen and semi-evergreen trees comprising an unusually dense mixed jungle. A considerable part of the forest areas which are low lying area remains scattered among the small high lands covered with tall grasses (which are home to wild animals). In the district, there are total of 161,195 hectares of forest area and 8.7 % of the total forest area of Assam (District Census Handbook, Kokrajhar, 2011). The present estimated area under reserved forests is roughly 1,719 km^2, which includes parts of Aie Valley Forest Division of Bongaigaon district as well as Guma Range of Dhubri Forest Division. The two forest divisions which fall totally under this district are Haltugaon and Kachugaon. There are three overlapping forest divisions in the district for particular purposes, namely Social Forestry Division, Working Plan Division as well as Wildlife Division. A portion of the Chakrasila Widlife Sanctuary also falls under Kokrajhar district (Brief Industrial Profile of Kokhrajhar District by Ministry of MSME, Govt. of India). According to 2011 Census, the total geographical area under forest is 312,900 hectares of which the forest area is 161195 hectares, reserved forests is 64,877.12 hectares, protected area is 4,556 hectares and other protected reserve forest is 2,947 hectares.

Dhubri district:
The district is rich in forest resources having a total forest covers of 6947.83 hectares, comprises 6,082.06 Hectares of Reserved forest, and 865.77 Hectares of Proposed Reserved forest. The total forest area does not include the unclassed state forest. The forests are mainly tropical moist deciduous forests interspersed with grasslands. The valuable trees available in the forests of the district are – Sal, Poma, Outenga, Sida , Azar, Bhomra, Simul, etc. A portion of the Chakrasila Widlife Sanctuary covering an area of 4558.7 hectares of land also falls under Dhubri district sharing with Kokrajhar district (Brief Industrial Profile of Dhubri District by Ministry of MSME, Govt. of India).

(2) Sensitive Area

No sensitive ecological habitats or ecosystems i.e Wildlife Sanctuary, National park, Ramsar Site, Important Bird Area, Wildlife Corridor, Tiger reserve, Elephant reserve are identified within the direct influence area of the project corridor. Nambor Wildlife Sanctuary is the sensitive ecological habitat in the indirect influence area (above 10km buffer zone).

(3) Vegetation

Vegetation around 10 km and 15 km buffer of the study area mostly comprises of large/ medium/ small trees bushy shrubs and annuals perennials or biennials herbs. No scheduled species as per Wildlife Protection Act ,1972 had been described from the project site nor any species listed under Endangered or Vulnerable as per IUCN status had been described from the project site.

Table 7-55: Vegetation of the Project Site

Family	*Scientific Name*	*Local Name*	*Type*	*IUCN Status*
Anacardiaceae	*Mangifera indica*	*Aam*	*T*	*DD*
Anacardiaceae	*Spondias pinnata*	*Amora*	*T*	*NA*
Arecaceae	*Calamus latifolius*	*Bet*	*S*	*LC*
Aracea	*Alocasia sp*	*Kochu*	*H*	*NA*
Athyriaceae	*Diplezium esculentum*	*Dhekia sak*	*H*	*NA*
Bambacaceae	*Bombax ceiba*	*Himulu/Shimul*	*T*	*LC*
Basellaceae	*Basella sp*	*Puroi/ Pui xak*	*C*	*NA*
Brassicaceae	*Brassica nigra*	*Soriyoh Sak*	*H*	*LC*
Caesalpiniaceae	*Bauhinia acuminata*	*Kanchan*	*T*	*LC*
Caesalpiniaceae	*Cassia fistula*	*Hunaru/Amaltas*	*T*	*LC*
Caricaceae	*Carica papaya*	*Amita*	*T*	*LC*
Combretaceae	*Terminalia chebula*	*Silikha*	*T*	*NA*
Combretaceae	*Terminalia bellerica*	*Bhomora*	*T*	*NA*
Commelinales	*Eichhornia crassipes*	*Meteka*	*AV*	*NA*
Dilleniaceae	*Dillenia indica*	*Ou tenga*	*T*	*LC*
Dipterocarpaceae	*Shorea robusta*	*Sal*	*T*	*LC*
Euphorbiaceae	*Baccaurea ramiflora*	*Leteku*	*T*	*LC*
Elaeocarpaceae	*Elaeocarpus floribundus*	*Jolphai*	*T*	*NA*
Euphorbiaceae	*Phyllanthus emblica*	*Amlokhi*	*T*	*NA*
Euphorbiaceae	*Trewia nudiflora*	*Bhelo*	*T*	*LC*
Fabaceae	*Tamarindus indica*	*Teteli*	*T*	*LC*
Gentianaceae	*Swertia chirayita*	*Chirota tita*	*H*	*NA*
Lauraceae	*Cinnamomum tamala*	*Tejpat*	*T*	*LC*
Lythraceae	*Lagerstroemia speciosa*	*Ajar,Jarul*	*T*	*NA*
Meliaceae	*Azadiracta indica*	*Maha-neem*	*T*	*LC*
Meliaceae	*Toona ciliata*	*Poma*	*T*	*LC*
Moraceae	*Artocarpus heterophyllus*	*Kothal*	*T*	*NA*
Moraceae	*Ficus hispida*	*Dumur,Dumuru*	*T*	*LC*
Moraceae	*Ficus benghalensis*	*Bor, Bot*	*T*	*NA*
Moraceae	*Ficus religiosa*	*Ahot, Asothyo*	*T*	*NA*
Moringaceae	*Moringa oleifera*	*Sajina*	*T*	*NA*
Musaceae	*Musa sp*	*kol*	*H*	*NA*
Myrtaceae	*Syzygium cumini*	*Kola Jamu, Jam*	*T*	*LC*
Myrtaceae	*Psidum guajava*	*Madhuri/Peyara*	*T*	*LC*
Nelumbonaceae	*Nelumbo nucifera*	*Podom/Podmo*	*AV*	*DD*
Nymphaeaceae	*Nymphaea rubra*	*Seluk*	*AV*	*LC*
Oxalidaceae	*Averrhoa carambola*	*Kordoi*	*T*	*NA*
Oleaceae	*Nyctanthes arbor-tristis*	*Sewali phul*	*T*	*NA*
Poaceae	*Bambusa balcooa*	*Bhaluka Bah*	*S*	*LC*
Poaceae	*Bambusa tulda*	*Jati Bah*	*S*	*LC*
Piperaceae	*Piper betle*	*Pan*	*C*	*NA*
Rhamnaceae	*Zizyphus mauritiana*	*Bogori*	*T*	*NA*
Rutaceae	*Aegle marmelos*	*Bel*	*T*	*NA*
Rubiaceae	*Anthocephalus chinensis*	*Kadam*	*H*	*NA*
Rutaceae	*Citrus grandi*	*Robab tenga*	*T*	*NA*
Rutaceae	*Murraya koenigii*	*Narasingha*	*S*	*NA*

Family	*Scientific Name*	*Local Name*	*Type*	*IUCN Status*
Salicaceae	*Flacourtia jangomas*	*Ponial*	*T*	*NA*
Solanaceae	*Capsicum sp*	*Bhot Jolokia*	*S*	*NA*
Trapaceae	*Trapa natans*	*Singori/Pani phal*	*AV*	*LC*
Verbenaceae	*Tectona grandis*	*Segun*	*T*	*NA*
Zingiberaceae	*Curcuma longa*	*Halodhi*	*H*	*DD*
T= Tree, S= Shrub, AV= Aquatic Vegetation, H= Herb, C= Climbers *LC= Least Concern, DD= Data Deficient, NA= Not Listed*				

Source: 1. https://avibase.bsc-eoc.org/avibase.jsp
2. http://asbb.gov.in/

(4) Fauna in Study Area

The flora and fauna survey was conducted during July – August 2020. Below is the details of the methodology of the flora and fauna survey.

Table 7-56: Methodology of the Flora and Fauna Survey

Survey Period	2020 : July last week to Aug first Week
Vegetation Survey	Quadrat Method (15 m. radius circular plot) Randomly selected 3 quadrat survey was carried out. Secondary information on distribution also consulted to prepare the complete list
Avian / Bird Diversity	Point Transect Methods were used to record /document available species using binocular. 3 points are selected in different habitat along the present ROW to document the diversity of birds. Secondary information on distribution and diversity also consulted to prepare the complete list.
Mammalian Diversity	Sign Survey through Line transect Method. 3 transects of 1 km length was surveyed along the present ROW. Secondary information on diversity of mammals was also carried out through semi structured questionnaire survey of local community. Secondary information on distribution and diversity also consulted to prepare the complete list.
Reptilian Diversity	Based on secondary information and semi structured questionnaire survey. Some snake species were documented during vegetation analysis, bird diversity count and Sign Survey.
Amphibian Diversity	Documented during vegetation analysis, bird diversity count and Sign Survey. Secondary information on distribution and diversity also consulted to prepare the complete list.

Source：JICA Survey Team

Mammals of Study Area

Mammalian diversity is not high as the area does not have any dense forest cover. Only minor mammals are seen. Gangetic Dolphin is only found in the waters of Brahmaputra, which do not fall under the direct influence zone of the project site.

Table 7-57: Mammal of the Project Site

Order	*Common Name*	*Scientific Name*	*Local Name*	*IUCN Status*	*WPA Status*
Primates	Monkey	*Macaca mulatta*	Molu Bandor	LC	II
Artiodactyla	Gangetic Dolphin	*Platanista gangetica*	Hihu	EN	I
Artiodactyla	Wild Boar	*Sus scrofa*	Gahori	LC	III
Carnivora	Jackal	*Canis aureus*	Siyal	LC	II
Carnivora	Bengal Fox	*Vulpes bengalensis*	Siyal	LC	II
Carnivora	Jungle Cat	*Felis chaus*	Junglee Mekuri	LC	II
Carnivora	Common Palm Civet	*Paradoxurus hermaphroditus*	Joha Mol	LC	II
Carnivora	Small Indian Mongoose	*Herpestes auropunctatus*	Neul	LC	IV
Lagomorpha	Black-Naped Hare	*Lepus nigricollis*	Sohapohu	LC	IV
Chiroptera	Flying Fox	*Pteropus giganteus*	Baduli	LC	V
Eulipotyphla	The Asian House Shrew	*Suncus murinus*	Sika	LC	V
Rodentia	Himalayan Porcupine	*Hystrix brachyura*	Katela Pohu	LC	II
Rodentia	Hoary-Bellied Squirrel	*Callosciurus pygerythrus*	Kerketua	LC	V
Rodentia	The House Mouse	*Mus musculus*	Nigoni	LC	V
Rodentia	Bandicoot Rat	*Bandicota bengalensis*	Musua	LC	IV
LC= Least Concern, EN= Endangered					

Source:

1.Khatun.,M., Ali., A. and Sarma.,A(2014)Population fluctuation at Indian Flying Fox (Pteropus giganteus) colonies in the Kacharighat Roosting Site of Dhubri district of Assam. Int. J. Pure App. Biosci. 2 (4): PP184-188
2.Das A., Sharma P., Harikrishnan S., Ghosh S., Nath A., Dhar D., Mondol J. and Wangdi Y. (2014) A Rapid Assessment of Herpetofaunal Diversity in Manas-Bhutan TransboundaryLandscape
3.http://asmenvis.nic.in/Database/Animal_Diversity_844.aspx
4.http://wiienvis.nic.in/Database/ScheduleSpeciesDatabase_7969.aspx

Birds of Study Area

Due to the presence of numerous fish-rich water bodies and mighty Brahmaputra River, agricultural fields, the area is home to multiple bird species. Some water bodies such as Sareswar Beel and Brahmaputra River act as winter migration habitat for many species. There are reports of rare sightings of White Rumped Vulture from the area, but no nesting sites had been reported in close vicinity of the project's direct influence zone.

Table 7-58 Birds of the Project Site

Order	*Common Name*	*Scientific name*	*Type*	*IUCN Status*	*WPA Status*
ANSERIFORMES	Lesser Whistling Duck	*Dendrocygna javanica*	R	LC	IV
ANSERIFORMES	Common Shelduck	*Tadorna tadorna*	W	LC	IV
ANSERIFORMES	Ruddy Shelduck	*Tadorna ferruginea*	W	LC	IV
ANSERIFORMES	Red-Crested Pochard	*Netta rufina*	W	LC	IV
ANSERIFORMES	Common Pochard	*Aythya ferina*	W	VU	IV
ANSERIFORMES	Ferruginous Duck	*Aythya nyroca*	W	NT	IV
ANSERIFORMES	Tufted Duck	*Aythya fuligula*	W	LC	IV
ANSERIFORMES	Garganey	*Spatula querquedula*	W	LC	IV
ANSERIFORMES	Northern Shoveler	*Spatula clypeata*	W	LC	IV
ANSERIFORMES	Gadwall	*Mareca strepera*	W	LC	IV
ANSERIFORMES	Eurasian Wigeon	*Mareca penelope*	W	LC	IV
ANSERIFORMES	Indian Spot-Billed Duck	*Anas poecilorhyncha*	W	LC	IV
ANSERIFORMES	Mallard	*Anas platyrhynchos*	W	LC	IV
ANSERIFORMES	Northern Pintail	*Anas acuta*	W	LC	IV
ANSERIFORMES	Common Teal	*Anas crecca*	W	LC	IV
PHOENICOPTERIFORMES	Little Grebe	*Tachybaptus ruficollis*	R	LC	IV
COLUMBIFORMES	Rock Dove	*Columba livia*	R	LC	IV
COLUMBIFORMES	Oriental Turtle Dove	*Streptopelia orientalis*	R	LC	IV
COLUMBIFORMES	Yellow-Footed Green-Pigeon	*Treron phoenicoptera*	R	LC	IV
COLUMBIFORMES	Spotted Dove	*Streptopelia chinensis*	R	LC	IV
COLUMBIFORMES	Red Collared Dove	*Streptopelia tranquebarica*	R	LC	IV
CAPRIMULGIFORMES	Common Swift	*Apus apus*	R	LC	IV
CUCULIFORMES	Greater Coucal	*Centropus sinensis*	R	LC	IV
CUCULIFORMES	Indian Cuckoo	*Cuculus micropterus*	R	LC	IV
CUCULIFORMES	Asian Koel	*Eudynamys scolopaceus*	R	LC	IV
GRUIFORMES	White-Breasted Waterhen	*Amaurornis phoenicurus*	R	LC	IV
GRUIFORMES	Purple Swamp Hen	*Porphyrio porphyrio*	R	LC	IV
GRUIFORMES	Common Coot	*Fulica atra*	R	LC	IV
PELECANIFORMES	Lesser Adjutant	*Leptoptilos javanicus*	R	VU	IV
PELECANIFORMES	Asian Openbill	*Anastomus oscitans*	R	LC	IV
PELECANIFORMES	Indian Pond Heron	*Ardeola grayii*	R	LC	IV
PELECANIFORMES	Cattle Egret	*Bubulcus ibis*	R	LC	IV
PELECANIFORMES	Great Egret	*Ardea alba*	R	LC	IV
PELECANIFORMES	Intermediate Egret	*Ardea intermedia*	R	LC	IV
PELECANIFORMES	Little Egret	*Egretta garzetta*	R	LC	IV

Order	***Common Name***	***Scientific name***	***Type***	***IUCN Status***	***WPA Status***
PELECANIFORMES	Little Cormorant	*Microcarbo niger*	R	LC	IV
CHARADRIIFORMES	Northern Lapwing	*Vanellus vanellus*	W	NT	IV
CHARADRIIFORMES	Grey-Headed Lapwing	*Vanellus cinereus*	W	NT	IV
CHARADRIIFORMES	Red-Wattled Lapwing	*Vanellus indicus*	R	LC	IV
CHARADRIIFORMES	River Lapwing	*Vanellus duvaucelii*	R	LC	IV
CHARADRIIFORMES	Pheasant-Tailed Jacana	*Hydrophasianus chirurgus*	R	LC	IV
CHARADRIIFORMES	Bronze-Winged Jacana	*Metopidius indicu*	R	LC	IV
CHARADRIIFORMES	Common Sandpiper	*Actitis hypoleucos*	W	LC	IV
CHARADRIIFORMES	Common Greenshank	*Tringa nebularia*	W	LC	IV
CHARADRIIFORMES	Marsh Sandpiper	*Tringa stagnatilis*	W	LC	IV
CHARADRIIFORMES	Common Snipe	*Gallinago gallinago*	W	LC	IV
CHARADRIIFORMES	Black-Headed Gull	*Chroicocephalus ridibundus*	W	LC	IV
CHARADRIIFORMES	Whiskered Tern	*Chlidonias hybrida*	W	LC	IV
ACCIPITRIFORMES	Black-Winged Kite	*Elanus caeruleus*	R	LC	IV
ACCIPITRIFORMES	Himalayan Griffon	*Gyps himalayensis*	R	EN	IV
ACCIPITRIFORMES	White Rumped Vulture	*Gyps indicus*	R	CR	I
ACCIPITRIFORMES	Crested Serpent-Eagle	*Spilornis cheela*	R	LC	IV
ACCIPITRIFORMES	Black Kite	*Milvus migrans*	R	LC	IV
ACCIPITRIFORMES	Pallas's Fish-Eagle	*Haliaeetus leucoryphus*	R	EN	IV
ACCIPITRIFORMES	Gray-Headed Fish-Eagle	*Haliaeetus ichthyaetus*	R	NT	IV
STRIGIFORMES	Barn Owl	*Tyto alba*	R	LC	IV
STRIGIFORMES	Brown Fish-Owl	*Ketupa zeylonensis*	R	LC	IV
STRIGIFORMES	Asian Barred Owlet	*Glaucidium cuculoides*	R	LC	IV
STRIGIFORMES	Jungle Owlet	*Glaucidium radiatum*	R	LC	IV
STRIGIFORMES	Spotted Owlet	*Athene brama*	R	LC	IV
BUCEROTIFORMES	Oriental Pied-Hornbill	*Anthracoceros albirostris*	R	LC	IV
BUCEROTIFORMES	Common Hoopoe	*Upupa epops*	R	LC	IV
CORACIIFORMES	Common Kingfisher	*Alcedo atthis*	R	LC	IV
CORACIIFORMES	White-Throated Kingfisher	*Halcyon smyrnensis*	R	LC	IV
CORACIIFORMES	Pied Kingfisher	*Ceryle rudis*	R	LC	IV
CORACIIFORMES	Green Bee-Eater	*Merops orientalis*	R	LC	IV
CORACIIFORMES	Chestnut-Headed Bee-Eater	*Merops leschenaulti*	R	LC	IV
CORACIIFORMES	Indian Roller	*Coracias benghalensis*	R	LC	IV
PICIFORMES	Coppersmith Barbet	*Psilopogon haemacephalus*	R	LC	IV
PICIFORMES	Blue-Eared Barbet	*Psilopogon duvaucelii*	R	LC	IV
PICIFORMES	Lineated Barbet	*Psilopogon lineatus*	R	LC	IV
PICIFORMES	Blue-Throated Barbet	*Psilopogon asiaticus*	R	LC	IV
PICIFORMES	Common Flame-Backed Woodpecker	*Dinopium javanense*	R	LC	IV
PICIFORMES	Black-Rumped Flameback	*Dinopium benghalense*	R	LC	IV

Order	***Common Name***	***Scientific name***	***Type***	***IUCN Status***	***WPA Status***
PICIFORMES	Greater Flameback	*Chrysocolaptes guttacristatus*	R	LC	IV
PSITTACIFORMES	Alexandrine Parakeet	*Psittacula eupatria*	R	NT	IV
PSITTACIFORMES	Rose-Ringed Parakeet	*Psittacula krameri*	R	LC	IV
PSITTACIFORMES	Gray-Headed Parakeet	*Psittacula finschii*	R	NT	IV
PSITTACIFORMES	Blossom-Headed Parakeet	*Psittacula roseata*	R	NT	IV
PSITTACIFORMES	Red-Breasted Parakeet	*Psittacula alexandri*	R	NT	IV
PASSERIFORMES	Scarlet Minivet	*Pericrocotus speciosus*	R	LC	IV
PASSERIFORMES	Black-Hooded Oriole	*Oriolus xanthornus*	R	LC	IV
PASSERIFORMES	Common Iora	*Aegithina tiphia*	R	LC	IV
PASSERIFORMES	Black Drongo	*Dicrurus macrocercus*	R	LC	IV
PASSERIFORMES	Long-Tailed Shrike	*Lanius schach*	R	LC	IV
PASSERIFORMES	Rufous Treepie	*Dendrocitta vagabunda*	R	LC	IV
PASSERIFORMES	House Crow	*Corvus splendens*	R	LC	IV
PASSERIFORMES	Common Tailorbird	*Orthotomus sutorius*	R	LC	IV
PASSERIFORMES	Paddyfield Warbler	*Acrocephalus agricola*	R	LC	IV
PASSERIFORMES	Red-vented Bulbul	*Pycnonotus cafer*	R	LC	IV
PASSERIFORMES	Red-whiskered Bulbul	*Pycnonotus jocosus*	R	LC	IV
PASSERIFORMES	Jungle Babbler	*Turdoides striata*	R	LC	IV
PASSERIFORMES	Indian White-eye	*Zosterops palpebrosus*	R	LC	IV
PASSERIFORMES	Asian Pied Starling	*Gracupica contra*	R	LC	IV
PASSERIFORMES	Common Myna	*Acridotheres tristis*	R	LC	IV
PASSERIFORMES	Bank Myna	*Acridotheres ginginianus*	R	LC	IV
PASSERIFORMES	Jungle Myna	*Acridotheres fuscus*	R	LC	IV
PASSERIFORMES	House Sparrow	*Passer domesticus*	R	LC	IV
PASSERIFORMES	Oriental Magpie-Robin	*Copsychus saularis*	R	LC	IV
PASSERIFORMES	Baya Weaver	*Ploceus philippinus*	R	LC	IV
PASSERIFORMES	Western Yellow Wagtail	Motacilla flava	R	LC	IV
PASSERIFORMES	Gray Wagtail	Motacilla cinerea	R	LC	IV
PASSERIFORMES	Citrine Wagtail	Motacilla citreola	R	LC	IV
PASSERIFORMES	White Wagtail	Motacilla alba	R	LC	IV

Source:

1. Islam, Z.-U., and Rahmani, A. R.(2004). Important Bird Areas in India. Priority sites for conservation. 1st ed. Mumbai: Indian Bird Conservation Network: Bombay Natural History Society and BirdLife International (UK). Pp. i–xviii, 1–1133
2. Sinha, A., Talukdar, S., Das, G.C., Sarma, P.K., and Singha ,H., 2015. Diversity of winter avifauna in Dheer beel, Assam, India. Indian BIRDS. 10 (3&4): 99–103

Table 7-59: Comparison with the List of Endangered Species (IUCN Red List)

Common Name / Local Name	*Scientific Name*	Type	IUCN Status	Remarks
Gangetic Dolphin	*Platanista gangetica*	Mammals	EN	Mostly seen in deep waters of Brahmaputra River .
Burmese Python	*Python bivittatus*	Reptile	VU	Locally Common, mostly found in forested areas.
Assam Roofed Turtle	Pangshura sylhetensis	Reptile	EN	Rare. Found mostly in river waters of Brahmaputra . Out side of ROW.
Indian Eyed Turtle	Morenia petersi	Reptile	VU	Rare. Found mostly in river waters of Brahmaputra . Outside of ROW.
Tricarinate Turtle	Melanochelys tricarinata	Reptile	EN	Rare. Found mostly in forested areas. Outside of ROW
Narrow-Headed Softshell Turtle	Chitra indica	Reptile	EN	Rare. Found mostly in river waters of Brahmaputra . Out side of ROW.
Indian Peacock Soft-Shell Turtle	Nilssonia hurum	Reptile	VU	Rare. Found mostly in river waters of Brahmaputra . Out side of ROW.
Gangetic Soft-Shell Turtle	Nilssonia gangeticus	Reptile	VU	Rare. Found mostly in river waters of Brahmaputra . Out side of ROW.
Crowned River Turtle	Hardella thurjii	Reptile	VU	Rare.Found mostly in river waters of Brahmaputra . Out side of ROW.
Yellow Tortoise	Indotestudo elongata	Reptile	EN	Rare. Found mostly in forested areas. Outside of ROW
Three-Striped Roofed Turtle	Batagur dhongoka	Reptile	EN	Rare.Found mostly in river waters of Brahmaputra . Out side of ROW.
Gethu	Botia rostrata	Fish	VU	Locally Common. Mostly found in deep river waters or Beels.
Common carp	Cyprinus carpio	Fish	VU	Locally Common. Mostly found in deep river waters or Beels.
Silver carp	Hypopthalmychthys molitrix	Fish	NT	Locally Common. Mostly found in deep river waters or Beels.
Chital	Chitala chitala	Fish	NT	Locally Common. Mostly found in deep river waters or Beels.
Kholihona	Ctenop nobilis	Fish	NT	Locally Common. Mostly found in deep river waters or Beels.
Pavo	Ompok pabda	Fish	NT	Locally Common. Mostly found in deep river waters or Beels.
Barali	Wallago attu	Fish	NT	Locally Common. Mostly found in deep river waters or Beels.
Kajoli	Ailia coila	Fish	NT	Locally Common. Mostly found in deep river waters or Beels.

Common Name / Local Name	***Scientific Name***	**Type**	**IUCN Status**	**Remarks**
Common Pochard	*Aythya ferina*	Bird	VU	Migratory. Mostly found near large water bodies(Beels) or River Beds
Ferruginous Duck	*Aythya nyroca*	Bird	NT	Migratory. Mostly found near large water bodies(Beels) or River Beds
Lesser Adjutant	*Leptoptilos javanicus*	Bird	VU	Migratory. Mostly found near large water bodies(Beels) or River Beds
Northern Lapwing	*Vanellus vanellus*	Bird	NT	Migratory. Mostly found near large water bodies(Beels) or River Beds
Grey-Headed Lapwing	*Vanellus cinereus*	Bird	NT	Migratory. Mostly found near large water bodies(Beels) or River Beds
Himalayan Griffon	*Gyps himalayensis*	Bird	EN	Rare visitor. No nesting sites reported in close vicinity of ROW
White Rumped Vulture	*Gyps indicus*	Bird	CR	Rare visitor. No nesting sites reported in close vicinity of ROW.
Pallas's Fish-Eagle	*Haliaeetus leucoryphus*	Bird	EN	Mostly found near large water bodies (Beels) or River banks. No nesting sites reported in close vicinity of ROW.
Gray-Headed Fish-Eagle	*Haliaeetus ichthyaetus*	Bird	NT	Mostly found near large water bodies (Beels) or River banks. No nesting sites reported in close vicinity of ROW.
Alexandrine Parakeet	*Psittacula eupatria*	Bird	NT	Locally Common.
Gray-Headed Parakeet	*Psittacula finschii*	Bird	NT	Locally Common.
Blossom-Headed Parakeet	*Psittacula roseata*	Bird	NT	Locally Common.
Red-Breasted Parakeet	*Psittacula alexandri*	Bird	NT	Locally Common.
VU = Vulnerable, T = Near Threatened, EN = Endangered, CR = Critically Endangered,				

Source: http://www.iucnredlist.org/

Herpetofauna of Study Area

Herpetofauna includes Reptiles and amphibian animals in a particular area. Major reptiles include snakes, lizards, turtles, and tortoises. Turtles and Tortoise are found mostly in Brahmaputra river system and large beels which are not in the direct influence zone of the project site. Snakes are common in the project site as the area being a predominantly agriculture zone. Few snakes are also venomous such as Banded Krait, Monocled Cobra, Spectacled Cobra, and Red Necked Keelback.

Table 7-60: Herpetofauna of the Project Site

Order	*Common Name*	*Scientific Name*	*Local Name*	*IUCN Status*	*WPA Status*
Snakes and lizards					
Agamidae	Garden Lizard	*Calotes versicolor*	Tez-Pia	LC	IV
Gekkonidae	Tokay Gecko	*Gekko gecko*	Keko Sap	LC	IV
Gekkonidae	Indian House Gecko	*Hemidactylus sp*	Jethi	LC	IV
Scincidae	Common Skink	*Eutropis carinata*	Nai Pia	LC	IV
Varanidae	Common Indian Monitor	*Varanus bengalensis*	Gui Haap	LC	I
Pythonidae	Burmese Python	*Python bivittatus*	Ajogor	VU	I
Typhlopidae	Diard's Blind Snake	*Typhlops diardii*	Kechu Haap	LC	IV
Colubridae	Common Wolf Snake	*Lycodon aulicus*	Maroli	LC	IV
Colubridae	Copper-Headed Trinket Snake	*Coelognathus radiatus*	Dhundhuli Feti	LC	IV
Colubridae	Indian Rat Snake	*Ptyas mucosa*	Musuagum	LC	IV
Colubridae	Checkered Keelback	*Fowlea piscator*	Dhora	LC	IV
Elapidae	Banded Krait	*Bungarus fasciatus*	Hokso	LC	IV
Colubridae	Spectacled Cobra	*Naja naja*	Feti	LC	II
Colubridae	Monocled Cobra	*Naja kaouthia*	Feti	LC	II
Colubridae	Red Necked Keelback Snake	*Rhabdophis subminiatus*	Batchupa	LC	IV
Colubridae	Vine Snake	*Ahaetulla Sp*	Lata Sap	LC	IV
Colubridae	Ornate Flying Snake	*Chrysopelea ornata*	Sundori	LC	IV
Colubridae	Painted Bronzeback Tree Snake	*Dedrelaphis pictus*	Achari	LC	IV
Turtles and Tortoises					
Testudines	Assam Roofed Turtle	Pangshura sylhetensis	Salika Dura	EN	I
Testudines	Indian Tent Turtle	Pangshura tentoria	Salika Dura	LC	~
Testudines	Brown Roofed Turtle	Pangshura smithii	Muga Dura	NT	~
Testudines	Indian Eyed Turtle	Morenia petersi	~	VU	~
Testudines	The Assam Leaf Turtle	Cyclemys gemeli	Sepeta Dura		~
Testudines	Tricarinate Turtle	Melanochelys tricarinata	Sil Dura/ Paharia Dura	EN	I
Testudines	Indian Flap-Shelled Turtle	Lissemys punctata andersonii	Bagh Dura/ Halodhiya Phutuki Kaso	LC	I
Testudines	Narrow-Headed Softshell Turtle	Chitra indica	Baghia Kaso	EN	IV
Testudines	Indian Peacock Soft-Shell Turtle	Nilssonia hurum	Bor Kaso/ Chokori Kaso	VU	I
Testudines	Gangetic Soft-Shell Turtle	Nilssonia gangeticus	Laomura Kaso	VU	I
Testudines	Crowned River Turtle	Hardella thurjii	Kaldhap / Bor Dura	VU	~
Testudines	Yellow Tortoise	Indotestudo elongata	Halodiya Kaso	EN	IV
Testudines	Three-Striped Roofed Turtle	Batagur dhongoka		EN	~

Order	*Common Name*	*Scientific Name*	*Local Name*	*IUCN Status*	*WPA Status*
Amphibians					
Bufonidae	Common Asian Toad	Duttaphrynus melanostictus	Chuk Bhekuli	LC	~
Rhacophoridae	Terai Tree Frog	Polypedates teraiensis	Pat Beng	LC	~
Dicroglossidae	Indian Bull Frog	Hoplobatrachus tigerinus	Bamun Beng	LC	IV
Dicroglossidae	Indian Skipping Frog	Euphylctis cyanophlyctis	Pani Beng	LC	IV
Microhylidae	Ornate Narrow Mouth Frog	Microhyla ornata	Paruwa Beng	LC	~
Microhylidae	Ballon Frog	Uperodon globulosus	Belun Beng	LC	~
LC= Least Concern, EN= Endangered,NT= Near Threatened, VU= Vulnerable					

Source:

1. Ahmed, M.F., Das, A. and Dutta, S.K. (2009): Amphibians and Reptiles of Northeast India- A Photographic Guide. 1st edition, Aaranyak, Guwahati, India.
2. Nath., A., Singha.,H. and Das.,A. (2011). Snakes of Bongaigaon Municipality Area, Assam, India. Reptile Rap, 13.PP 9-13
3. Nath.,B. and Sharma., D., K. (2016). Inventorization of Chelonian species of Dhubri district of Assam. Biolife. 4(3). PP 498-502.
4. Dutta., S. (1997). Fresh water turtles and land tortoises of Dhubri District, Zoos' Print XII(6): 1–4
5. Kour.,S.,B., and Sharma., D., K.(2016). Conservation status of Varanus bengalensis in Kokrajhar district of Assam, India . International Journal of Fauna and Biological Studies 2016; 3(3). PP 42-44.

Fishes of Study Area

Water bodies of Dhubri district are rich in ichthyofaunal diversity. Some studies reported that the diversity of fish found to be more numerous in the lower reaches of the Brahmaputra River. Carps constitute the largest group of ichthyofauna in the study area. Ilish (Hilsa ilisha), Chital (Notopterus chitala), Borali (Wallago Sp.) along with some other large-sized catfishes are some highly valuable fish species found abundantly in this zone of Assam.

Table 7-61: Fish of the Project Site

Order	*Scientific Name*	*Local Name*	*IUCN Status*
Beloniformes	Xenentodon cancila	Kokila	LC
Clupeiformes	Gudusia chapra	Karati	LC
Clupeiformes	Tenualosa ilisha	Ilish	LC
Cypriniformes	Botia Dario	Rani	LC
Cypriniformes	Botia rostrata	Gethu	VU
Cypriniformes	Lepidocephalichthys guntea	Getho	LC
Cypriniformes	Amblypharyngodon mola	Moa	LC
Cypriniformes	Barbonymus gonionotus	Puthi	LC
Cypriniformes	Barilius barna	Balisundre	LC
Cypriniformes	Catla catla	Bhakua	LC
Cypriniformes	Chela cachius	Laopota	LC
Cypriniformes	Cirrhinus mrigala	Mirika	LC
Cypriniformes	Cirrhinus reba	Lachim	LC
Cypriniformes	Ctenophryngodon idella	Grass carp	LC
Cypriniformes	Cyprinus carpio	Common carp	VU
Cypriniformes	Esomus danricus	Dorikona	LC
Cypriniformes	Hypopthalmychthys molitrix	Silver carp	NT
Cypriniformes	Labeo calbasu	Mali	LC
Cypriniformes	Labeo gonius	Kurhi	LC
Cypriniformes	Labeo rohita	Rou	LC
Cypriniformes	Laubuka laubuca	Laopota	LC
Cypriniformes	Pethia conchonius	Puthi	LC
Cypriniformes	Puntius chola	puthi	LC
Cypriniformes	Puntius sophore	Puthi	LC
Cypriniformes	Systomus sarana	Cheniputhi	LC
Cypriniformes	Acanthocobitis botia	Botia	LC
Osteoglossiformes	Chitala chitala	Chital	NT
Osteoglossiformes	Notopterus notopterus	Kanduli	LC
Perciformes	Chanda nama	Chanda	LC
Perciformes	Parambassis lala	Chanda	LC
Perciformes	Anabas testudineus	Kaowi	DD
Perciformes	Badis assamensis	Randhoni	DD
Perciformes	Channa gachua	Seng	DD
Perciformes	Channa marulius	Sal	LC
Perciformes	Channa orientalis	Seng	NE
Perciformes	Channa punctata	Goroi	LC
Perciformes	Channa striata	Shol	LC
Perciformes	Glossogobius giuris	Patimutura	LC
Perciformes	Nandus nandus	Gedgedi	LC
Perciformes	Ctenop nobilis	Kholihona	NT
Perciformes	Trichogaster chuna	Kholisa	LC
Perciformes	Trichogaster fasciata	Kholihona	LC
Perciformes	Trichogaster labiosa	Kholihona	LC
Siluriformes	Mystus cavasius	Singora	LC
Siluriformes	Mystus tengara	Tengera	LC
Siluriformes	Mystus bleekari	Singora	LC

Order	*Scientific Name*	*Local Name*	*IUCN Status*
Siluriformes	Sperata aor	Ari	LC
Siluriformes	Sperata seenghala	Ari	LC
Siluriformes	Chaca chaca	Kurkuria	LC
Siluriformes	Clarias batrachus	Magur	LC
Siluriformes	Heteropneustes fossilis	Singi	LC
Siluriformes	Ompok pabda	Pavo	NT
Siluriformes	Wallago attu	Barali	NT
Siluriformes	Ailia coila	Kajoli	NT
Siluriformes	Clupisoma garua	Neria	LC
Siluriformes	Eutropiichthys sp	Bacha	LC
Siluriformes	Pangasius pangasius	Koch	LC
Synbranchiformes	Mastacembelus armatus	Bami	LC
Synbranchiformes	Macrognathus aral	Tura	LC
Synbranchiformes	Macrognathus puncalus	Tura	LC
Synbranchiformes	Monopterus cuchia	Cuchia	LC
LC= Least Concern,NT= Near Threatened, VU= Vulnerable,DD= Dada Deficient, NE= Not Evaluated			

Source:

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Plankton of Study Area

Plankton are the microscopic organisms that drift on the water currents. Phytoplankton forms the sole base of food chain in aquatic system as they act as energy transducers and convert the solar energy into chemical energy of food. Zooplankton passes this food energy to the higher trophic levels and thus provides a link between energy producers and the consumers. These organisms are important biological indicator of water quality and trophic status of aquatic ecosystem as they respond quickly to the environmental changes.

Table 7-62: Species Diversity of Phytoplankton at Various Location of River : Redundant Part of River at Kachuar Khas Pt II (ch. 51+536km)

S. No	Name of Species	No/L			
		Location 1	Location 2	Location 3	Location 4
1	Frustulia sp.	+	+	+	+
2	Gyrosigma sp.	+	+	+	+
3	Navicula sp.	+	*	+	+
4	Tabellaria sp.	+	+	+	+
5	Gomphonema sp.	+	+	+	+
6	Fragilaria sp.	+	+	+	+
7	Synedra sp.	+	*	+	+
8	Pinnularia sp.	+	+	+	+
9	Draparnaldiopsis sp.	+	+	+	*
10	Hyalotheca sp.	+	+	*	+
11	Spirogyra sp.	*	*	+	+
12	Gonatozygon sp.	+	+	+	*
13	Ulothrix sp.	+	*	*	+
14	Eudorina sp.	+	+	+	+
15	Anabaena sp.	+	+	+	+
16	Oscillatoria sp.	+	*	*	*
17	Spirulina sp.	+	+	+	+
18	Nostoc sp.	+	+	*	+
19	Mougeotia sp.	+	+	+	+
20	Zygnema sp.	*	+	+	+
21	Microspora sp.	+	*	+	+
22	Triploceras sp.	+	+	+	+
23	Eudorina sp.	+	+	+	*
24	Ceratium sp.	+	*	+	+
25	Glenodinium sp.	+	+	*	+
26	Closterium sp.	+	+	+	+
Total		24	19	21	22

* Organism not present
Source: JICA Survey Team

Table 7-63: Species Diversity of Zooplankton at various Location of River: Redundant Part of River at Kachuar Khas Pt II (ch. 51+536km)

S. No	Name of Species	No/m3			
		Location 1	Location 2	Location 3	Location 4
1	Nauplii sp. larvea	+	+	+	+
2	Cyclops sp.	+	+	+	+
3	Diaptomus sp.	+	+	+	+
4	Mesocyclops sp.	+	*	+	*
5	Tropocyclops sp.	+	+	+	+
6	Moina sp.	+	+	*	+
7	Bosmina sp.	+	+	+	*
8	Ceriodaphnia sp.	+	+	+	+
9	Daphnia sp.	*	+	+	+
10	Monostyla sp.	+	+	+	*
11	Brachionus sp.	+	+	+	+
12	Keratella sp.	+	*	+	+
13	Lepadella sp.	+	+	*	*
14	Nauplius sp.	+	+	+	+
15	Euchlanis sp.	+	*	+	+
16	Paramoecium sp.	+	+	+	+
17	Euglena sp.	+	+	+	+
Total		16	14	15	13

* Organism not present
Source: JICA Survey Team

The sampling site is mainly a redundant part of river course which presently act as a seasonal part time natural reservoir and drainage system for flood water during the monsoon season in Assam. In the year 2020, the state of Assam experienced several waves of floods and heavy rains started from month of April. The sampling sites get inundated after receiving of excess runoff waters from the nearby village lakes, ponds, Beels, small seasonal creeks and surface runoffs from nearby agricultural fields which gets flooded during the monsoon. Along with the flood water, different microorganisms present in different surrounding water sources and agricultural fields also reaches the sampling sites. Hence the area might show a higher degree of planktonic diversity during the month of Monsoon i.e. June –September. As the sampling and study of Plankton diversity was conducted in the month of July 2020, which is the peak monsoon period. Therefore, there is also possibility of documentation of some species of planktons which might not be present in the stagnant water of this old Redundant part of River in summer and winter.

7.7 Impact Analysis

After the careful consideration of the analysis of the present conditions and estimated values, Summary of the Assessment has been provided in the table below.

Table 7-64: Summary of Impact Assessment

Item	No.	Impact	Impact Assessment			Rationale
			Pre-construction stage	construction Phase	Operation Phase	
Pollution Control	1	Air Quality	D	B-	B-	**Pre Construction phase: Nil** **Construction phase:** Minimum dust dispersion will be expected. **Operation phase:** Air pollution caused by exhaust gas generated as the more vehicles traffic predicted.
	2	Water Quality	D	B-	B-	**Pre Construction phase: Nil** **Construction/Operation phase:** Although turbidity increases due to construction near the river area, the effect is temporary. For wastewater accompanying concrete construction and wastewater containing oil, the muddy stream caused by embankment at the time of rainy weather.
	3	Waste	D	B-	B-	**Pre Construction phase: Nil** **Construction phase:** Generally construction & demolition will be generated during construction phase, suitable mitigation and disposal facility will be provided. **Operation phase:** Road users may dispose of garbage, but that will be restricted by installing notice boards that prohibits the dumping of garbage.
	4	Soil Contamination	D	B-	B-	**Pre Construction phase: Nil** **Construction phase:** There is a chance of soil contamination due to leakage of oil from the operation and maintenance of equipment and machineries. **Operation phase:** May occurred in case of any oil spill in the road and leaching to the surrounding.
	5	Noise and Vibration	D	B-	B-	**Pre Construction phase: Nil** **Construction phase:** Minor noise may be generated due to construction activity and movement of vehicles. **Operation phase:** Noise may be generated from the movement of vehicles and machineries, which is temporary.
	7	Sediment	D	B-	D	**Pre Construction phase: Nil** **Construction phase:** Sedimentation may occur due construction of cross drainage structures and bridges on river. Suitable mitigation measures will be provided. **Operation phase:** Nil
Natural Environment	8	Protected Areas	D	D	D	**Pre Construction phase:** No protected area falls within 10 kms of the project road. **Construction phase:** No protected area falls within 10 kms of the project road.

Item	No.	Impact	Impact Assessment			Rationale
			Pre-construction stage	construction Phase	Operation Phase	
						Operation phase: No protected area falls within 10 kms of the project road.
	9	Ecosystem	D	B-	B-	**Pre Construction phase: Nil** **Construction phase:** Cutting of trees and habitat fragmentation may be caused by the proposed project, which has some impact on the ecosystem. Flora and fauna close to Sareswar Beel could be affected with noise/air pollution. **Operation phase:** Temporary impact is there like Vehicular noise disturbs the hearing of animals and birds, lighting on animals and accidents road during crossing. Flora and fauna close to Sareswar Beel could be affected with noise/air pollution.
Natural Environment	10	Hydrology	D	B-	D	**Pre Construction phase: Nil** **Construction phase:** May alter the hydrological process during construction of bridges in the river. Sedimentation may also have some impact on it. Suitable measures will be provided. **Operation phase:** No impact
	11	Topography and Geology	D	B-	D	**Pre Construction phase: Nil** **Construction phase:** As the road is in plain terrain, no major change will occur in the topography. Only the widening of road and new bypasses due to cutting and filling will slightly change the topography. **Operation phase: Nil**
	12	Soil Erosion	D	D	D	**Pre Construction phase: Nil** **Construction phase:** As the project is in flood prone area and parallel to a river, soil erosion is common particularly in rainy season. **Operation phase:** During flood and heavy rain, soil erosion may take place.
Social Environment	12	Resettlement and Land Acquisition	A-	A-	D	**Pre Construction and Construction phases:** 159.071ha (private land 142.688 ha and Govt/others land 16.383 ha) of land will be acquired for the project. A total of 1,114 structures would be affected due to the improvement of the project road within the proposed ROW. A total of 1,396 households (7,262 people) would be affected due to the improvement of the project road within the proposed ROW. **Operation phases:** No impact is expected due to availability of resettlement sites adjacent to present location and adequate compensation and resettlement assistances.
	13	Poor Classes	B-	B+	B+	**Pre Construction phase:** Roughly 25% PAHs have Below Poverty Line (BPL) ration cards. They will be affected by land acquisition and resettlement.

Item	No.	Impact	Impact Assessment			Rationale
			Pre-construction stage	construction Phase	Operation Phase	
						Construction phase and Operational phase: Envisage to have increase employment/ income generation opportunity.
	14	Tribal Peoples	B-	B-/+	B+	**Pre Construction phase:** It is known that around 12km of the project road is passing through the area under administration of Bodoland Territorial Council, inhabited by Schedule tribes. However the STs are not culturally attached to the Natural Habitat. Among the total 1,396 affected households, 265 households are ST including 177 title holders. Among the total 1,114 affected structures, 115 structures belong to ST including 55 residential structure and 49 commercial structure. **Construction phase:** Disturbances from construction activities to the tribal people are expected while direct and indirect job/business opportunities are expected during construction. **Operational phase:** The affected ST are mostly in the lower income group. The improvement of the road contribute to economic growth and poverty reduction in the area.
	15	Local Economy such as Employment and Livelihood, etc.	B+	B+	B+	**Pre Construction phase:** Positive impacts are expected due to additional cash flow in PAHs and constriction of the resettlement households, etc. **Construction:** Some changes are required to adapt construction activities while positive impacts are expected from construction work and additional employment. **Operation:** The construction of road and bridges will benefit the lives of local people such as improvement of access to social services and opportunity of employment.
	16	Land Use and the Utilization of Local Resources	B-	B-	B-/+	**Pre Construction phase:** Land acquisition and involuntary resettlement will cause changes in existing land use pattern. **Construction phase:** While changes in land use associated with construction work are relatively minor at expansion section of the existing road, land use, including agriculture would be affected at bypass sections. **Operational phase**: The development due to the Project will induce a change in land use along the alignment. Change in land use will be sparked off as a result of land speculation. Greater traffic volume may affect the use of road and surrounding area by local residents.
	17	Water Usage and Water Rights	B-	B-	D	**Pre Construction phase:** Water usage and water rights of the affected households may be curtailed due to resettlement.

Item	No.	Impact	Impact Assessment			Rationale
			Pre-construction stage	construction Phase	Operation Phase	
						Construction phase: Disturbance to water usage, water rights and communal rights during construction work is expected to be minor and short-term in nature. **Operational phase**: **Nil**
	18	Existing Social Infrastructure and Services	B-	B-	B-/+.	**Pre Construction phase:** 33 Common Property Resources (CPRs) are affected. That negatively affect social infrastructure and services. **Construction phase:** Construction work will disturb access to existing social infrastructure and social services. For mitigating this impact, passage shall be secured during construction. **Operational phase**: Access to social infrastructure and services will be improved. Increased traffic volume may disturb the access of Community to existing social infrastructure and services. For mitigating this, passage needs to be secured.
	19	Local Communities and Decision-making Institutions	B-	B-	B-	**Pre Construction phase:** Displacement may affect the existing network of local communities and decision-making institutions **Construction phase:** Social capital and local decision-making institutions will be affected by the influx of resettling population and construction workers. **Operational phase**: Flow of new residents could change the priorities of the local communities and decision making.
	20	Unequal Distribution of Benefits and Damages	B-	B-	D	**Pre Construction phase:** Land acquisition and involuntary resettlement will lead to unequal distribution of benefits and damages between groups who are directly affected by the project and who are not. **Construction phase:** Job and business opportunities could be unequally. **Operational phase:** Generally, all stakeholders will be benefit from the projects as same as common road projects.
	21	Local Conflicts of Interest	B-/+	B-/+	D	**Pre Construction and Construction Phases:** Unequal distribution of benefits and damages may trigger and/or intensify local conflicts of interests in the community. Local community will be involved in construction works and petty contractors. **Operational phase:** No impacts are expected.
	22	Cultural Heritage	D	D	D	**Pre Construction, Construction and Operation Phases:** There is no cultural heritage site which comes in the way of the proposed road alignment.
	23	Landscape	D	B-	B-	**Pre Construction phase:** No impact is expected. **Construction and Operational phases:** There would be changes in landscape such as conversion of crop land in roads and other built up structures.

Item	No.	Impact	Impact Assessment			Rationale
			Pre-construction stage	construction Phase	Operation Phase	
	24	Gender	B-	B-/+	B+	**Pre Construction phase:** Women may hardship during the transition period until the time the project-affected households are able to regain their lost income and livelihood. **Construction phase**: ditto. Local females will be employed as unskilled/skilled worker and also play an important role in GRM. **Operational phase:** Improvement of local economy will give positive impact on improvement of job opportunity and livelihood.
	26	Children's Rights	B-	B-	B+	**Pre Construction phase:** Out of 7,262 PAPs, 997 are children (0-6 yrs old). Children from households losing their land or jobs may suffer from adverse impact on their household economy, such as dropping-out of school. **Construction phase**: Access way to their schools will be physically hindered by the construction site. For mitigating this impact, passage shall be secured. Child labour can be provoked at the construction site because of the huge demand for unskilled workers. **Operational phase:** Better access to health and educational institutes for children.
	27	Infectious Disease such as HIV/AIDS	D	B-	B-	**Pre Construction phase:** No impact is expected. **Construction phase:** Influx of construction workers is likely to increase health risks, particularly that of STD/STI, HIV/AIDS, COVID-19, etc. **Operational phase:** Improved mobility of local residents and influx of external residents may increase the risk of infectious diseases. For mitigating this risk, measure for prevention of infection shall be taken.
	28	Work Environment (Including Work Safety)	D	B-	B+	**Pre Construction phase:** No impact is expected. **Construction phase:** Accidents may be caused by construction work.. **Operational phase:** Less road maintenance work is expected and less work accidents are expected.
	29	Sunlight	D	D	D	There is no impacts is anticipated.
	30	Accidents	D	B-	B-/+	**Pre Construction phase:** No activities are expected to cause accidents. **Construction phase:** There can be various construction related accidents**.** **Operation phase:** Better road design is expected to reduce traffic accidents. On the other hand, increase of the traffic would cause accidents**.**

Item	No.	Impact	Impact Assessment			Rationale
			Pre-construction stage	construction Phase	Operation Phase	
	31	Cross-boundary Impact and Climate Change	B+	B-	B+	**Pre Construction phase:** The project design has been done in such a way to minimize all adverse impacts of climate changes. **Construction phase:** Construction instruments including hotmix plant, batching plant etc are potential source of GHG emission. **Operation phase: A** better road condition leads to reduction of CO2 emission year by year.
Others	32	Climate Change	D	B-	B+	**Pre Construction phase:** No impact expected. **Construction phase:** The emission of GHGs from use of construction machines and operation of vehicles will have minor impact. Tree felling can be a loss of GHG absorption but it is compensated. **Operation phase: A** better road condition leads to reduction of CO2 emission year by year.
	33	Natural Disaster	D	D	B+	**Pre Construction phase:** No impact expected. **Construction phase:** The project will not affect flooding conditions. **Operation phase:** Slope protection/stabilization measures and drainage are expected to significantly reduce the risk of natural disaster.

Note:
A+/-: Significant positive/negative impact is expected.
B+/-: Positive/negative impact is expected to some extent.
C: Impact is unknown. (Further examination is needed, and the impact may be clarified as the study progresses.) D: No impact is expected.
Source: JICA Survey Team

7.8 Environmental Management Plan and Monitoring Plan

7.8.1 Environment Management Program

The Environmental management plan (EMP) outlines existing and potential problems that may impact the environment and recommends corrective measures wherever required. Enhancement measures are also proposed in order to provide sound environmental practices and improve the aesthetics of the project area.

This EMP consists of a set of mitigation, monitoring, and institutional measures to be taken up for the project to avoid, minimize, and mitigate adverse environmental impacts and enhance positive impacts. The plan also includes the actions needed for the implementation of these measures. The major components of the Environmental Management Plan are:

- Mitigation of potentially adverse impacts;
- Monitoring of EMP implementation during project implementation and operation; and
- Institutional arrangements to implement the EMP

The environmental management measures shall be implemented during the various stages of the project viz: Pre-construction/Design stage, Construction stage, and Operational stage.
The main objectives of this EMP are:

- To formulate avoidance, mitigation and compensation measures for anticipated adverse environmental impacts during construction and operation, and ensure that environmentally sound, sustainable and good practices are adopted;
- To stipulate monitoring and institutional requirements for ensuring safeguard compliance; and
- The project road should be environmentally sustainable.

Environmental management measures shall be implemented during the various stages of the project viz: Pre-construction stage, Construction stage and Operational stage.

(1) Pre-Construction Stage

C.1. Pre-construction activities by the Authority/ Consultant

Prior to the contractor mobilization, the PIU will ensure that an encumbrance free Corridor is handed over to enable the start of construction. Clearance involves the following activities:

- Removal and felling of trees, which is very minimal;
- Relocation of common property resources and utilities like telephone poles, electric poles and hand pumps;
- Formal arrangements for maintenance of enhancement sites. This includes plantation of trees and barricades along the road; and
- Modification (if any), of the contract documents by the Engineer of the Independent Consultant.

C.2. Pre-construction Activities by Contractor

Pre-construction stage involves mobilisation of the Contractor and the activities undertaken by the Contractor about the planning of logistics and site preparation necessary for commencing construction activities. The activities include:

- Joint field verification by the Environment Specialist of the Independent Consultant and Contractor to check the different applicable component of EMP.
- Identification and selection of material sources (quarry and borrow material, water, sand etc).
- Procurement of construction equipment / machinery such as crushers, hot mix plants, batching plants and other construction equipment and machineries.
- Selection, design and layout of construction areas, hot mix and batching plants, labour camps etc.
- Apply for and obtain all the necessary clearances/ NOC's/ consents from the agencies concerned.
- Planning traffic diversions and detours including arrangements for temporary land acquisition.

(2) Construction Stage

D.1. Construction Activities by the Contractor

Construction stage is the most crucial stage in terms of activities that require careful management to avoid environmental impacts. There are several other environmental issues that have been addressed as part of good engineering practices, the costs for which have been accounted for in the Engineering Costs.

D.2. Construction Activities by the Authority/ Consultants

The PIU/Consultant shall be involved in the smooth execution of the project and assisting the contractor during this phase. Their work shall include but not limited to:

- Monitoring and guiding the contractor for the implementation of EMP and EMoP during construction stage;
- Monitoring and guiding the contractor on adopting good environmental and engineering practices;
- Arrangement of plantation through the Forest Department;
- Arranging training to the contractor and other stakeholders according to the needs rising; and
- To make changes in the design if need so arises.

(3) Operation Stage

The operational stage involves the following activities by the Authority Monitoring of environmental conditions through approved monitoring agency; and Monitoring of operational performance of the various mitigation/enhancement measures carried out.

EMP for this project indicating the issues, management measures, locations and responsibility matrix is presented in the table below.

Table 7-65: Environment Management Plan

AE: Authority Engineer, PIU: Project Implementation Unit

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
PRE-CONSTRUCTION STAGE					
P1	Alignment,	• The alignment as finalized by shifting / adjusting the centreline of the road, adopting of suitable cross-sections and adjustment of the median width to minimize land acquisition, loss of settlements and to avoid environmentally sensitive features compatible with project activities.	Throughout Corridor	PIU, Revenue Dept. NGOs Collaborating Agencies	-
P2	Land Acquisition	• The acquisition of land and private properties will be carried out in accordance with the RAP and entitlement framework for the project. It will be ensured that all R & R activities including implementation of Environment Management Plan are completed before the start of work. • PIU has to ascertain that any additional environmental impacts resulting from acquisition of land are addressed and integrated into the EMP and other relevant documents.	Throughout Corridor	PIU, Revenue Dept. NGOs Collaborating Agencies	-
P3	Preservation of Trees	• All efforts will be made to preserve trees including evaluation of minor design adjustments/ alternatives to save trees. Specific attention will be given for protecting giant trees, and locally important trees (religiously important etc.). • Tree cutting is to proceed only after all the legal requirements including attaining of In-principle and formal Clearances from the Forest Dept./ MoEF& CC are completed and subsequently a written order is issued to the Contractor. • In the event of design changes, additional assessments including the possibility to save trees shall be made. • Stacking, transport and storage of the wood will be done as per the relevant norms.	Throughout Corridor	PIU Forest Department Contractor	
P4	Relocation of Utilities and Common Property Resources (CPR)	• All utilities and CPRs i.e., water supply lines, religious structures, hand pumps will be relocated before the construction starts. • The PIU will relocate these properties in consultation and written agreement with the agency/ owner/community. • Environmental considerations with suitable/required actions including health and hygiene aspects will be kept in mind while relocating all utilities and CPRs.	Throughout Corridor	PIU Concerned Agencies Contractor	

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
P5	Orientation of Implementing Agency and Contractors	• The PIU shall organize orientation sessions and regular training sessions during all stages of the project. This shall include on-site training (general as well as in the specific context of the sub-project). • These sessions shall involve all staff of Authority Engineer, field level implementation staff of PIU and Contractor. The contractor will ensure that his staff including engineers, supervisors and operators attend the training sessions.	Throughout Corridor	Contractor	
P6	Joint Field Verification	• The Environmental Expert of AE and the Contractor will carry out joint field verification to ascertain any additional possibility to saving trees, environmental and community resources. • The verification exercise should assess the need for additional protection measures 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.	Throughout out Corridor	Contractor Environmental Expert of AE	**PIU**
P7	Assessment of Impacts due to Changes/Revisions /Additions in the Project Work	• The Environmental Expert of AE will assess impacts and revise/ modify the EMP and other required sections of the project documents in the event of changes/ revisions (including addition or deletion) in the project's scope of work.	Throughout out Corridor	Contractor Environmental Expert of AE	**PIU**
P8	Crushers, Hot-mix plants and Batching Plants Location	• Hot mix plants and batching plants will be sited sufficiently away from settlements and agricultural operations or any commercial establishments. Such plants will be located at least 1 Km away from the nearest village/ settlement preferably in the downwind direction. • The Contractor shall submit a detailed layout plan for all such sites and approval of Environmental Expert of AE/PMC shall be necessary prior to their establishment. • Arrangements to control dust pollution through provision of windscreens, sprinklers, and dust encapsulation will have to be provided at all such sites. • Specifications of crushers, hot mix plants and batching plants will comply with the requirements of the relevant current emission control legislations and Consent/NOC for all such plants shall be submitted to the "PIU through Environmental Expert of AE/PMC.	Throughout out Corridor	Contractor	**Environmental Expert of AE and PIU**

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
		• The Contractor shall not initiate plant/s operation till the required legal clearances are obtained and submitted. The engineer will ensure that the regulatory and legal requirements are being complied with.			
P9	Other Construction Vehicles, Equipment and Machinery	• All vehicles, equipment and machinery to be procured for construction will confirm to the relevant Indian Standard (IS) norms. The discharge standards promulgated under the Environment Protection Act, 1986 will be strictly adhered to. • Noise limits for construction equipments to be procured such as compactors, rollers, front loaders concrete mixers, cranes (moveable), vibrators and saws will not exceed 75 dB (A), measured at one meter from the edge of the equipment in free field, as specified in the Environment (Protection) Rules, 1986. • The Contractor shall maintain a record of PUC for all vehicles and machinery used during the contract period, which shall be produced for NH verification whenever required. • Mobile equipment shall be placed at least 100 m away from the nearest dwelling.	Throughout out Corridor	Contractor	**Environmental Expert of AE and PIU**
P10	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 selected borrow areas until the formal agreement is signed between landowner and contractor and a copy is submitted to the PIU/Environmental Expert of AE through the Engineer. • Locations finalized by the contractor shall be reported to the Environmental Expert of AE and who will in turn report to PIU. • Planning of haul roads for accessing borrow materials will be undertaken during this stage. The haul roads shall be routed to avoid agricultural areas as far as possible (in case such a land is disturbed, the Contractor will rehabilitate it as per Borrow Area Rehabilitation Guidelines) and will use the existing village roads wherever available. • In addition to testing for the quality of borrow materials by the AE, the environmental personnel of the AE will be required to inspect every borrow area location prior to approval	Along the Project Influence Area	Contractor	**Environmental Expert of AE and PIU**

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
		• The AE will make sure that each such site is in line with IRC and other project guidelines. • Necessary clearances need to be obtained prior to operation of Borrow areas.			
P11	Quarry	• Contractor will finalize the quarry for procurement of construction materials after assessment of the availability of sufficient materials, quality and other logistic arrangements. • In case the contractor decides to use quarries other than recommended by DPR consultants, then it will be selected based on the suitability of the materials and as per established law. • The contractor will procure 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 PIU through Engineer. • Contractor will also work out haul road network and report to Environmental Expert of AE and will inspect and in turn report to PIU before approval. • The location will avoid the peripheral of Warer resource, Wildlife Sanctuary defined in the country , IBA / KBA.	Along the Project Influence Area	Contractor	**Environmental Expert of AE and PIU**
P12	Arrangement for Construction Water	• To avoid disruption/disturbance to other water users, the contractor will extract water from fixed locations and consult the Environmental Expert of AE before finalizing the locations. • The contractor will not be allowed to pump from any irrigation canal and surface water bodies used by community. • The contractor will need to comply with the requirements of the State Ground Water Department and seek their approval for doing so and submit copies of the permission to AE and PIU prior to initiation of any construction work.	Along the Project Road	Contractor	**Environmental Expert of AE and PIU**
P13	Labor Requirements	• The contractor preferably will use unskilled labor from local communities to give the maximum benefit to the local community.	Along the Project Area	Contractor	**Environmental Expert of AE and PIU**
P14	Construction Camp Locations – Selection, Design and Lay-out	• Sitting of the construction camps will be selected by the contractor as per the guidelines.	Along the Project Road	Contractor	**Environmental Expert of AE and PIU**

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
		• Construction camps will not be proposed within 500 m from the nearest settlements to avoid conflicts and stress over the infrastructure facilities with the local community. • Location for stockyards for construction materials will be identified at least 1000 m from watercourses. • The waste disposal and sewage system for the camp will be designed, built and operated such that no odor is generated.			
P15	Arrangements for Temporary Land Requirement	• The contractor as per prevalent rules will carry out negotiations with the landowners for obtaining their consent for temporary use of lands for construction sites/hot mix plants/traffic detours/borrow areas etc. • The Contractor will submit a copy of agreement to the Environmental Expert of AE. The Environmental Expert will be required to ensure that the clearing up of the site prior to handing over to the owner (after construction or completion of the activity) is included in the contract.	Along the Project Road	Contractor	**Environmental Expert of AE and PIU**
P16	Implementation - Information Meetings	• The contractor will organize at least 2 implementation information meetings in the vicinity of Project Site (minimum one in each section) for general public to consult and inform people about his plans covering overall construction schedule, safety, use of local resources (such as earth, water), traffic safety and management plans of debris disposal, drainage protection during construction, pollution abetment and other plans, measures to minimize disruption, damage and in convenience to roadside users and people along the road. • The first Implementation information meeting be conducted within four weeks of mobilization. The people should be informed about the date, time and venue at least 7 days prior to meetings. Public shall be informed about the meeting through display of posters at prominent public places (panchayat offices, offices of Market committees, Notice board of religious places etc.) and distribution of pamphlets along roadside communities or in any manner deemed fit. • The contractor will maintain a channel of communication with the communities through his designated Environment and Safety Officer to address any concern or grievances. • Periodic meetings will also be conducted during the construction period to take feedback from communities or their representatives to ensure minimum	Along the Project Road	Contractor	**Environmental Expert of AE and PIU**

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
		disturbance. The mechanism and contents for disclosure shall be approved by PIU prior to the meetings.			
		CONSTRUCTION STAGE			
C1	Clearing and Grubbing	• Vegetation will be removed from the construction zone before commencement of construction. All works will be carried out such that the damage or disruption to flora other than those identified for cutting is minimum. • Only ground cover/shrubs that impinge directly on the permanent works or necessary temporary works will be removed with prior approval from the Environmental Expert of AE. • The Contractor under any circumstances will not cut trees other than those identified for cutting and for which he has written instructions from the PIU. The PIU will issue these instructions only after receiving all stages of clearances from the Forest Department/ MoEF& CC. • Vegetation only with girth of over 30 cm will be considered as trees and shall be compensated, in the event of PIU's instruction to undertake tree cutting. • The sub grade of the existing pavement shall be used as embankment fill material. • The existing base and sub-base material shall be recycled as sub-base of the haul road or access roads. • The existing bitumen surface may be utilized for the paving of cross roads, access roads and paving works in construction sites and campus, temporary traffic diversions, haulage routes etc.	Along the work in progress	Contractor	**Environmental Expert of AE and PIU**
C2	Waste and Disposal of debris from dismantling structures and road surface	• The contractor shall identify disposal sites. The identified locations will be reported to the Environmental Expert of AE. These locations will be checked on site and accordingly approved by Environmental Expert of AE prior to any disposal of waste materials. • All arrangements for transportation during construction including provision, maintenance, dismantling and clearing debris, will be considered incidental to the work and will be planned and implemented by the contractor as approved and directed by the Environmental Expert of AE. • The pre-designed disposal locations will be a part of Comprehensive Solid Waste Management Plan to be prepared by Contractor in consultation and with approval of Environmental Expert of AE.	Along the work in progress	Contractor	**Environmental Expert of AE and PIU**

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
		• Debris generated from pile driving or other construction activities shall be disposed such that it does not flow into the surface water bodies or form mud puddles in the area. Guidelines for management of Debris Disposal site is attached in Annexure 17.			
C3	Other Construction Waste Disposal	• The pre-identified disposal locations will be a part of Comprehensive Waste Disposal Management Plan to be prepared by the Contractor in consultation and with approval of Environmental Expert of AE. Location of disposal sites will be finalized prior to initiation of works on any particular section of the road. • The Environmental Expert of AE will approve these disposal sites after conducting a joint inspection on the site with the Contractor. • Contractor will ensure that any spoils of material unsuitable for embankment fill will not be disposed off near any water course, agricultural land, and natural habitat like grass lands or pastures. Such spoils from excavation can be used to reclaim borrow pits and low-lying areas located in barren lands along the project corridors (if so desired by the owner/community and approved by the Environmental Expert of AE). • All waste materials will be completely disposed and the site will be fully cleaned and certified by Environmental Expert of AE before handing over.Guideline for waste disposal and management is attached in annexure 13. • The contractor at its cost shall resolve any claim, arising out of waste disposal or any non-compliance that may arise on account of lack of action on his part.	Along the Road	Contractor	**Environmental Expert of AE and PIU**
C4	Stripping, stocking and preservation of top soil	• The topsoil from all areas of cutting and all areas to be permanently covered will be stripped to a specified depth of 150 mm and stored in stockpiles. A portion of the temporarily acquired area and/or Right of Way will be earmarked for storing topsoil. The locations for stock piling will be pre-identified in consultation and with approval of Environmental Expert of AE.Guideline for soil conversation and reuse is attached in annexure 18. The following precautionary measures will be taken to preserve them till they are used: • 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, silt fencing will protect the edges of the pile.	Along the Road	Contractor	**Environmental Expert of AE and PIU**

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
		• Stockpiles will not be surcharged or otherwise loaded and multiple handling will be kept to a minimum to ensure that no compaction will occur. The stockpiles shall be covered with gunny bags or vegetation. • It will be ensured by the contractor that the topsoil will not be unnecessarily trafficked either before stripping or when in stockpiles. • Such stockpiled topsoil will be utilized for - • covering all disturbed areas including borrow areas only in case where these are to be rehabilitated as farm lands (not those in barren areas) • top dressing of the road embankment and fill slopes, • filling up of tree pits, in the median and in the agricultural fields of farmers, acquired temporarily.			
C5	Accessibility	• The contractor will provide safe and convenient passage for vehicles, pedestrians and livestock to and from roadsides and property accesses connecting the project road, providing temporary connecting road. • The contractor will take care that schools and religious places are accessible to Public. The contractor will also ensure that the work on / at existing accesses will not be undertaken without providing adequate provisions and to the prior satisfaction of Environmental Expert of AE. • The contractor will take care that the cross roads are constructed in such a sequence that construction work over the adjacent cross roads are taken up one after one so that traffic movement in any given area not get affected much.	Along the Road	Contractor	**Environmental Expert of AE and PIU**
C6	Planning for Traffic Diversions and Detours	• Temporary diversions will be constructed with the approval of the Resident Engineer and Environmental Expert of AE for which contractor will seek prior approval for such plans. • Detailed Traffic Control Plans will be prepared and submitted to the Resident Engineer for approval, seven days prior to commencement of works on any section of road. The traffic control plans shall contain details diversions; traffic safety arrangement during construction; safety measures for night – time traffic and precautions for transportation of hazardous materials. Traffic control plans shall be prepared in line with requirements of IRC:SP 55 document and The Contractor will ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow.	Along the Road	Contractor	**Environmental Expert of AE and PIU**

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
		• The contractor will also inform local community of changes to traffic routes, conditions and pedestrian access arrangements with assistance from AE and PIU. The temporary traffic detours will be kept free of dust by sprinkling of water three times a day and as required under specific conditions (depending on weather conditions, construction in the settlement areas and volume of traffic).			
C7	Earth from Borrow Areas for Construction	• No borrow area will be opened without permission of the Environmental Expert of AE. The location, shape and size of the designated borrow areas will be as approved by the Environmental Expert of AE and in accordance to the IRC recommended practice for borrow pits for road embankments (IRC:10-1961). The borrowing operations will be carried out as specified in the guidelines for sitting and operation of borrow areas. Borrow area management guideline is attached in annexure 11. • The unpaved surfaces used for the haulage of borrow materials, if passing through the settlement areas or habitations; will be maintained dust free by the contractor. Sprinkling of water will be carried out twice a day to control dust along such roads during their period of use. • During dry seasons (winter and summer) frequency of water sprinkling will be increased in the settlement areas and Environmental Expert of AE will decide the numbers of sprinkling depending on the local requirements. • Contractor will rehabilitate the borrow areas as soon as borrowing is over from a particular borrow area in accordance with the guidelines for Redevelopment of Borrow Areas or as suggested by Environmental Expert of AE. • The final rehabilitation plans will be approved by the Environmental Expert of AE.	Borrow Areas	Contractor	**Environmental Expert of AE and PIU**
C8	Quarry Operations	• The contractor shall obtain materials from quarries only after the consent of the Department of Mining / SPCB (both the states) / District Administration or will use existing approved sources of such materials. Copies of consent/ approval/ rehabilitation plan for opening a new quarry or use of an existing quarry source will be submitted to Environmental Expert of AE and the Resident Engineer. • The contractor will develop a Comprehensive Quarry Redevelopment plan, as per the Mining Rules of the state and submit a copy to PIU and AE prior to opening of the quarry site. Guideline for siting operation and re-development of quarry operations is attached in annexure 16.	Quarry Areas	Contractor	**Environmental Expert of AE and PIU**

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
		• The quarry operations will be undertaken within the rules and regulations in force in the state.			
C9	Transporting Construction Materials and Haul Road Management	• Contractor will maintain all roads (existing or built for the project), which are used for transporting construction materials, equipment and machineries as précised. All vehicles delivering fine materials to the site will be covered to avoid spillage of materials. • All existing highways and roads used by vehicles of the contractor or any of his sub-contractor or suppliers of materials and similarly roads, which are part of the works, will be kept clear of all dust/mud or other extraneous materials dropped by such vehicles. • Contractor will arrange for regular water sprinkling as necessary for dust suppression of all such roads and surfaces with specific attention to the settlement areas. • The unloading of materials at construction sites/close to settlements will be restricted to daytime only.	All Roads Used	Contractor	**Environmental Expert of AE and PIU**
C10	Construction Water	• Contractor will arrange adequate supply and storage of water for the whole construction period at his own costs. The Contractor will submit a list of source/s from where water will be used for the project to 'PIU' through the Engineer. • The contractor will source the requirement of water preferentially from ground water but with prior permission from the Central Ground Water Board. A copy of the permission will be submitted to 'PIU' through the Engineer prior to initiation of construction. • The contractor will take all precaution to minimize the wastage of water in the construction process/ operation.	Along the Project	Contractor	**Environmental Expert of AE and PIU**
C11	Disruption to Other Users of Water	• While working across or close to any perennial water bodies, contractor will not obstruct/ prevent the flow of water. • Construction over and close to the perennial streams shall not be undertaken in any season. • The contractor will take prior approval of the River Authority or Irrigation Department for any such activity. The PIU and the Engineer will ensure that	All Water Bodies Used	Contractor	**Environmental Expert of AE and PIU**

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
		contractor has served the notice to the downstream users of water well in advance.			
C12	Drainage	• Contractor will ensure that no construction materials like earth, stone, ash or appendage is disposed off in a manner that blocks the flow of water of any water course and cross drainage channels. Contractor will take all-necessary measures to prevent any blockage to water flow. In addition to the design requirements, the contractor will take all required measures as directed by the Environmental Expert of AE and the 'Resident Engineer' to prevent temporary or permanent flooding of the site or any adjacent area. • To maintain the surface water flow/drainage, proper mitigation measures will be taken along the road, like: i. Drainage line will be constructed all along the project road. ii. Good engineering and construction practice should be followed • Use of sediment traps, silt fencing, oil and grease turfing etc. to minimise of the soil movement. Guideline for sediment control is attached in annexure 22.	Drainage line along the road	Contractor	**Environmental Expert of AE and PIU**
C13	Siltation of Water Bodies, Degradation of Water Quality, And Hydrology issues	• The Contractor will not excavate beds of any stream/canals/ any other water body for borrowing earth for embankment construction. • Contractor will construct silt fencing at the base of the embankment construction for the entire perimeter of water bodies (including wells) adjacent to the ROW and around the stockpiles at the construction sites close to water bodies. • Site Fencing at identified 1 major bridge of project road crossingRedundant part of River at ch 51+536 km. The cost of this bridge fencing comes under project cost. • The fencing will be provided prior to commencement of earthwork and continue till the stabilization of the embankment slopes, on the particular sub-section of the road. The contractor will also put up sedimentation cum grease traps at the outer mouth of the drains located in truck lay byes and bus bays which are ultimately entering into any surface water bodies / water channels with a fall exceeding 1.5 m. in present case three Sedimentation Cum Grease Trap are proposed. However, the item has been kept in case need arises during construction.	All Surface Water Bodies Along the Road	Contractor	**Environmental Expert of AE and PIU**

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
		• Enhancement of road side ponds, mostly big ponds; ch17+750km, ch 18+000km, ch 19+000km, ch 19+850km – ch 20+000km, ch 23+600km, ch 25+300km, ch 32+250km, ch 33+00km, ch 33+100km, ch 35+500km, ch 38+000km, ch 38+050km – 38+300km, ch 38+500km, ch 46+850km) should be considered. Total 900m. • Contractor will ensure that construction materials containing fine particles are stored in an enclosure such that sediment-laden water does not drain into nearby watercourse.			
C14	Slope Protection and Control of Soil Erosion	• The contractor will take slope protection measures as per design, or as directed by the Environmental Expert of AE to control soil erosion and sedimentation. • 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.Guidelines for slope stabilisation is given in Annexure 19. • Contractor will ensure the following aspects: 1.During construction activities on road embankment, the side slopes of all cut and fill areas will be graded and covered with stone pitching, grass and shrub as per design specifications. 2.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. 3.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. 4.Along sections abutting water bodies, stone pitching as per design specification will protect slopes.	Along the Roads	Contractor	**Environmental Expert of AE and PIU**
C15	Water Pollution from 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. Contractor will avoid construction works close to the streams or water bodies. • All waste arising from the project is to be disposed off in the manner that is acceptable and as per norms of the State Pollution Control Board.	Along the road	Contractor	**Environmental Expert of AE and PIU**

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
C16	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 and refuelling sites will be located at least 500 m from rivers and irrigation canal/ponds. • All location and layout plans of such sites will be submitted by the Contractor prior to their establishment and will be approved by the Environmental Expert of AE and PIU. • Contractor will ensure that all vehicle/machinery and equipment operation, maintenance and refuelling will be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground. Oil interceptors will be provided for vehicle parking, wash down and refuelling areas as per the design provided. • Oil and grease traps will be provided at fuelling locations, to prevent contamination of water. • 'Oil interceptors' shall be provided in wash down areas and re-fuelling areas • In all, fuel storage and refuelling areas, if located on agricultural land or areas supporting vegetation, the top soil will be stripped, stockpiled and returned after cessation of such storage. • Contractor will arrange for collection, storing and disposal of oily wastes to the pre-identified disposal sites (list to be submitted to AE and PIU) and approved by the Environmental Expert of AE. All spills and collected petroleum products will be disposed off in accordance with MoEF&CC and state PCB guidelines. • Environmental Expert of AE and Resident Engineer' will certify that all arrangements comply with the guidelines of PCB/ MoEF&CC or any other relevant laws.	Along the Roads	Contractor	**Environmental Expert of AE and PIU**
C17	Dust Pollution	• The contractor will take every precaution to reduce the level of dust from crushers/hot mix plants, construction sites involving earthwork by sprinkling of water, encapsulation of dust source and by erection of screen/barriers. • All the plants will be sited at least 1 km in the downwind direction from the nearest human settlement. • The contractor will provide necessary certificates to confirm that all crushers used in construction conform to relevant dust emission control legislation.	Along the Roads, Construction Site/ Camps	Contractor	**Environmental Expert of AE and PIU**

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
		• The suspended particulate matter value at a distance of 40m from a unit located in a cluster should be less than 500 g/m3. The pollution monitoring is to be conducted as per the monitoring plan. • Alternatively, only crushers licensed by the SPCB shall be used. Required certificates and consents shall be submitted by the Contractor in such a case to the Environmental Expert of AE through the 'Engineer'. • Dust screening vegetation will be planted on the edge of the ROW for all existing roadside crushers. Hot mix plant will be fitted with dust extraction units.			
C18	Emission from Construction Vehicles, Equipment and Machineries	• Contractor will ensure that all vehicles, equipment and machinery used for construction are regularly maintained and confirm that pollution emission levels comply with the relevant requirements of SPCB. • The Contractor will submit PUC certificates for all vehicles/ equipment/machinery used for the project. Monitoring results will also be submitted to 'PIU' through the 'Engineer'.	Along the Roads , all vehicles used/ Camps	Contractor	**Environmental Expert of AE and PIU**
C19	Noise Pollution: Noise from Vehicles, Plants and Equipments	• The Contractor will confirm the following: • All plants and equipment used in construction shall strictly conform to the MoEF& CC/CPCB 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. • Limits for construction equipment used in the project such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws shall not exceed 75 dB (A) (measured at one meter from the edge of equipment in the free field), as specified in the Environment (Protection) rules, 1986. • Maintenance of vehicles, equipment and machinery shall be regular to keep noise levels at the minimum. • At the construction sites within 150 m of the nearest habitation, noisy construction work such as crushing, concrete mixing, batching will be stopped during the night time between 10.00 pm to 6.00 am.	Along the Roads , all vehicles used/Camps	Contractor	**Environmental Expert of AE and PIU**

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
		• No construction activities will be permitted around educational institutes/health centres (silence zones) up to a distance of 100 m from the sensitive receptors i.e., school, health centres and hospitals between 10.00 pm to 6.00 am. • Monitoring shall be carried out at the construction sites as per the monitoring schedule and results will be submitted to Environmental Expert of AE through the 'Engineer'. • Noise barriers / trees will be planted along the road especially in front of sensitive locations, for such mitigation measure. the boundary wall should be 50 m. before and after the sensitive locations.			
C20	soil contamination	• Construction equipment and vehicles shall be restricted to move only within a designated area to avoid compaction of productive soil. • Construction vehicles and equipment shall be operated and maintained in such a manner so that soil contamination from spillage shall be at a minimum. Fuel storage shall only be done on wasteland and will be kept away from drainage channels and natural water bodies • Debris generated due to the dismantling of the existing pavement structure and the cutting of the hill side for the widening shall be suitably reused in the proposed construction, such as for fill materials for embankments. • Debris and other material obtained from existing embankment shall be dumped in approved landfill site already identified by concerned agency.	Along the Roads	Contractor	**Environmental Expert of AE and PIU**
C21	Personal Safety Measures for Labour	• Contractor will provide: • Protective footwear and protective goggles to all workers employed on mixing asphalt materials, cement, lime mortars, concrete etc. • Welder's protective eye-shields to workers who are engaged in welding works • Protective goggles and clothing to workers engaged in stone breaking activities and workers will be seated at sufficiently safe intervals • Earplugs to workers exposed to loud noise, and workers working in crushing, compaction, or concrete mixing operation. • Adequate safety measures for workers during handling of materials. • The contractor will comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress.	Along the Roads, all vehicles used/Camps	Contractor	**Environmental Expert of AE and PIU**

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
		• The contractor will comply with all the precautions as required for ensuring the safety of the workmen as per the International Labor Organization (ILO) Convention No. 62 as far as those are applicable to this contract.Guideline to ensure worker's safety during construction is attached annexure 20. • 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. • Contractor will provide facemasks for use to the workers when paint is applied in the form of spray or a surface having lead paint dry is rubbed and scrapped. • The Contractor will mark 'hard hat' and 'no smoking' and other '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 AE and PIU.			
C22	Traffic and Safety	• The contractor will take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, markings, flags, lights and flagmen as proposed in the Traffic Control Plan/Drawings and as required by the Environmental Expert of AE and 'Resident Engineer' for the information and protection of traffic approaching or passing through the section of any existing cross roads. Proper guideline of traffic management plan is attached in annexure 21. • The contractor will ensure that all signs, barricades, pavement markings are provided as per the MOSRT&H specifications. Before taking up of construction on any section of the existing lanes of the highway, a Traffic Control Plan will be devised and implemented to the satisfaction of Environmental Expert of AE and ' Resident Engineer'	Along the Roads , all vehicles used/Camps	Contractor	**Environmental Expert of AE and PIU**

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
C23	Risk from Electrical Equipment(s)	• The Contractor will take all required precautions to prevent danger from electrical equipment and ensure that: • No material will be so stacked or placed as to cause danger or inconvenience to any person or the public. • All necessary fencing and lights will be provided to protect the public in construction zones. • All machines to be used in the construction will conform to the relevant Indian Standards (IS) codes, will be free from patent defect, will be kept in good working order, will be regularly inspected and properly maintained as per IS provision and to the satisfaction of the 'Resident Engineer'.	Along the Roads	Contractor	**Environmental Expert of AE and PIU**
C24	Risk Force Measure	• The contractor will take all reasonable precautions to prevent danger to the workers and public from fire, flood etc. resulting due to construction activities. • The contractor will make required arrangements so that in case of any mishap all necessary steps can be taken for prompt first aid treatment. Construction Safety Plan prepared by the Contractor will identify necessary actions in the event of an emergency.Guidelines for emergency management system is attached in annexure 12.	Along the oads, construction Camps	Contractor	**Environmental Expert of AE and PIU**
C25	First Aid	• The contractor will arrange for - • a readily available first aid unit including an 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.	Along the Roads, construction Camps	Contractor	**Environmental Expert of AE and PIU**
C26	Informatory Signs and Hoardings	• The contractor will provide, erect and maintain informatory/safety signs, hoardings written in English and local language, wherever required as per IRC and MoRT&H specifications.	Along the Roads, construction Camps	Contractor	**Environmental Expert of AE and PIU**
C27	Road side Plantation Strategy	• The contractor will do the plantation at median and/or turfing at embankment slopes as per the tree plantation strategy prepared for the project. • Minimum 90 percent survival rate of the saplings will be acceptable otherwise the contractor will replace dead plants at his own cost. The contractor will maintain the plantation till they handover the project site to NHAI.	Along the oads	Contractor	**Environmental Expert of AE and PIU**

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
		• Environmental Expert of AE will inspect regularly the survival rate of the plants and compliance of tree plantation guidelines.			
C28	Ecosystem Flora and Fauna	• The contractor will take reasonable precaution to prevent his workmen or any other persons from removing and damaging any flora (plant/vegetation) and fauna (animal) including fishing in any water body and hunting of any animal. • If any wild animal is found near the construction site at any point of time, the contractor will immediately upon discovery thereof acquaint the Environmental Expert of AE and carry out the AE instructions for dealing with the same. • Environmental Expert of AE will report to the nearby forest office (range office or divisional office) and will take appropriate steps/ measures, if required in consultation with the forest officials. • All efforts during the design stage should be made to minimize the tree felling requirement • Compensatory plantation should be started during construction phase parallel to the construction activities. . Guideline for tree plantation is attached in annexure 10. • Monitoring of tree felling along the road • Prohibiting workers from collecting, capturing, and hunting creatures (especially Spoonbills) • Move to near the site if necessary • Implementation of awareness program • Reduced lighting or use of low illumination • Use of low noise machines	Along the Roads Sareswar Beel and neaby sites	Contractor	**Environmental Expert of AE and PIU**
C29	Chance Found Archaeological Property	• All fossils, coins, articles of value of antiquity, structures and other remains or things of geological or archaeological interest discovered on the site shall be the property of the Government and shall be dealt with as per provisions of the relevant legislation. • The contractor will take reasonable precautions to prevent his workmen or any other persons from removing and damaging any such article or thing. He will, immediately upon discovery thereof and before removal acquaint the Environmental Expert of AE of such discovery and carry out the AE instructions for dealing with the same, waiting which all work shall be stopped.	Along the Roads, construction sites/Camps	Contractor	**Environmental Expert of AE and PIU**

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
		• The AE will seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence the work in the site.			
C30	Labour Accommodation	• 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 labor camp. • The location, layout and basic facility provision of each labor camp will be submitted to AE and 'PIU' prior to their construction. • The construction will commence only upon the written approval of the Environmental Expert of AE. • The contractor will maintain necessary living accommodation and ancillary facilities in functional and hygienic manner and as approved by the AE. • The construction camps will be located away from the habitation as discussed in chapter 3 (project description, section F). guideline for siting construction camp is given in annexure 15. • The sewage system for such camps will be properly designed and built so that no water pollution takes place in adjacent canals	Along the oads, construction Camps/site	Contractor	**Environmental Expert of AE and PIU**
C30	Potable Water	• The Contractor will construct and maintain all labour accommodation in such a fashion that uncontaminated water is available for drinking, cooking and washing. • The Contractor will also provide potable water facilities within the precincts of every workplace in an accessible place, as per standards set by the Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996. • Testing of water will be done as per parameters prescribed in IS 10500:1991.	Along the Roads, construction Camps/construction site	Contractor	**Environmental Expert of AE and PIU**

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
C31	Sanitation and Sewage System	• The contractor will ensure that - • the sewage system for the camp are designed, built and operated in such a fashion that no health hazards occurs and no pollution to the air, ground water or adjacent water courses take place • separate toilets/bathrooms, wherever required, screened from those from men (marked in vernacular) are to be provided for women • Adequate water supply is to be provided in all toilets and urinals	Along the Roads, construction Camps/Construction Sites	Contractor	**Environmental Expert of AE and PIU**
C32	Waste Disposal	• The contractor will provide garbage bins 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 AE. • Unless otherwise arranged by local sanitary authority, arrangements for disposal of night soils (human excreta) suitably approved by the local medical health or municipal authorities or as directed by Environmental Expert of AE will have to be provided by the contractor.	Along the Roads, construction Camps	Contractor	**Environmental Expert of AE and PIU**
C33	Consultation	• The Environmental Expert of AE will contact the responsible people with the enhancement drawing of the site for which enhancement has been proposed and take their consent before the start of work. • Accesses to Different Schools along the road will be developed to the satisfaction of 'PIU'.	Along the Roads	Contractor	**Environmental Expert of AE and PIU**
C34	Clean-up Operations, Restoration and Rehabilitation	• Contractor will prepare site restoration plans, which will be approved by the Environmental Expert of AE. 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 and POL waste as per Comprehensive Waste Management Plan and as approved by AE. • All disposal pits or trenches will be filled in and effectively sealed off. Residual topsoil, if any will be distributed in pre identified approved areas or in places suggested by the Environmental Expert of AE areas in a layer of thickness of 75 mm-l50 mm. All construction zones including river-beds, culverts, road-side areas, camps, hot mix plant sites, crushers, batching plant sites and any other	Along the Roads, construction Camps	Contractor	**Environmental Expert of AE and PIU**

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
		area used/affected by the project will be left clean and tidy, at the contractor's expense, to the entire satisfaction to the Environmental Expert of AE and PIU will certify in this regard.			
OPERATION STAGE					
Activities to be carried Out by PIU					
O1	Monitoring Operation Performance	• The PIU 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, status of rehabilitation of borrow areas and disposal sites,	Along the Road	PIU	**PIU**
O2	Maintenance of Drainage	• PIU will ensure that all drains (side drains, median drain and all cross drainages) are periodically cleared especially before monsoon season to facilitate the quick passage of rainwater and avoid flooding. • PIU will ensure that all the sediment and oil and grease traps set up at the water bodies are cleared once in every three months.	Along the Road	PIU	**PIU**
O3	Pollution Monitoring	• The periodic monitoring of the ambient air quality, noise level, water quality, soil pollution/contamination in the selected locations as suggested in pollution monitoring plan. • PIU will either appoint PCB or its approved pollution-monitoring agency for the purpose	Along the Road	PIU through Pollution Monitoring Agency	**PIU**
O4	Air Pollution	• Ambient air concentrations of various pollutants shall be monitored as envisaged in the pollution-monitoring plan. • Bottlenecks should be avoided for smooth flow of traffic. • Plantation of pollutant adsorbing trees, such as Spider Plant, Bamboo Palm, etc. • Regular maintenance of the road will be done to ensure good surface condition	Along the Road	PIU through Pollution Monitoring Agency	**PIU**
O5	Noise Pollution	• Noise pollution will be monitored as per monitoring plan at sensitive locations. Noise control programs are to be enforced strictly. • According to monitoring results, use of sound barriers / trees will be considered where warranted • Signs for sensitive zones (health centers / educational institutions etc.) will be put up where horn should not be blown or traffic speed need to be regulated • Pressure Horn must be banned in the project road	Along the Road	PIU through Pollution Monitoring Agency	**PIU**

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
O6	Water Pollution	• Water Quality will be monitored as per monitoring plan	Along the Road	PIU through Pollution Monitoring Agency	**PIU**
O7	Soil Contamination	• Prevention of soil and water pollution in the surrounding area • Contingency plans to be in place for cleaning up of spills of oil, fuel and toxic chemicals. • Monitoring shall be carried out as specified in the Monitoring Plan	Along the Road	PIU through Pollution Monitoring Agency	**PIU**
O8	Ecosystem, Plantation, Flora and Fauna	• Monitoring of survival of trees should be done at regular interval and suitable mitigation measures should be taken to protect the trees. • Efforts will be made for proper maintenance of planted trees, shrubs and grasses to maintain greenery and aesthetics • Planted tree should be covered with fence or net • Road users are prohibited from collecting creatures and hunting and hunting (especially the sandpiper)---Reduced lighting or use of low illumination	Along the Road Sareswar Beel and 3 nearby sites	PIU through Pollution Monitoring Agency	**PIU**/MoEFCC
O9	Soil Erosion and Monitoring of Borrow Areas	• Visual monitoring and inspection of soil erosion at borrow areas, quarries (if closed and rehabilitated), embankment > 2m. and other places expected to be affected, will be carried out once in every three months as suggested in monitoring plan.In case soils erosion is found, suitable measures should be taken to control the soil erosion.	Along the Road	PIU	**PIU**
O10	**Road Safety and Traffic**	• **Road Safety will be monitored during operation especially at location where traffic-calming measures have been proposed.** • **The spills at the accident sites will be cleared immediately and disposed off properly in accordance with Emergency Response Plan** • **Traffic management plan will be developed, especially along congested locations and near sensitive locations** • **Traffic control measures including speed limits will be enforced strictly.** • **Engagement with local community / Awareness Training**	**Along the Road**	**PIU**	**PIU**

Source: JICA Survey Team

7.8.2 Environment Monitoring Program

The purpose of the monitoring program 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 Environmental Management Plan (EMP), it is essential that an effective monitoring program should be designed and carried out. The environmental monitoring program provides such information based on which management decision may be taken during construction and operational stages. It provides basis for evaluating the efficiency of mitigation and enhancement measures and suggest further actions that need to be taken to achieve the desired effect. The Objectives of environmental monitoring program are-

- Evaluation of the efficiency of mitigation and enhancement measures;
- Updating of the actions and impacts of baseline data;
- Adoption of additional mitigation measures if the present measures are insufficient; and
- Generating the data, which may be incorporated in environmental management plan in future projects.

All monitoring strategies and program have reasons and justifications which are often designed to establish the current status of an environment or to establish trends in environmental parameters. In all cases the results of monitoring will be reviewed, analyzed statistically and published. The design of a monitoring program must therefore have regard to the final use of the data before monitoring starts.

Monitoring methodology covers the following key aspects:

- Components to be monitored;
- Parameters for monitoring of the above components;
- Monitoring frequency;
- Monitoring standards;
- Responsibilities for monitoring

(1) Performance Indicators

The Environmental monitoring of the parameters involved and the threshold limits specified are discussed below:-

Ambient Air Quality Monitoring

The air quality parameters viz. Sulphur di-oxide (SO2), Oxides of Nitrogen (NOX), Carbon Monoxide (CO) and Particulate Matter (PM 2.5 & PM 10) shall be regularly monitored at identified locations from the start of the construction activity. The air quality parameters shall be monitored in accordance with the National Ambient Air Quality Standards.
The duration and the pollution parameters to be monitored and the responsible institutional arrangements are detailed out in the Environmental Monitoring Plan.

Noise Quality Monitoring

The noise levels shall be monitored at designated locations in accordance with the Ambient Noise Quality standards. The duration and the noise pollution parameters to be monitored and the responsible institutional arrangements are detailed in the Environmental Monitoring Plan.

Water Quality Monitoring

Water quality parameters such as pH, BOD, COD, DO, Coliform, Total Suspended Solids, Total Dissolved Solids, Iron, etc. shall be monitored at all identified locations during the construction

stage as per standards prescribed by Central Pollution Control Board and IS:10500 quality standards. The duration and the pollution parameters to be monitored and the responsible institutional arrangements are detailed out in the Environmental Monitoring Plan.

Soil Quality Monitoring

Soil quality parameters such as NPK, oil & grease and heavy metals shall be monitored at all the identified locations during the construction stage as per the standards. The duration and the pollution parameters to be monitored and the responsible institutional arrangements are detailed out in the Environmental Monitoring Plan.

(2) Monitoring Plans for Environmental Condition

To ensure the effective implementation of the mitigation measures and environmental management plan, it is essential that an effective Environmental Monitoring Plan (EMoP) to be designed. The EMoP contains parameters, location, sampling and analysis methods, frequency, and compared to standards or agreed actions that will indicate non-compliances and trigger necessary corrective actions. The objectives of the EMoP are to:

- Ensure that impacts do not exceed the applicable legal standards
- Check the implementation of mitigation measures in the manner described in the EIA report
- Monitor implementation of the EMP
- Provide an early warning of potential environmental damage
- Check whether the proposed mitigation measures have been achieved the intended results, and or/ other environmental impacts occurred.

Monitoring plan does not include the requirement of arising out of Regulation Provision such as obtaining NOC/ consent for plant site operate.

Table 7-66: Environmental Monitoring Plan

Environmental Component	Project Stage	Monitoring					Institutional Responsibility	
		Parameters	Special Guidance	Standards	Location	Frequency	Implementation	Supervision
Air	**C**	PM10, PM 2.5, SO_x, NOx, CO	Respirable Dust Sampler to be located 50 m from the plant in the downwind direction. Use method specified by CPCB for analysis	Air (P&CP) Act,1981 and its amendment	• Hot mix Plant / Batching Plant approved by engineers. At 3 locations. • Monitoring at construction sites near sensitive locations. at 2 locations (Total 05 locations)	Three times in a Year for two years (Excluding Rainy season)	Contractor through NABL approved monitoring agency	Environment Expert-AE
	O	PM10, PM 2.5, SO_x, NOx, CO	Respirable Dust Sampler to be located 50m from the plant in the downwind direction. Use method specified by CPCB for analysis	Air (P&CP) Act,1981 and its amendment	As directed by the Engineer (04 Project locations)	As specified by the Engineer	P I U through NABL approved monitoring agency	P I U

Environmental Component	Project Stage	Monitoring					Institutional Responsibility	
		Parameters	Special Guidance	Standards	Location	Frequency	Implementation	Supervision
Water Quality	**C**	Parameters as per IS: 10500	Grab sample collected from source and analyze as per Standard Methods for Examination of Water quality	Water quality standards by CPCB	04 ground water sample and 04 surface water samples in project stretch.	Three times in a Year for two years (Excluding Rainy season)	Contractor through NABL approved monitoring agency	Environment Expert-AE
	O	Parameters as per IS: 10500	Grab sample collected from source and analyze as per Standard Methods for Examination of Water quality	Water quality standards by CPCB	As directed by the Engineer (08 Project locations)	As specified by the Engineer	P I U through NABL approved monitoring agency	P I U
Noise Levels	**C**	Noise levels on dB (A) scale	As per CPCB	Noise standards by CPCB	Hot mix Plant / Batching Plant. Stretch of the road where construction is in progress at the site. (Total 5 locations) Sensitive receptors such as school or hospitals (Total 3 locations)	Three times in a Year for two years. (Excluding Rainy season)	Contractor through NABL approved monitoring agency	Environment Expert-AE

Environmental Component	Project Stage	Monitoring					Institutional Responsibility	
		Parameters	Special Guidance	Standards	Location	Frequency	Implementation	Supervision
	O	Noise levels on dB (A) scale	As per CPCB	Noise standards by CPCB	As directed by the Engineer (04 Project locations) Sensitive receptors such as school or hospitals (Total 3 locations)	As specified by the Engineer	PIU	PIU
Soil Contamination	**C**	NPK, heavy metals & oil-Grease	----	As per Standard (ICAR)	03 major construction locations. (Total 03 locations)	Three times in a Year for two years	Contractor	Environment Expert-AE
	O	NPK, heavy metals & oil-Grease , water courses	----	As per Standard (ICAR)	As directed by the Engineer. (03 Project locations)	As specified by the Engineer	PIU	PIU
Ecosystem	**C**	Endangered species	Confirmation of the habitat of rare species, mainly birds, and analysis of their habitat status	Types and numbers of rare species, mainly birds As per Indian and JICA Guideline (2010)	Sareswar Beel and locations nearby Sareswar Beel	Quarterly throughout construction time	PIU	PIU with MOEFCC

Environmental Component	Project Stage	Monitoring					Institutional Responsibility	
		Parameters	Special Guidance	Standards	Location	Frequency	Implementation	Supervision
	O	Endangered species	Confirmation of the habitat of rare species, mainly birds, and analysis of their habitat status	Types and numbers of rare species, mainly birds As per Indian and JICA Guideline (2010)	Sareswar Beel and locations nearby Sareswar Beel	Quarterly throughout operation time	PIU	PIU with MOEFCC

Source: JICA Survey Team

Table below shows the Environmental Monitoring Budget. Air, Surface water, ground water monitoring are most costly monitoring activities.

Table 7-67: Environmental Monitoring Budget

S. No.	Parameters/ Components	Frequency		UnitCost/Sample (Rs.)	Total Cost (Rs.)
1	Ambient Air Monitoring Construction Stage	At 05 locations for three season in a year for 2 years (Total 30 samples in 2 years)		[redacted]	[redacted]
	Operation Stage	At 4 locations for three season for a year (Total 12 samples in 1 year)		[redacted]	[redacted]
2	Ground Water Sampling Construction Stage	At 4 locations for three season in a year for 2 years (Total 24 samples in 2 years)		[redacted]	[redacted]
	Operation Stage	At 4 locations for three season for a year (Total 12 samples in 1 year)		[redacted]	[redacted]
3	Surface Water Sampling Construction Stage	At 4 locations for three season in a year for 2 years (Total 24 samples in 2 years)		[redacted]	[redacted]
	Operation Stage	At 4 locations for three season for a year (Total 12 samples in 1 year)		[redacted]	[redacted]
4	NoiseMonitoring Construction Stage	At 05 locations for three season in a year for 2 years (Total 30 samples in 2 years)		[redacted]	[redacted]
	Operation stage	At 04 locations for three season for a year (Total 12 samples in 1 year)	-	[redacted]	[redacted]
5	Soil Monitoring Construction Stage	At 03 locations for three season in a year for 2 years (Total 18 samples in 2 years)	-	[redacted]	[redacted]
	Operation Stage	At 03 locations for for three season for a year (Total 09 samples in 1 year)	-	[redacted]	[redacted]
	Total Monitoring Cost				[redacted]

Source: JICA Survey Team

7.8.3 Institutional Arrangement

To enhance the capacity of officials for effective implementation of proposed mitigation measures and monitoring the resultant effects, as well as create awareness amongst workers and public, the training and awareness program is planned and is given in Table 7-68. The institutions/agencies like regional office of MoEF, SPCB/CPCB, and Indian Institute of Technologies can be consulted for such trainings. Independent subject's experts/consultants (e.g., for the environmental awareness program, impact assessment specialist will be the resource person) can also be the resource persons to impart trainings. These experts /agencies shall be appointed based on specific need for the training. A separate budget for training has been allocated under the CSC budget.

Table 7-68: Outline Capacity Building Program on EMP Implementation

Description	Target Participants and Venue	Estimate (₹)18	Cost and Source of Funds
1. Introduction and Sensitization to Environmental Issues (1 day) JICA environmental safeguard policy Government of India and Assam applicable safeguard laws, regulations and policies including but not limited to core labor standards, occupational health and safety, etc. Incorporation of environmental management plan (EMP) into the project design and contracts Monitoring, reporting and corrective action planning Awareness programme for COVID -19	All staff and consultants involved in the project At project management unit (PMU) (combined program for all subprojects)	-	Included in the overall program cost
2. EMP implementation (1/2 day per alternative month for 24 month = 12 mandays) EMP mitigation and monitoring measures -Roles and responsibilities Public relations, -Consultations Grievance redress Monitoring and corrective action planning Reporting and disclosure Construction site standard operating procedures (SOP) -- Chance find (archeological) protocol AC pipe protocol Traffic management plan Waste management plan Site clean-up and restoration	All project implementation unit (PIU) staff, contractor staff and consultants involved in the subproject At PIU	[redacted]	Included in subproject cost estimates
3. Contractors Orientation to Workers (1/2 day) - Environment, health and safety in project construction	Once before start of work, and thereafter regular briefing every month once. Daily briefing on safety prior to start of work All workers (including unskilled laborers)	-	Contractors cost

Source: JICA Survey Team

[18] The rate is as per current market rate.

7.8.4 Monitoring Forms

In this section, the monitoring forms for this project is given.

The general monitoring forms

The general monitoring form contans the followings.

- Overall project description and objectives
- Environmental category of each subproject as per national laws and regulations
- Project Safeguards Team

Name	Designation/Office	Email Address	Contact Number
1. PMU			
2. PIUs			
3. Consultants			

- Overall project and sub-project progress and status
- Descriptionofsubprojects (package-wise) and status of implementation (preliminary,detailed design, on-going construction, completed, and/or O&M stage)

Package Number	Components /List of Works	Status of Implementation (Preliminary Design/ Detailed Design/ On-going Construction/ Completed/O&M)[a]	Contract Status (specify if under bidding or contract awarded)	If On-going Construction	
				%Physical Progress	Expected Completion Date

[a] If on-going construction, include %physical progress and expected date of completion.

Compliance Status With National/State/Local Statutory Environmental Requirements[a]

Package No.	Subproject Name	Statutory Environmental Requirements[b]	Status of Compliance[c]	Validity if obtained	Action Required	Specific Conditions that will require environmental monitoring as per Environment Clearance, Consent/Permit to Establish[d]

[a] Allstatutoryclearance/s,no-objectioncertificates,permit/s,etc.shouldbeobtainedpriortoawardofcontract/s. Attach as appendix all clearance obtained during the reporting period. If already reported, specify in the "remarks" column.
[b] Specify (environmental clearance? Permit/consent to establish? Forest clearance? Etc.)
[c] Specify if obtained, submitted and awaiting approval, application not yet submitted
[d] *Example: Environmental Clearance requires ambient air quality monitoring, Forest Clearance/Tree-cutting Permit requires 5 trees for every tree cut, etc.*

Compliance Status With Environmental Loan Covenants

No. (List schedule and paragraph number of Loan Agreement)	Covenant	Status of Compliance	Action Required

Compliance Status with the Environmental Management Plan (Refer to EMP Tables in Approved EIA/S)

- Confirm if EIA/s require contractors to submit site-specific EMP/construction EMPs. If not, describe the methodology of monitoring each package under implementation.

Package-wise Implementation Status

Package Number	Components	Design Status (Preliminary Design Stage/ Detailed Design Completed)	Final EIA based on Detailed Design				Site-specific EMP (or Construction EMP) approved by Project Director? (Yes/No)	Remarks
			Not yet due(detailed design not yet completed)	Submitted to JICA (Provide Date of Submission)	Disclosed On project website (Provide Link)	Final EIA provided to Contractor/s (Yes/No)		

- Identify the role/s of Safeguards Team including schedule of on-site verification of reports submitted by consultants and contractors.
- For each package, provide name/s and contact details of contractor/s' nodal person/s for environmental safeguards.

- Include as appendix all supporting documents including **signed** monthly environmental site inspection reports prepared by consultants and/or contractors.
- With reference to approved EMP/site-specific EMP/construction EMP, complete the table below
- Provide the monitoring results as per the parameters outlined in the approved EMP (or site- specific EMP/construction EMP when applicable).
- In addition to the table on EMP implementation, the main text of the report should discuss in details the following items:

  (i) **Grievance Redress Mechanism.** Provide information on establishment of grievance redress mechanism and capacity of grievance redress committee to address project-related issues/complaints. Include as appendix Notification of the GRM (town-wise if applicable).

  (ii) **Complaints Received during the Reporting Period.** Provide information on number, nature, and resolution of complaints received during reporting period. Attach records as per GRM in the approved EIA. Identify safeguards team member/s involved in the GRM process. Attach minutes of meetings (ensure English translation is provided).

  - Confirm if any dust was noted to escape the site boundaries and identify dust suppression techniques followed for site/s.
  - Identify muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads.
  - Identify type of erosion and sediment control measures installed on site/s, condition of erosion and sediment control measures including if these were intact following heavy rain;
  - Identify designated areas for concrete works, chemical storage, construction materials, and refueling. Attach photographs of each area.
  - Confirm spill kits on site and site procedure for handling emergencies.
  - Identify any chemical stored on site and provide information on storage condition. Attach photograph.
  - Describe management of stockpiles (construction materials, excavated soils, spoils, etc.). Provide photographs.
  - Describe management of solid and liquid wastes on-site (quantity generated, transport, storage and disposal). Provide photographs.
  - Provide information on barricades, signages, and on-site boards. Provide photographs.
  - Provide informationon Checking if there are any activities being undertaken out of working hours and how that is being managed.

Summary of Environmental Monitoring Activities (for the Reporting Period)

Impacts (List from EIA)	Mitigation Measures (List from EIA)	Parameters Monitored (As a minimum those identified in the EIA should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name of Person Who Conducted the Monitoring
Design Phase						
Pre-Construction Phase						
Construction Phase						
Operational Phase						

[a] Attach Laboratory Results and Sampling Map/Locations

Overall Compliance with CEMP/ EMP

No.	Sub-Project Name	EMP/ CEMP Part of Contract Documents (Y/N)	CEMP/ EMP Being Implemented (Y/N)	Status of Implementation (Excellent/Satisfactory/ Partially Satisfactory/ Below Satisfactory)	Action Proposedand Additional Measures Required

Approach and Methodology for Environmental Monitoring of the Project

- Brief description on the approach and methodology used for environmental monitoring of each sub-project

Monitoring of Environmental Impacts on Project Surroundings (Ambient Air, Water Quality and Noise Levels)

- Brief discussion on the basis for monitoring
- Indicate type and location of environmental parameters to be monitored
- Indicate the method of monitoring and equipment to be used
- Provide monitoring results and ananalysis of results in relation to baseline data and statutory requirements

As a minimum the results should be presented as per the tables below.

Air Quality Results

Site No.	Date of Testing	Site Location	Parameters (Government Standards)		
			PM10 µg/m3	SO2 µg/m3	NO2 µg/m3

Site No.	Date of Testing	Site Location	Parameters (Monitoring Results)		
			PM10 µg/m3	SO2 µg/m3	NO2 µg/m3

Water Quality Results

Site No.	Date of Sampling	Site Location	Parameters (Government Standards)					
			pH	Conductivity µS/cm	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L

Noise Quality Results

Site No.	Date of Testing	Site Location	LAeq (dBA) (Government Standard)	
			Day Time	Night Time

Site No.	Date of Testing	Site Location	LAeq (dBA) (Monitoring Results)	
			Day Time	Night Time

7.8.5 Environmental Management Budget

The environmental budget for the various environmental management measures proposed in the EMP is detailed in table below. The budget has been worked out on the basis of market rates.

Table 7-69: Mitigation and Enhancement Cost in Construction and Operation Phase

Sl. No	Environmental Components	Particulars	Unit	Rate In (Rs.)	Approx. Quantity	Total Cost In (Rs.)
		Mitigation / Enhancement Cost				
2		Construction Stage				
2.1	Air	Dust Management with sprinkling of water, covers for vehicles transporting construction material	54.154 Km	Cost included in Total Civil Cost		
2.2	Water	Provision of Taps	No.	Included in utility shifting and replacement cost.		
	Water Bodies	Enhancement of Road side Ponds (18 big ponds as per EMP Table 7-65 Total length of water bodies proposed for enhancement = 900m	No.	Retaining wall has been proposed to protect this water bodies. Cost of retaining wall is included in total Civil Cost.		
		Oil trap at parking/servicing of construction vehicles (at three location every 14km)-	No.	Ref: Project Cost Estimate		
2.3	Environmental Enhancements	Enhancement of traffic sign outside of most sensitive locations mentioned in EMP, by planting of traffic sign and planting of 1 row of trees at a distance of 3m c/c and as per directions of the Engineer	No.	At this location proper traffic sign has been proposed. The cost of traffic sign is included in total civil cost.		

Sl. No	Environmental Components	Particulars	Unit	Rate In (Rs.)	Approx. Quantity	Total Cost In (Rs.)
2.4	Flora	1. Compensatory Afforestation @ 1:10 ratio (Number of trees to be cut =4202) Compensatory Afforestation (Greenbelt) will be provided within the ROW along the roadside at available locations and especially in some of the project section where roadside plantation (greenbelt) does not exist or found very few, including watering and maintenance of Planted trees for 5 years	Nos.	[redacted]	[redacted]	[redacted]
		Tree guarding (Making Tree Guard 53 cm dia and 1.3 m each 359.00 high as per design from empty bitumen Drum) Price details as per SoR, PWD, Assam is attached in annexure 23	Nos.	[redacted]	[redacted]	[redacted]
2.5	Silt Runoff Control	Slope stabilization, turfing, silt fencing etc		For slope stabilization turfing has been proposed on high embankment. Cost of slope stabilization is included in Total Civil Cost.		
2.6	Slope/ embankment protection measures	Stone pitching, Gabion, Retaining wall, Turfing at toe line, etc		For Slope/ embankment protection Retaining wall, Turfing has been proposed. Cost of Slope/ embankment is included in Total Civil Cost.		
		Total Mitigation / Enhancement Cost				[redacted]
3		**Operation Stage**				
3.1	Soil erosion	Mitigation measure for soil erosion		included in Total Civil Cost		
3.2	Contamination from spills due to traffic and accidents	Clearing of spills at accident site			Average cost (detailed calculation is given in annexure 23)	[redacted]
3.3	Flora	Maintenance of planted trees	Already included in construction phase			
3.4	Safety	Traffic management and Traffic control	Part of project construction cost.			
		Total Mitigation / Enhancement Cost				[redacted]

Source: JICA Survey Team

The final cost for the Environmental Management is shown as below.

Table 7-70: Summary of Environmental Management Budget

Sl. No.	Environmental Components	Cost (Rs.)
1	**Construction Phase**	
1.1	Total Mitigation / Enhancement Cost	[redacted]
1.2	Environmental Monitoring Cost	[redacted]
	Total Cost in Construction phase	[redacted]
2	**Operation Phase**	
2.1	Total Mitigation / Enhancement Cost	[redacted]
2.2	Environmental Monitoring Cost	[redacted]
	Total Cost in Operation Phase	[redacted]
3	**Miscellaneous Cost**	
3.1	Environmental Awareness and Training	[redacted]
3.2	Administrative Charges including logistics	[redacted]
	Total Cost in Miscellaneous	[redacted]
	TOTAL BUDGETED COST (1+2+3)	[redacted]

Source: JICA Survey Team

An environmental management budget at of **INR** [redacted] has been estimated for implementation of the environmental management plan. This budget includes cost of environmental monitoring and associated trainings.

7.9 Resettlement Action Plan

7.9.1 Objectives and Overview

The aim of this Resettlement Action Plan (RAP) is to mitigate all such unavoidable negative impacts caused by the project and resettle the Project Affected Persons (PAPs) and restore their livelihoods. RAP will be prepared on the basis of project census survey findings and consultation with various stakeholders. RAP complies with National Highway Act, RFCTLARR, Assam State Laws and Regulations and World Bank's Operational Manual 4.12 and 4.10 in accordance with the JICA Guidelines for Environmental and Social Considerations.

Socio-economic mitigation measures will consist of policies and actions taken before the implementation of the project with the intention of minimizing the extent of impact after land acquisition along the existing road. The first step of such mitigation will be to avoid unnecessary acquisition and then decide about the mitigation for the damage which is unavoidable. Mitigation is a long-term effort for reduction of socio-economic impacts on the affected population.

The RAP focuses on three generic areas in implementation of mitigation measures, institutional strengthening and training and monitoring. The RAP will include proposed work programme, budget estimates, schedules, staffing and training requirements and other necessary support services to implement the mitigation measures. Institutional arrangements required for implementing this management plan will be provided in the RAP. The cost of implementing the monitoring and evaluation including staffing, training and institutional arrangements will also be specified where monitoring and evaluation requires inter-agency collaboration/association.

This RAP is developed based on the legal provisions (national and state), government memorandum/notification and World Bank Operational Policy on Involuntary Resettlement (OP 4.12). The following sections provide an overview of the legal provisions governing the land acquisition and resettlement and rehabilitation.

(1) Principles

Based on the above analysis of Government statutes and the JICA Guidelines, the following resettlement principles will be adopted for this project:

- Screen the project early on to identify, present, and future involuntary resettlement impacts and risks. Determine the scope of impacts using a screening checklist.
- Ensure that affected persons with or without recognizable legal rights to land are eligible for replacement value for loss of non-land assets and resettlement and rehabilitation assistance. Where displacement is unavoidable in such cases, improve, or at least restore the livelihoods of all Project Affected Persons by providing resettlement and rehabilitation assistance.
- Improve the standards of living of affected persons particularly, poor and vulnerable groups, to national minimum standards or standard before displacement whichever is higher.
- Carry out meaningful consultations with affected persons, local communities, and concerned agencies/departments. Inform all affected persons of their entitlements and resettlement options. Ensure their participation in planning, implementation, and monitoring and evaluation of resettlement programs. Pay attention to the needs of vulnerable groups, especially those below the poverty line, the landless, the elderly, women and children, and those without ownership to land, and ensure their participation in consultations.
- Conduct census and socio-economic surveys, consultations, etc and prepare a Social Impact Assessment (SIA) report and also prepare RAP, as the case may be, depending upon the magnitude of impacts.
- Identify vulnerable groups for additional support in their efforts to improve their living standards.
- Disclose draft and final RAP, including documentation of the consultation process in a timely manner, in an accessible place and a form and language(s) understandable to affected persons and other stakeholders.
- Pay compensation and provide resettlement and rehabilitation assistance as per entitlements before clearing the affected area for the commencement of project activities.
- Establish an accessible Grievance Redressal Mechanism (GRM) to receive and facilitate the resolution of the concerns of affected persons within a specified time frame.
- Monitor and assess resettlement outcomes, their impacts on the standard of living of affected persons, and whether the objectives of the resettlement plan have been achieved by considering the baseline conditions and the results of resettlement monitoring.

(2) Eligibility

Persons affected by the proposed project may belong to either of the following two categories and will be eligible for compensation and resettlement and rehabilitation assistance in accordance with the principles of this RAP:

- Those who have ownership to land
- Those who have no recognizable legal right or claim to the land they are occupying (informal settlers on public land at site – encroachers and squatters).

(3) Definitions

In this Resettlement Action Plan, following terms shall mean as described below, unless the context requires otherwise,

Affected area: Means such area as may be notified by the appropriate government for the purposes of land acquisition/purchase;

Assistance: All support mechanisms such as monetary help, services, trainings or assets given to Project Affected Persons/Project Affected Families constitute assistance in this project.

Below poverty line (BPL) or BPL family: means below poverty line families as defined by the Planning Commission of India, from time to time and those included in the BPL list by the State Government for the time-being in force;

Compensation: Compensation for land taken under RFCTLARR, 2013 in fair and transparent manner based on mutual consent;

Cut-off date: For title holders, the date of notification under Section 4(1) of the RFCTLARR Act, 2013 (if the land is acquired is acquired as per the Act) or the date of local notice of land intended for direct purchase from landowners in the public offices and local newspaper(s). For non-titleholders the cut-off date is the date on which census survey from Jul. 2020 starts in the project area,

Displaced family: means a family, who on account of acquisition or purchase of land needs to be relocated and resettled from the affected area to the resettlement area or elsewhere;

Encroacher: A person/family, who transgresses into the public land (i.e., extended their building, agricultural lands, business premises or work places into public land), adjacent to his/her own land or other immovable assets and derives his/her additional source of shelter, livelihood, etc.;

Family: includes a person, his or her spouse, minor children, minor brothers and minor sisters' dependent on him. Widows, divorcees, and women deserted by families shall be considered separate families;

Petty shop/Kiosk: It could be cubicle/booth/stall/cabin made of wood or iron or any other building material which could be shifted to another location as a single unit without much damage and is used for carrying out petty business, commercial activities and has been in operation/existence prior to cut off date;

"Land acquisition" or "acquisition of land": means acquisition of land as per RFCTLARR, Act 2013 for the time being in force

Marginal farmer: Means a cultivator with an un-irrigated land holding up to one hectare or irrigated land holding up to one-half hectare;

Market value: Means the value of land determined in accordance with Section 26 of the RFCTLARR, Act 2013 or the base price of land determined taking into account the assessed value of land or set forth value of land whichever is higher;

Minimum Wages: means the minimum wage of a person for his/her services/labour by type of trade per day as stipulated by Department of Labour of the project state;

Non-agricultural labourer: means a person who is not an agricultural labourer but is primarily residing in the affected area for a period of not less than three years immediately before the declaration of the affected area and who does not hold any land under the affected area but who earns his livelihood mainly by manual labour or as a rural artisan immediately before such declaration and who has been deprived of earning his livelihood mainly by manual labour or as such artisan in the affected area;

Non-titleholder: Affected persons/families/ households with no legal rights to the land, structures and other assets adversely affected by the project. Non-titleholders include encroachers, squatters, etc.;

Notification: Means a notification published in the Gazette of India or, as the case may be, Gazette of a State and the expression "notify" shall be construed accordingly;

Persons losing their livelihood: Persons losing their livelihood are individual members of the PAHs, who are at least 18 years of age and are impacted by loss of primary occupation or source of income;

Permanent buildings or Pucca structure: Buildings of a permanent construction type with reinforced concrete;

Project affected area: Refers to the area of village or locality under a project for which land will be acquired as per the provisions of the RFCTLARR Act, 2013 through declaration by Notification in the Official Gazette by the appropriate Government.

Project affected person (PAP): Any tenure holder, tenant, Government lessee or owner of other property, or non-titleholder who on account of the project has been affected from such land including plot in the *abadi* or other property in the affected area will be considered as PAP;

Project affected household (PAH): A social unit consisting of a family and or non-family members living together, and is affected by the project negatively and or positively;

Replacement cost: A replacement cost/value of any land or other asset is the cost/value equivalent to or sufficient to replace/purchase the same land or other asset;

Semi-permanent building or structure: Buildings of a semi-permanent type with tiled roof and walls not of concrete or permanent brickwork;

Squatter: A person/family who has settled on public/government land, land belonging to institutions, trust, etc. and or someone else's land without permission for residential, business and or other purposes or has been occupying public building without authority prior to the cut-off date and is depending for his or her shelter or livelihood and has no other source of shelter or livelihood;

Tenant: A person who holds/occupies land/structure of another person and (but for a special contract) would be liable to pay rent for that land/structure. This arrangement includes the predecessor and successor-in-interest of the tenant but does not include mortgage of the rights of a landowner or a person to whom holding has been transferred;

Temporary building/Kutcha structure: Temporary building or structure means a temporary type of structure, which includes buildings with roofs constructed of thatch, galvanized iron or corrugated cement sheet or asbestos;

Titleholder: A person who has legal rights of the land acquired/purchased by the project;

Women Headed Household (WHH): A household that is headed by a woman and does not have an adult male earning member is a Woman Headed Household. This woman may be a widowed, separated or deserted person;

Vendor: A vendor is someone who sells things such as newspapers, tea, cigarettes, or food and other miscellaneous items from a small stall or cart etc.;

Agricultural Labourer is the person depends on the agricultural land for their livelihoods.

Vulnerable group: Includes Scheduled Caste, Scheduled Tribe, family/household headed by women/female, widows, physically challenged (disabled person), BPL, and land less. The vulnerable group will also include those landowners who after acquisition or purchase of their land due to project become landless.

7.9.2 Socioeconomic Studies on Land Acquisition and Resettlement

(1) Summary of the Impacts

The Socio-economic survey was carried out in the month of June -July, 2020 by a team of trained enumerators. A set of questionnaire was used to collect detailed information of affected households/ business for a full understanding of impacts in order to develop mitigation measures and resettlement framework for the project. Socio-economic survey and census survey were carried out for 743 PAHs and 1,396 PAHs respectively to collect detailed information of affected households/ properties and for a full understanding of impacts in order to develop mitigation measures and resettlement plan for the PAPs.

The below table shows summary of the major findings of the census survey and the socio-eocnomic survey. The numbers of PAHs, PAPs and affected structures detected in the surveys are 1,396 households, 7,262 individuals, and 1,081 structures respectivel. They are far bigger than the previously detected figures of 74 households, 387 individuals and 67 structures the Social Impact Survey in DPR, which were used for the environmental and social scoping of this project. These gaps happened as the numbers of PAHs, PAPs and affected structures listed in the DPR were only those of households, indivisuals and their residential structures who need to be relocated and who have no legal land ownership. They did not include the affected household or individual who are not relocated or who has land ownership. Thus the numbers were only a limited portion of the whole affected households, indivisuals and structures. However, such definitions of the PAHs, PAPs and affected structures were not stated in the DPR.

Table 7-71: Summary Project Impacts

Sl. No.	Impacts	Fgirues confirmed in the census survey	Previous SIA (in the DPR in Mar. 2020)
1	Total area of private land acquisition (in ha)	142.688 ha	142.688 ha
2	Project affected households (PAHs)	1,396	74
3	Households to be relocated from their residents	225	NA
4	Vulnerable households among the PAHs	698	21
5	Project affected persons (PAPs)	7,262	387
6	Persons to be relcated from theire residents	1,168	NA
7	Persons losing only land	466	NA
8	Owners losing structures	684	Nil
9	Owners losing cattle sheds	3	Nil
10	Tenants without formal document	94	NA
11	Employees of the affected commercial structures and agricultural land	90	NA
12	Affected private structures	1,081	67
13	Residential structures that require relocation	318	NA
14	Kiosks	59	NA
15	Common Property Resources (CPRs) affected (for community and religious usess)	33	33

Source: Census Survey by JICA Survey Team (June- July 2020).
Detailed Project Report (DPR) of the project (Mar. 2020).

(2) Land Acquisition

The alignment was finalized as per the detailed engineering design. Initially, the numbers of affected villages were identified as per the alignment. All the village maps were collected from the local revenue offices. The village maps were digitized. Following the digitization of village maps, the engineering design of the alignment was superimposed in the digitized cadastral map in order to identify the number of land parcels and their demarcation including the quantification. The superimposition of alignment on the village map provided all the plot numbers. A Land Acquisition Plan (LAP) has been prepared accordingly.

As discussed earlier also the scope of land acquisition is quite significant in the project because of availability of limited ROW and construction of four bypasses. According to the Land Acquisition Plan (LAP) prepared as a part of Project Report, 159.071ha (private land 142.688 ha and Govt/others land 16.383 ha) of land will be acquired for the project. The area is excluding the area that already lies with Road Construction Department in terms of proposed roads falling in the alignment. A project census survey was carried out to identify the persons who would be displaced by the project and to make an inventory of their assets that would be lost to the project, which would be the basis of calculation of compensation. The major findings of the land acquisition estimate and census of 100% affected structures are discussed in the following sections.

(3) Impacts on Structures

During the census survey in addition to structures belong to titleholders, large number of encroachers and squatters were also enumerated along the proposed road. Based on the social survey data of the title and non-title holders, a total of 1,114 structures would be affected due to the improvement of the project road within the proposed ROW. Out of 1,114 affected structures, 667 are private structures of title holders, 355 are structures are of non-title holders and there are 33 Common Property Resources (CPRs) and 59 kiosks as detailed in Table 7-72.

Table 7-72: Loss of Structure in the Sub-Project

Sl. No.	Type of Ownership	No of Affected Household Families	No. of Structures
1	Title Holder	556	767
2	Encroacher	87	183
3	Squatter	44	72
4	Kiosk	59	59
5	Tenants	94	-
6	Employees to Commercial Structures/ Agricultural Labour	90	-
7	Persons losing only land	466	-
8	Common Property Resources	-	33
Total		**1,396**	**1,114**

Source: Census Survey, June - July 2020

Structures have been classified as permanent, semi-permanent or temporary based on the type of material use in construction of wall and roof. Structures having roof made of substantial material such as stone, brick, cement, concrete, etc. is considered as permanent structure. A structure that has at least two fixed walls or structures made up of permanent material but roof is made up of the material other than those used for *pucca* or permanent structure are considered as semi-permanent. A temporary structure neither have two fixed walls or structures made up of permanent material nor roof is made up of the material that of the *pucca* or permanent structure more than 30% of the structures are temporary. The details of type and area of constructions of the affected Private structures are summarized in the Table 7-73.

Table 7-73: Type and area of Construction of Affected Private Structures

Sl. No.	Type of Holding	Number of Structures	Total Area (m^2)	Affected Area (m^2)	Percentage of Area Composition
1	Compound Wall	93	4,560.6	2,728.7	14.26%
2	Permanent	13	553.6	156.7	0.82%
3	Semi-Permanent	488	17,342.5	8,354	43.66%
4	Temporary	332	8539.8	5,756.9	30.09%
5	Tin/ Bamboo etc. Fencing	81	2,276.2	1,711.9	8.95%
6	Under Construction	15	816.6	364.8	1.91%
7	Kiosk	59	179.6	160.5	0.32%
Total		**1,081**	**34,168.9**	**19,133.5**	100%

Source: Census Survey, June - July 2020

The details of the scale of Impact of the structures are depicted in the Table 7-74.

Table 7-74: Intensity of Impact

Sl. No.	Scale of Impact	Numbers	%
1	Category A (more than 40%)	811	73%
2	Category B (less than 40% but more than 25%)	115	10%
3	Category C (less than 25% more than 10%)	99	9%
4	Category D (less than 10%)	89	8%
Total		1114	100%

Source: Census Survey, June - July2020

As per census survey, out of 1,114 affected structures, 767 are private structures of title holders, 255 are structures are of non-title holders and there are 33 CPRs and 59 structures are kiosk. Out of 767 tittle holders' structures, 314 structures are of residential type, 361 are of commercial type,

11 are of residential-cum-commercial type, 69 compound walls of residential structures, 2 are cattle shed and there are 10 structures which are under construction. Out of the 314 structures of the non-title holders, there are 104 residential structures, 119 commercial structures, residential cum commercial are 2 structures, 24 Compound walls of residential structures, under construction 5 and 1 cattle shed. There are also 59 Kiosk, who are considered as non-title holders, would be affected. The details of structures are given in Table 7-75.

Table 7-75: Use of Private Properties

Sl. No.	Use of Private Property of Title Holders	Total Title Holder	Total Non-Title Holder	Total
1	Residential	314	104	418
2	Commercial	361	178	539
3	Compound wall of residential structure	69	24	93
4	Res-cum-commercial	11	2	13
5	Under Construction	10	5	15
6	Cattle Shed	2	1	3
Total		**767**	**314**	**1,081**

Source: Census Survey, June - July2020

(4) Impacts on Community Property Resources

During census, it was observed that presence of common property resources including community, religious and government properties within the proposed ROW. About 33 of such properties belong to community structures, religious structures and government structures. The detail of number of community properties, which may face relocation, has been mentioned in Table 7-76.

Table 7-76: Loss of Community Property Resources

Sl. No.	Type of Properties	Number	Percentage
1	Temple	13	39.4%
2	Mosque	2	6.1%
3	Waiting shade	11	33.3%
4	*Chabutara*	2	6.1%
5	School	3	9.1%
6	*Idgah*	1	3.0%
7	Union office	1	3.0%
Total		**33**	**100.00%**

Source: Census Survey, June - July2020

(5) Project Affected Persons

As per World Bank's definition, Project Affected Persons (PAPs) mean persons affected by direct economic and social impacts that both result from Bank-assisted investment projects and are caused by:

(a) the involuntary taking of land resulting in

(i) relocation or loss of shelter;
(ii) lost of assets or access to assets; or
(iii) loss of income sources or means of livelihood, whether or not the affected persons must move to another location; or

(b) the involuntary restriction of access to legally designated parks and protected areas resulting in adverse impacts on the livelihoods of the displaced persons.

PAPs could be categorized as (a) owners with legal or formal title, b) tenants and leaseholders, c) non-titled project affected persons (encroacher and squatter), d) economically PAPs (livelihood losers e.g., employees, business owner, kiosks workers etc.).

During the census survey in addition to structures belong to titleholders, large number of encroachers and squatters were also enumerated along the proposed road. Based on the social survey data a total of 1,396 households would be affected due to the improvement of the project road within the proposed ROW. Out of the 1,396 Project Affected Households (PAHs), 466 PAHs are title holders losing only their land, 737 PAHs are losing private structures, 59 PAHs are losing kiosks and three PAHs are losing cattle sheds. There are 94 tenants in the proposed alignment without any formal documents and 32 mobile vendors who will be temporarily impacted. About 90 employees to the commercial structures and agricultural labourer are identified by the surveyor as there is no formal document. The agricultural labourer have seasonal job for around 5 to 7 months a year and usually works in more than one farm on daily basis. The details of the loss to the project is depicted in the Table 7-77.

Table 7-77: Loss in the Sub-project

Sl. No.	Type of Ownership	No of Affected Household
1	Title Holder losing only Land	466
2	Owners losing structures	684
3	Owners losing Cattle shed	3
4	Tenant without formal document	94
5	Kiosk	59
6	Employees to commercial structures / Agricultural Labour	90
Total		1,396

Source: Census Survey, June - July2020

(6) Profile of PAPs

Socioeconomic survey was carried out for 743 sample families with 3,864 persons. The sample was selected among the PAHs such that there is proportional representation of the socio-economic parameters of the primary project impact area. The sample population is around 53% of the total PAHs. Thus, the surveyor usually collects the detail socio economic data of one PAH out of two PAHs surveyed.[19] The sample survey data reveals that average family size of the sample family is 5.2. The age group break-up of the PAPs is depicted in Table 7-78.

Table 7-78: Demography of PAPs

Sl. No.	Age	Persons
1	0-6 Yrs.	543
2	6-14 Yrs.	246
3	15-17 Yrs.	189
4	18-60 Yrs.	2,232
5	Above 60 Yrs.	654
Total		**3,864**

Source: Census & SES Survey, June - July2020

Hinduism is the predominant religion in the project affected area followed by Muslims. The detail presence of religion in the PIA is depicted in Table 7-79.

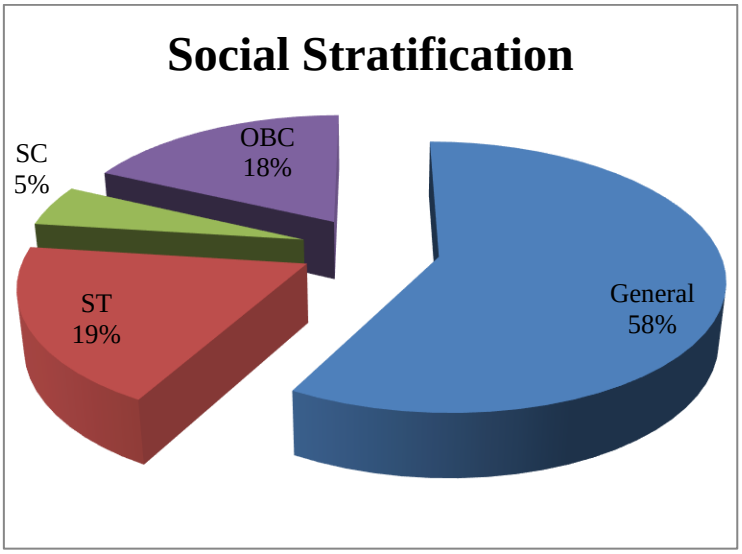
[19] The Survey was conducted in the month of June 2020 with several guidelines including Lockdown issued by the Government to control the COVID-19 Pandemic. 100% Census survey was performed to all the PAHs. SES took twice the time of interaction with the PAFs than that of Census Survey, thus the SES sample was reduced to 50% of the Census. Wherever there is a single PAH, SES with Census was done.

Table 7-79: Religious Stratification

Sl. No.	Category	Percentage
1	Hindu	39%
2	Muslim	36%
3	Christian	23%
4	Others	2%
Total		**100%**

Source: Census & SES Survey, June - July2020

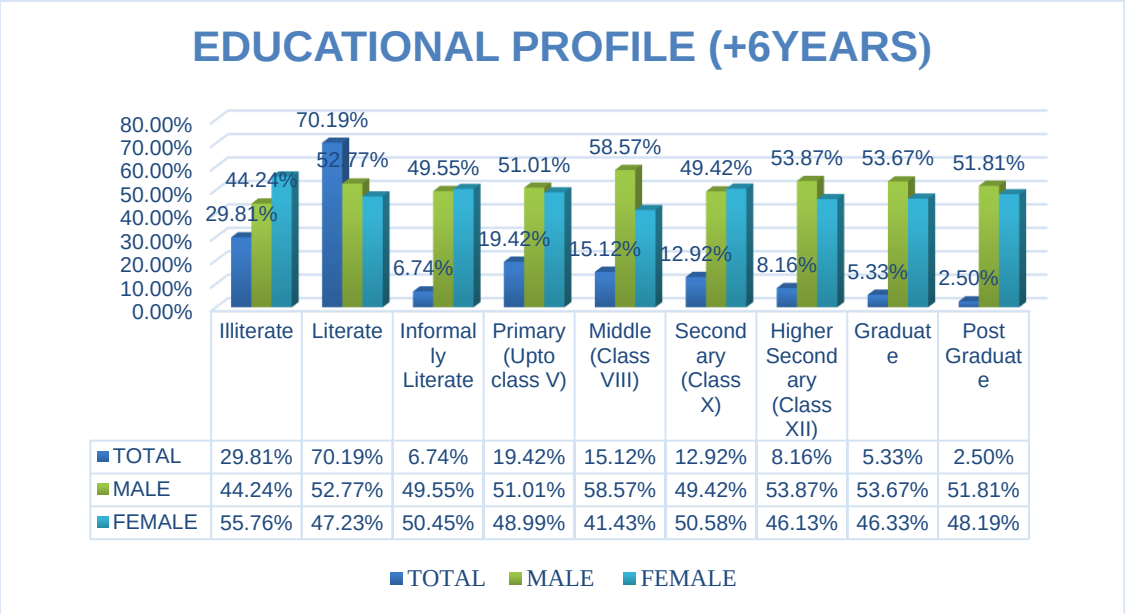
The social stratification of the project area shows dominance of the general population (who are not scheduled tribe, scheduled caste or other backword class) with 58% households followed by schedule tribe at 19%. The third and fourth stratum of the social grouping in the project affected area is of other backward class and schedule caste comprising of 18% and 5% respectively. The detail of social grouping in the project area is presented in Figure 7-55.



Source: Census & SES Survey, June - July2020

Figure 7-55: Social Categories of PAHs along the Project Road

The educational status of the PAPs, above 6 years of age, reveals that overall scenario of literacy level is not encouraging in the project area. Out of the total sample population of 3,864, the number of child population (0-6 yrs.) is 543 which are kept out. Significant percentage of population, i.e., 30% is still illiterate. About 19% has attained the education up to elementary level. Again about 5% PAPs are graduates; while very few (2%) have degree of master and above. For better understanding of the male female distribution each category of education is given. Thus the male and female distribution within the secondary level of education appropriately depicts that there are more females (51%) than the males 49%. The educational status is presented in Figure 7-56. It should be noted that with the introduction of the midday meal scheme by the government, the number of dropouts at pre-primary and primary has reduced drastically. The dropout at the project affected area is even less than 2%.



	Illiterate	Literate	Informally Literate	Primary (Upto class V)	Middle (Class VIII)	Secondary (Class X)	Higher Secondary (Class XII)	Graduate	Post Graduate
TOTAL	29.81%	70.19%	6.74%	19.42%	15.12%	12.92%	8.16%	5.33%	2.50%
MALE	44.24%	52.77%	49.55%	51.01%	58.57%	49.42%	53.87%	53.67%	51.81%
FEMALE	55.76%	47.23%	50.45%	48.99%	41.43%	50.58%	46.13%	46.33%	48.19%

Source: Census & SES Survey, June - July2020

Figure 7-56: Educational Status of PAPs

The occupational status of PAPs reveals that 37% Population are depending on business and this includes the business they are carrying out along the road, mainly shops. About 13% Population are having agriculture as their source of income and 10% are engaged in government jobs. The details of occupations by the PAPs are presented in.

Table 7-80: Occupational Status of PAPs (14-60 Years)

Sl. No.	Type of Occupation	%
1	Agriculture & Allied Activities	13%
2	Government & Private Services	10%
3	Trade & Business	37%
4	Self Employed	7%
5	Casual Labour	4%
6	Others	29%

Source: Census & SES Survey, June – July 2020

The total number of persons is 3,864 and the number of persons within the active age group of 15 to 60 years is 2,421. Thus, the dependency ratio is about 59.6% which is quite high.

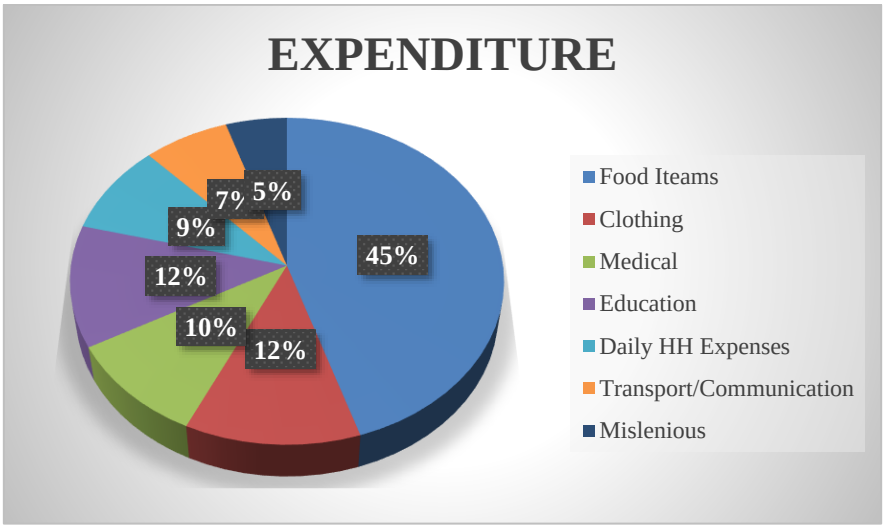
All the families surveyed have an average annual income more than Rs. 30,000/. About 28 % PAHs are having average annual income in the range of Rs. 30,000-50,000, while 43% of the families are earning between Rs. 50,000-100,000. It has been observed that about 29% PAHs have annual income more than Rs. 100,000. About 25% PAHs have Below Poverty Line (BPL) ration cards. The average income level of PAHs in the project area is summarized in Table 7-81.

Table 7-81: Annual Income Level of the Affected Families

Sl. No.	Annual Income Categories in (Rs)	%
1	More than 30,000 but less than or equal to 50,000	28%
2	More than 50,000 but less than or equal to 100,000	43%
3	More than 100,000	29%
Total		**100.00%**

Source: Census & SES Survey, June – July2020

The expenditure pattern of the families surveyed revealed that about 42% of the average expenditure incurred by the PAHs is on the food items. The detail of the same is presented in graphical format in Figure 7-57.



Source: Census & SES Survey, June - July2020

Figure 7-57: Annual Expenditure Level of the Affected Families

(7) Access to Social Services

All the clusters have primary schools and Anganwaris[20] located mostly within the clusters or within a distance of 1 km. There are primary schools mainly private in very clusters. High schools are also situated within accessible distance where the students can reach either on foot or by bicycle. Attendance of girl students up to high school level is encouraging. As reported there at least 96 primary schools and 60 high schools in the PIA. However, institutional facility beyond high secondary level of education is impeded by lack of frequent public transport system and bad traffic condition, especially during peak hours. The higher education for girls is adversely affected as journey to far off colleges becomes restricted for some of them. There are 13 colleges in the PIA.

There is 11 primary health centres (PHCs) and three referral government hospitals in the project impact area. Majority of the people in the PIA have access the facility of the private health clinics which are available nearby. In case of severity of ailment the referral hospital at accessible distance provides the necessary service. Besides, critical patients are also brought to private hospital at Hyderabad. The government primary health centres are however, constrained by poor health infrastructure and absence of suitable number of doctors. The common mode of transport to a health centre or referral hospital is bus and/or three wheeler or private vehicles. Average travel time to these health care centres is approximately 30 minutes, while journey to private hospital takes around 15 minutes. The average cost of one round trip journey to the frequently visited government health centres / referral hospitals is Rs.30 for about 50% population of the clusters. The same costs about Rs.20 for visit to private hospital.

On 1st April, 2008 Ministry of Labour and Employment, Government of India has launched a new health insurance scheme, Rashtriya Swasthya Bima Yojana a Bima Yojana (RSBY)[21] for

[20] Pre-nursery schools within villages under Integrated Child Development Schemes, GOI, which provide some preliminary education and midday nutritious meals.
[21] Rashtriya Swasthya Bima Yojana is a health insurance scheme initiated by Min. Labour & Employment, GoI in 1 April, 2008

the BPL families in order to protect them from financial liabilities arising out of health issues requiring hospitalization. The beneficiaries are entitled to hospitalization coverage up to Rs. [redacted]. The coverage extends up to five members of the family and the beneficiaries need to pay Rs. [redacted] only as registration fee. It has targeted intervention for about 500,000 to 600,000 BPL families in the district. So far about 400,000 beneficiary families of the district have been assisted under this scheme. Six private hospitals in the PIA are seclected to cater to the need of these poor families in order to ensure their hospitalization coverage. It is expected that once this project is implemented the poor people within PIA will be able to get the benefit of quality treatment in recognized hospitals under RSBY scheme. There are also some schemes provided by some private health care service providers.

There is unlimited number of markets within the PIA. Amongst them, most frequently visited major market centre is at Dhubri and Kokrajhar, at the project road section. For majority of the clusters, the market is located within a distance of 5 km and is accessible by bus and auto. The average travel time is 15 – 30 minutes with round trip travel cost of less than Rs. 30 for each person. The wholesale markets are located at Guwahati, Assam. Many traders and businessmen also travel by bus and jeep to the market for wholesale market facility. The traders of the clusters within PIA buy consumer goods at a reasonable rate to be resold at retail market in the clusters. The travel time to the wholesale market increases even up to 5 hours during rainy months when cost of travel too is raised with an upper limit of Rs. 140- 250 by shared vehicle.

Community Development Blocks (CD Block) would be established as a part of development plan of Government of India in order to provide assistance, subsidies, agricultural inputs and expertise and extension service to the rural people for all round development of an area within jurisdiction of a CD Block. The PIA is spread over nine CD Blocks. All the concerned clusters are within a distance of 5 km of their respective CD Block headquarters. Average travel time to most of the block offices is about half an hour with cost of round trip journey up to Rs.20. People can have necessary information on various Govt. sponsored schemes like NREGS, low cost housing grant (VAMBAY)[22], grant for sanitary toilet, free or subsidized agricultural inputs etc.

(8) Vulnerable Households in PAPs

Vulnerable households are defined as affected families who are either: (i) below poverty line (BPL); or (ii) women headed household (WHH); or (iii) differently able households (DAH); or (iv) elderly (60 years and above) living alone; or (v) scheduled tribes (ST); or (vi) scheduled caste (SC). It shall be noted here that though there are multiple categories of vulnerability groups exist in the project road, we have taken single impact of single vulnerable category for the authentication. For example, the number of BPL/DA/aged persons/WHH mentioned in the table below does not include those who fall under SC and ST category to avoid the repetition of data and vice-versa.

The census survey finding reveals that there is 19% PAHs along the roadside who belong to the ST community and 5% PAHs belong to SC category. As per the survey 25% of the population (excluding the SCs and STs) in the PIA are very poor having annual per capita income less than Rs. 12,000[23]/ and possess BPL ration cards. There is less than 1% of the PAHs are headed by female. The vulnerability is calculated of the census survey which is amounted to 50% of the PAHs in the project impact area.

[22] Valmiki Awas Yojana, housing grant for the poor
[23] The state specific poverty line was calculated on the basis of a monthly per capita income of Rs. 691.7 in rural areas and Rs. 871 in urban areas of Assam in the year 2012.

Table 7-82: Vulnerability Category Affected Families

Sl. No.	Vulnerability Categories	Number	% to total population
1	Schedule Tribe	265	19%
2	Schedule Caste	70	5%
3	Below Poverty Line	349	25%
4	Women Headed Households	14	1%
5	Senior Citizen living alone	0	0%
Total Vulnerable PAHs		**698**	**50%**
Total PAHs		**1396**	**100%**

Source: Census & SES Survey, June - July2020

As per the Entitlement Matrix below, the vulnerable households will receive a special vulnerable assistance of Rs. [redacted] over and above all other compensation and assistance that they are eligible for. Priority is given to vulnerable households to support livelihood recovery (training, etc.), which is established at the implementation stage of RAP by NGOs.

In case of a project involving land acquisition on behalf of a requiring body which involves involuntary displacement of two hundred or more Scheduled Tribes families, a specific plan for their resettlement and rehabilitation shall be prepared, in such form as may be prescribed, laying down the detailed procedure for settling land rights due but not settled and restoring titles of tribal on alienated land by undertaking a special drive together with land acquisition. Section 7.10. proposes the specific plan for ST's resettlement and rehabilitation.

The concerned *gram sabha* or the *panchayats* at the appropriate level in the Scheduled Areas under Schedule V of the Constitution or as the case may be, Councils in the Schedule VI Areas shall be consulted in all Cases of land acquisition in such areas including land acquisition in cases of urgency, before issue of a notification under the RTFCLARR Act, 2013 or any other Act of the Union or a State for the time being in force under which land acquisition is undertaken, and the consultation shall be in accordance with the provisions of the Panchayats (Extension to the Scheduled Areas) Act, 1996 and other relevant laws. Further, in cases of involuntary displacement of two hundred or more Scheduled Tribes families from the Scheduled Areas, the concerned Tribes Advisory Councils (TACs) may also be consulted.

Each affected family of Scheduled Tribe followed by Scheduled Caste categories shall be given preference in allotment of land-for-land, if government land is available in the resettlement area. In case of land being acquired from members of the Scheduled Tribes, at least one-third of the compensation amount due shall be paid to the affected families at the outset as first instalment and the rest at the time of taking over the possession of the land.

In case of a project involving land acquisition on behalf of a requiring body, each Scheduled Tribe affected family shall get an additional one-time financial assistance equivalent to five hundred days minimum agricultural wages for loss of customary rights or usages of forest produce.

The Scheduled Tribes affected families will be re-settled, as far as possible, in the same Schedule Area in a compact block, so that they can retain their ethnic, linguistic and cultural identity. Exceptions would be allowed only in rare cases where the requiring body in case of a project involving land acquisition, or the State Government in other cases of involuntary displacement is unable to offer such land due to reasons beyond its control.

The resettlement areas predominantly inhabited by the Scheduled Tribes shall get land free of cost for community and religious gatherings, to the extent decided by the appropriate Government.

In case of a project involving land acquisition on behalf of a requiring body, the Scheduled Tribes affected families resettled out of the district will get twenty-five percent higher rehabilitation and resettlement benefits in monetary terms.

Any alienation of tribal lands in violation of the laws and regulations for the time being in force shall be treated, as null and void. In the case of acquisition of such lands, the rehabilitation and resettlement benefits would be available to the original tribal land-owners.

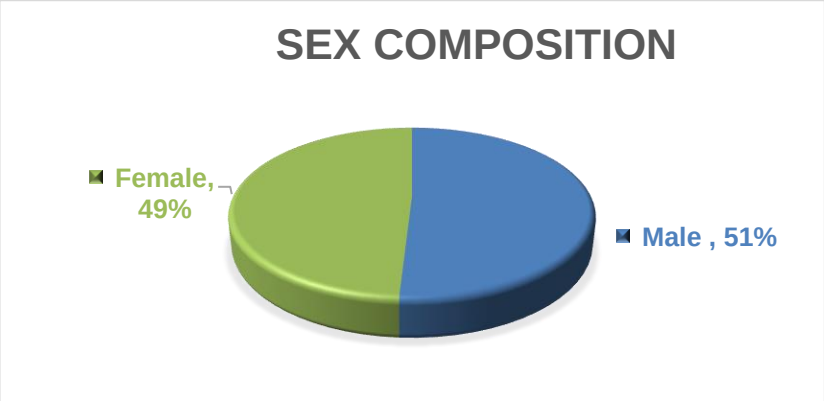
In the case of irrigation or hydroelectric projects, the affected Scheduled Tribes, other, traditional forest dwellers and the Scheduled Castes families having fishing rights in a river or pond, or dam in the affected area shall be given fishing rights in the reservoir area of the irrigation or hydel projects.

The Scheduled Tribes and Scheduled Castes affected families enjoying reservation benefits in the affected area shall be entitled to get the reservation benefits at the resettlement area(s).

The affected Scheduled Tribes families, who were in possession of forest / lands in the affected area prior to January, 2013, shall also be eligible for the rehabilitation and resettlement benefits under this policy.

(9) Gender of PAPs

In the total 1,396 PAHs, the total number of PAPs is 7,262. Out of the total 7,262 PAPs, 997 are children. The total PAPs 7,262 consist of 3,700 male (51%), and 3,562 female (49%). The literacy among the female is slightly higher than of the male counterparts at secondary level. There is less than 1% (14 households) of the PAHs are women headed households.



Source: Census & SES Survey, June - July2020

Figure 7-58: Gender Ratio in Study Area

In the project, women are affected in a variety of ways. From the past experience, it reveals that the women folk faces hardship and stress and continue to suffer during the transition period until the time the project-affected households are able to regain their lost income and livelihood. Often, the duration of this process is lengthened due to delays in payment of compensation, rehabilitation assistance and implementing the resettlement and rehabilitation, reconstructing the livelihood systems. The longer the transition period, more are the miseries for women. The census identified 1% women headed households. The vulnerability of women headed households has been addressed in the RAP with social attention and gender specific attention. During project implementation, project affected women will receive preferential treatment for the civil work in the project.

(10) Women Headed Households in PAPs

In this road section, out of 1,396 PAHs, only 14 women headed households including 59 PAPs are being affected. Among 59 PAPs, 4 belong to a child category and 55 are categorized in the age group of above 6 years.

Table 7-83: Occupational Profile of the Women Headed Households

Sl.	Occupational Pattern	Male	Female	Total Number of Person	Percentage
1	Agriculture & Allied Activities	3	1	4	7%
2	Government & Private Services	0	1	1	2%
3	Trade & Business	3	12	15	27%
4	Self Employed	2	3	5	9%
5	Casual Labour	5	1	6	11%
6	Others	10	14	24	44%
Total		23	32	55	100%

Source: Census & SES Survey, June - July2020

Table 7-84: Educational Profile of Women Headed Household

Sl. No	Educational Pattern	Male	Female	Total Number of Person	Percentage
1	Illiterate	4	7	11	20%
2	Literate	19	25	44	80%
2-1	Informally Literate	5	9	14	25%
2-2	Primary (Up to class V)	6	10	16	29%
2-3	Middle (Class VIII)	5	4	9	16%
2-4	Secondary (Class X)	2	1	3	5%
2-5	Higher Secondary (Class XII)	1	1	2	4%
2-6	Graduate	0	0	0	0%
2-7	Post Graduate	0	0	0	0%
Total		**23**	**32**	**55**	**100%**

Source: Census & SES Survey, June - July2020

Payments will be made directly to these women and the RAP implementing NGO/Agency will ensure that they have bank accounts opened in their names. They will also receive additional financial assistance and be eligible to the livelihood training, as they are considered as vulnerable as per the entitlement matrix.

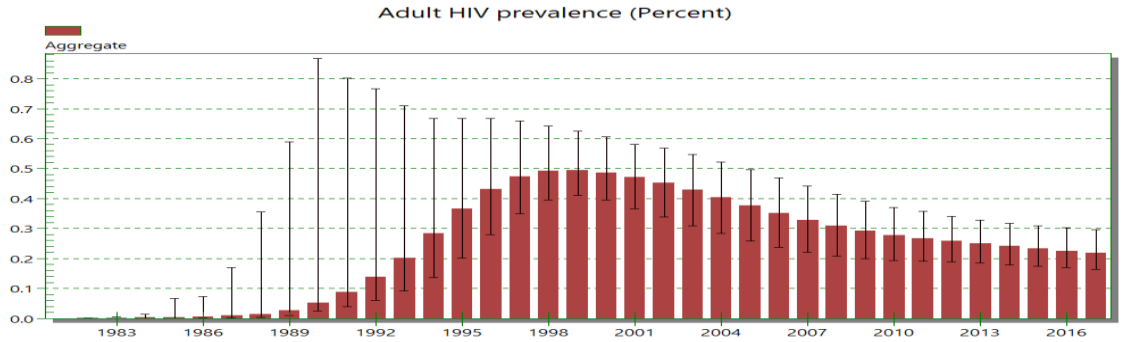
Each field team of the RAP implementation agencies/partner agencies shall include at least one-woman investigator/facilitator. The Project Implementation Unit will ensure that the women are consulted and invited to participate in group-based activities to gain access and control over the resource as a part of the RAP. The monitoring and evaluation team(s) shall include woman. Further, during RAP implementation, NGO's will make sure that women are actually taking part in issuance of identity cards, opening accounts in the bank, receiving compensation amounts by cheque in their names. This will further widen the perspective of participation by the women in the project implementation. The implementing agencies will provide training for upgrading women's skill for alternative livelihoods and income restoration.

(11) HIV/AIDS and Health Risks

HIV/AIDS are major development challenges in India. Given the epidemic nature of the problem, it may reverse India's achievements in health and development. According to National AIDS Control Organization (NACO) HIV estimates for 2017, National adult (15–49 years) HIV

prevalence in India is estimated at 0.22% (0.16% – 0.30%) in 2017and in the state of Assam it is 0.06% only.

In 2017, adult HIV prevalence is estimated at 0.25% (0.18-0.34) among males and at 0.19% (0.14-0.25) among females. The adult HIV prevalence at national level has continued its steady decline from an estimated peak of 0.38% in 2001-03 through 0.34% in 2007, 0.28% in 2012 and 0.26% in 2015 to 0.22% in 2017.

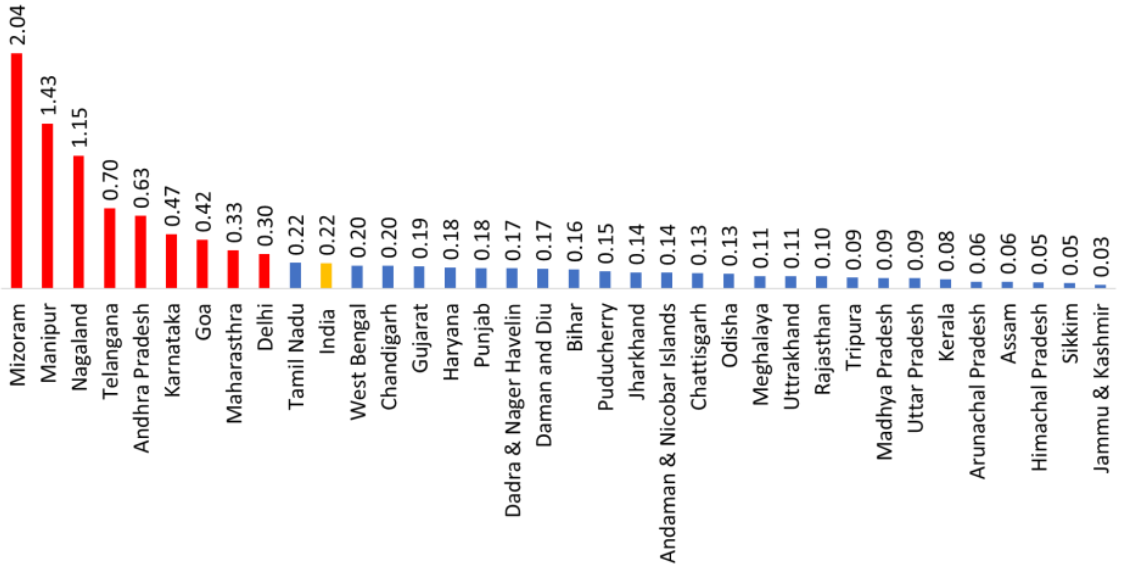


Source: National AIDS Control Organization & ICMR-National Institute of Medical Statistics (2020). *India HIV Estimates 2019: Report. New Delhi: NACO, Ministry of Health and Family Welfare, Government of India.*

Figure 7-59: Adult HIV Prevalence in India during 1990 to 2017, HIV Estimations 2017 (NACO)

Among the North-eastern states, in 2017, Mizoram has shown the highest estimated adult HIV prevalence of 2.04% (1.57-2.56), followed by Manipur (1.43%, 1.17-1.75), Nagaland (1.15%, 0.92-1.41), Telangana (0.70%, 0.50-0.95) and Andhra Pradesh (0.63%, 0.47-0.85). Besides these States, Karnataka (0.47%, 0.37-0.63), Goa (0.42%, 0.21-0.79), Maharashtra (0.33%, 0.25-0.45) and Delhi (0.30%, 0.18-0.47) have shown estimated adult HIV prevalence greater than the national prevalence (0.22%), while Tamil Nadu (0.22%, 0.14-0.31) had a point prevalence like the national average. All other states have levels of adult HIV prevalence below 0.22%.

Assam has relatively low HIV prevalence of 0.06%. The project affected area is not much affected by HIV/AIDS as per NACO reports on 2011 on the study for 2005, 2006 and 2007. The Dhubri and Kokrajhar districts lie in the Category C of HIV/AIDS affected districts of India. As disclosure of the names of the AIDS victim is not permissible the actual numbers of the victims in the PIA present is not available.



Source: National AIDS Control Organization & ICMR-National Institute of Medical Statistics (2020). *India HIV Estimates 2019: Report. New Delhi: NACO, Ministry of Health and Family Welfare, Government of India.* p12.

Figure 7-60: State wise Adult HIV Prevalence in 2017, HIV Estimations 2017 (NACO)

Focus Group Discussions (FGDs) that took place at the roadside eateries revealed that particularly the truckers drive the HIV/AIDS epidemic and many studies indicate that infection is spreading rapidly to the general population. Recently, the Government of India (GOI) has shown increasing commitment to HIV/AIDS control. GOI established a consortium like collaboration of external partners (UNAIDS, USAID, DFID, CIDA and others) to provide technical and financial assistance to NACO to design and help implement GOI's national policy on HIV/AIDS control before mass spread into general community.

There is a need to improve awareness level in the state. In recognition of the importance of HIV/AIDS issue, HIV/AIDS Awareness Campaign should be carried out under this project through the use of NGOs. Information and education campaign on HIV/AIDS and other sexually transmitted diseases (STDs) will be conducted by a qualified NGO during project implementation. The campaign will target the project construction workers at campsites, truckers at truck stops and *dhabas*[24] and the public at large along the alignment. The NGO will work closely with the relevant state agencies and other proposed networks dedicated to prevention work for further building up of awareness programs in the project area. HIV/AIDS awareness brochures would also be developed for distribution to local communities, local markets, truck/bus stations and other appropriate places to increase awareness about risks/dangers of HIV/AIDS. This would ultimately lead to lowering the risk for the general community in the project affected area.

(12) Impact on Access to Services Amenities

Transport facility is considered as the most basic of all civic amenities as this is the life line to access any kind of social services. Most of the clusters in the project impact area have adequate road transport facility but it fails to cater its benefit due to bad condition of the road. In the project area the nearest express railway stations are Kokrajhar, Dhubri & New Bongaigaon all are accessible by bus or shared vehicle.

[24] Roadside Eateries and sometimes stopover and night stay

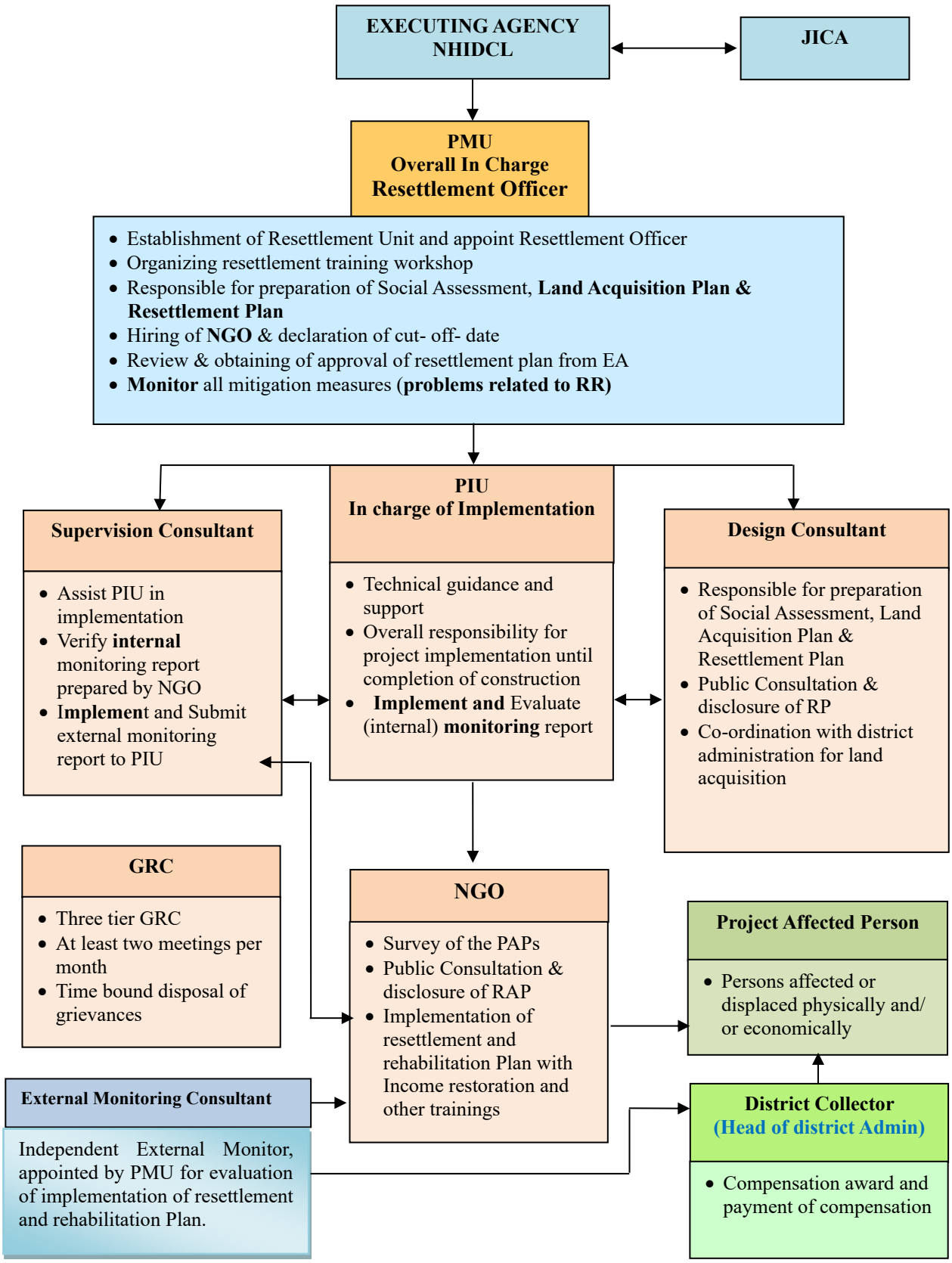
The proposed project road does not hindrance the Natural flow of water. About 2 more bridges are proposed at the proposed road. As the chainage is low lying flood prone the height of the road is raised. During the construction there might some temporary restrictions in access which have to be taken care in the Resettlement Plan.

There is no temporary or permanent impact regarding the limited access to services or amenities are envisaged in the process of development of the proposed project.

7.9.3 Institutional Framework

Institutions for planning & implementation of RAP vary substantially in terms of their respective roles & capacity. Timely establishment & involvement of appropriate resettlement and rehabilitation institutions would significantly facilitate achievement of objectives of the resettlement and rehabilitation program. The main resettlement and rehabilitation institution would include:

- Executing Agency (EA)
- Local Administration
- Line departments
- Non-Government Organization (NGO)
- District Level Committee (DLC)/ Grievance Redressal Committee (GRC)
- Training Institutions
- Monitoring & Evaluation (M&E) Agency Eligibility



Source: JICA Survey Taam

Figure 7-61: Institutional Arrangement for RAP

7.9.4 Eligibility

The entitlements of different categories of eligible persons are presented in a matrix form indicating the type of loss, category of entitled person, unit of entitlements, etc. Affected families will be eligible for compensation and resettlement and rehabilitation assistance or specific resettlement and rehabilitation assistance depending upon the status of ownership rights and type of loss. The entitlement matrix is presented below in Table 7-85.

Table 7-85: Entitlement Matrix

Sl. No.	Type of loss	Eligible category	Entitlements		Implementation Guidance
			Compensation	Resettlement and rehabilitation Assistance	
1	Private land	Titlehold er family	Compensation for land as per the First Schedule of the RFCTLARR Act, 2013 with the Assistance as per Second Schedule of RFCTLARR Act, 2013: One-time payment of Rs. [redacted] per affected family Subsistence grant @ Rs. [redacted] per month for a period of one year Stamp duty and other fees payable for registration of land, if allotted to the affected families. **Or** As per the provisions of Govt. of Assam under Assam RFSTLARR Rules, 2015, whichever is higher.		Factor applicable in shall be considered for multiplication with market value of land determined as per Section 26 of the Act. Stamp duty and other fees payable shall be borne by the Requiring Body. RFCTLARR First schedule includes: Market value of land as per Section 26 of the Act, Factor by which the market value is to be multiplied (rural and urban areas) Solatium @ 100% of the market value of land multiplied by applicable factor Mandatory interest on compensation amount @ 12% per annum from the date of publication of SIA notification under sub-section 2 of Section 4, till the date of the award of the Collector or the date of taking possession of the land, whichever is earlier..

Sl. No.	Type of loss	Eligible category	Entitlements		Implementation Guidance
			Compensation	**Resettlement and rehabilitation Assistance**	
	Structure (Residential, Commercial, Residential cum commercial) & structures used for other purposes and or assets attached to the land or building	-do-	Compensation for land as per the First Schedule of the RFCTLARR Act, 2013 Provision of housing unit (a constructed house as per PMAY specifications) or the equivalent cost of the house for the displaced. One time financial assistance of Rs.[redacted]/- as transportation cost to PAHs. One time resettlement allowance of Rs.[redacted]/- to PAHs. Right to salvage affected materials. The stamp duty and other fees payable for registration of house allotted to the affected families. **Or** As per the provisions of Assam RFCTLARR Rules, 2015, whichever is higher.		Provision of housing unit shall be applicable for physically PAHs losing only residential & residential cum commercial structure. Transport allowance and resettlement allowance shall be applicable in case of physical displacement from residential & residential cum commercial structure only. Market value of structure/building will be estimated as per the current year Schedule of Rates and without depreciation. Stamp duty and other fees payable shall be borne by the Requiring Body.
2	Trees, Plants and Standing Crops	-do-	Compensation for trees, plants, and standing crops damaged as per the First Schedule of the RFCTLARR Act, 2013 Or any existing state Act, whichever is higher Or, Allow the landowner to cut and take away trees, in case the landowner willingly opts for this option (in writing) and without claiming compensation for trees cut.	-	The value of trees and plants attached to the land acquired to be determined by Forest Department for timber trees and Horticulture and or Agriculture Department for fruit bearing trees/plants & Agriculture Department for standing crops
3	Workshop, work-shed, cattle shed, petty shop, Kiosk, etc.	TH & NTH	Not applicable	A minimum of Rs.[redacted]/- to each PAH (artisan, small trader or self-employed person or the family.	One time financial assistance.
4	Tenants (Residential, commercial, Residential cum commercial, storage, office, etc.)	TH & NTH	Not applicable	Rental Assistance of Rs.[redacted] /- per month for 3 months .	One month prior notice to vacate the rental premises.

Sl. No.	Type of loss	Eligible category	Entitlements		Implementation Guidance
			Compensation	Resettlement and rehabilitation Assistance	
5	Structure (Residential, Commercial, Residential cum commercial) & other immovable structure or assets attached to the land or building	NTH (Encroacher, Squatter & others)	Not applicable	Value of structure determined (without depreciation and without application of solatium). Right to salvage affected materials The stamp duty and other fees payable for registration of house allotted to the affected families shall be borne by the requiring body	Value of buildings/structures would be assessed by the Executive Engineer PWD, / *District Engineer/Executive* Engineer, or by such agency as the administrative department may decide as per the current year Schedule of Rates.
6	Livelihood	TH & NTH	Not applicable	A minimum wage of Rs.[redacted][25]/- per month to each affected commercial structures for the number of months it loses its livelihood, provided that there should be loss of livelihood more than 10 days. However, for losses less than 10 days, the wage would be calculated on a pro-rata basis	One time financial assistance. One month notice to vacate the affected area.
7	Vendors	NTH	Not Applicable	Should be relocated such that he/she can cater the same number of passenger/customer or a minimum wage of Rs.[redacted]/- per month to each affected vendors for the number of days it loses its livelihood, provided that they should obtain a vending license and there should be loss of livelihood for more than 10 days. However, for losses less than 10 days, the wage would be calculated on a pro-rata basis. Mobile Vendors are entitled for only subsistence allowance for 3 months.	Fifteen days' notice to vacate the affected area

[25] Minimum Wage for unskilled Labourer in Assam till June, 2020.

Sl. No.	Type of loss	Eligible category	Entitlements		Implementation Guidance
			Compensation	Resettlement and rehabilitation Assistance	
8	Vulnerable Households, such as ST, SC, BPL, WHH, Differently Able, and Senior Citizens	TH & NTH (Vulnerable group)	Not applicable	Additional assistance of Rs. [redacted]/- per family	This assistance will be applicable only for type of loss at Sl. No.1, 2 & 7
				Priority is given to vulnerable households to support livelihood recovery (training, etc.), which is established at the implementation stage of RAP by NGOs.	
9	Religious structure, well, and other facilities on public land	Community	Not applicable	To be reconstructed/ rehabilitated at project cost in consultation with local communities and ULBs/ Gram Panchayat, as the case may be.	The cost of reconstruction or rehabilitation may be transferred in installments to ULBs/ Gram Panchayat account linked to progress of works.
10	Unforeseen impacts	Community	Not applicable	-	Unforeseen impacts encountered during implementation will be addressed in accordance with the principles of RAP.

Note: These allowances may be adjusted by considering 2014 as the base year.

7.9.5 Valuation of and compensation for losses

(1) Introduction

The resettlement cost estimate for this project includes eligible compensation, resettlement assistance and support cost for RAP implementation. The support cost, which includes staffing requirement, monitoring and reporting, involvement of NGO in project implementation and other administrative expenses are part of the overall project cost. The unit cost for structures and other assets in this budget has been derived through field survey, consultation with affected families, relevant local authorities and reference from old practices. Contingency provisions have also been made to take into account variations from this estimate. Some of the major items of this resettlement and rehabilitation cost estimate are outlined below:

- Compensation for agricultural, residential and commercial land at their replacement value
- Compensation for structures (residential/ commercial) and other immovable assets at their replacement cost
- Compensation for crops and trees
- Assistance in lieu of the loss of business/ wage income/ employment and livelihood
- Assistance for shifting of the structures
- Resettlement and Rehabilitation Assistance in the form of Training allowance
- Special assistance to vulnerable groups for their livelihood restoration
- Cost for implementation of RAP

(2) Compensation

Private Agricultural Land:
The unit rate for agricultural land has been estimated as per Right to Fair Compensation and Transparency in Land Acquisition Resettlement and Rehabilitation Act, 2013, Assam RFCTLARR Rules, 2015 and National Highway Act, 1956. To meet the replacement cost of land compensation will be calculated over updated land rate with additional as registration cost plus 100% solatium with the multiplier effect as per the distance from the nearest municipality. It may be noted that the District Magistrate have the discretionary power in valuation of land in his jurisdiction. The State Government may also announce packages for Land Acquisition or can initiate a direct purchase procedure.

Residential/ Commercial and other structures:
The compensation cost of structures are arrived at by assessment of market value, consultation with displaced persons and data collected from building contractors and property agents this meets the replacement cost of the structures. The resettlement and rehabilitation budget has been calculated on the following basis:

- The resettlement and rehabilitation budget is calculated on the basis of District Level Committee (DLC) rates.
- The budget for the compensation of affected structures is based on the rates of various types as described in Basic Schedule Rates (BSR), PWD, Govt. Of Assam, 2013

The average estimated rate for permanent structures without land has been calculated at Rs. 14,744/m^2, semi-permanent structures have been calculated at Rs. [redacted]/m^2, and temporary structures have been calculated at the rate of Rs. [redacted]/m^2. The compensation for boundary walls at per running metre is Rs. [redacted]/ metre. Solatium amounting to 100% is added to the cost of the structures for the titleholders.

(3) Assistance

Shifting allowance: Shifting allowance will be provided to all the affected households losing structures and tenants. The unit cost has been derived on a lump sum basis of Rs. [redacted]/-.

Rehabilitation Assistance to displaced persons Losing Business Establishment: Title holders losing their business establishment due to displacement will be provided with a lump sum transitional allowance of Rs. [redacted]/-. This rate has been fixed based on the estimates of average income for a period of three months.

Rehabilitation Assistance to Employees in Structure: Wage earning employees indirectly affected due to displacement of commercial structure will be provided assistance as per the prevailing local wage rate for 3 plus months i.e. @ Rs. [redacted] per month.

Rehabilitation Assistance to Agricultural Labourers/Sharecroppers: Agricultural Labourers/ Sharecroppers will be provided with assistance as per the prevailing local wage rate for 3 plus months i.e. @ Rs. [redacted] per month.

Assistance to Vulnerable Households: One time lump sum assistance of Rs. [redacted]/- will be paid to each vulnerable households. (This will be paid above and over the other assistance(s) as per the entitlement matrix).

(4) Compensation for Community and Government Property

Religious and Community Structures: The religious and community structures are being partially affected and do not require full replacement. However a lump sum provision of Rs.[redacted]/- per structure is made in the budget to rebuild are enhance the ambience of these structures. However any religious or community structure which requires full relocation will be compensated in replacement rate.

7.9.6 Resettlement Measures

NHIDCL as the Executing Agency (EA) will initiate the following activities to commence and implement the RAP:

- Establish Project Implementation Unit (PIU) and field offices.
- Select NGO with proven track records for the smooth implementation of resettlement and rehabilitation activities as stated.
- Orientation and awareness seminars for PIU.
- Appointment of external monitoring and evaluation consultants.

Effective RAP implementation will require institutional relationships and responsibilities, rapid organizational development and collaborative efforts by EA, Assam state government partnering NGO. The PIU will establish operational links within EA (e.g. finance for release of budget on approval of micro plans) and with other agencies involved in the project induced settlement. It will provide means and mechanisms for coordinating the delivery of the compensation and assistance entitled to those who will suffer loss. On behalf of EA, PIU will assume the responsibility for representing the social impact and resettlement component of the project. The PIU will also be responsible for disseminating the information to the public and providing additional opportunities for public comment.

The PIU at the apex level will have overall responsibility for policy guidance, coordination, and contingency planning, monitoring and overall reporting during RAP implementation.

7.9.7 Site Selection, Site Preparation, and Relocation

The project involves linear acquisition of land and linear impacts on structures throughout the alignment. The details of the scale of Impact of the structures are depicted in the Table 7-86.

Table 7-86: Intensity of Impact

Sl. No.	Scale of Impact	Numbers	%
1	Category A (more than 40%)	811	73%
2	Category B (less than 40% but more than 25%)	115	10%
3	Category C (less than 25% more than 10%)	99	9%
4	Category D (less than 10%)	89	8%
Total		1,114	100%

Source: Census Survey, June - July2020

The landowners are eligible of identical land at the same district but it is very hard to find the land in same position with easy accessibility. Thus, the landowners opted for cash compensation during the survey so that they could purchase the land as per their suitability or will.

It is expected that 811 structures will be impacted (major) or have to be relocated or displaced. Out of 811 structures 33 structures are CPR. There are 59 kiosk, 72 squatters and 183 are

encroachers. Thus the total number of Non-title holders are either doing business on government land or utilizing the government land for their residential or commercial purpose.

Thus as per requirement of the Entitlement Matrix both the impacted title holders and the non-title holders will be compensated adequately. Both the title holders and non-title holders like to have the cash compensation so that they could reconstruct their structures as per their preference and will.

The CPRs will be reconstructed by the project.

Thus there is no movement of the community outside the impacted area and thus there is no requirement of i) Community participation, involvement of re-settlers and host community and ii) Integration with host populations.

7.9.8 Road Design to Mitigate Accidents in Operation Phase

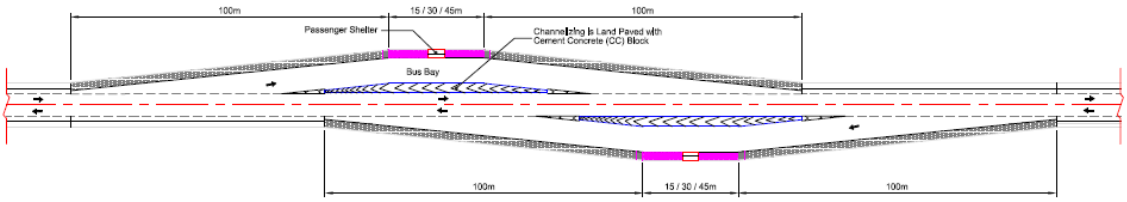
When the Survey Road is completed and opened to traffic, increases in traffic volume and vehicles' running speed are anticipated and due efforts to prevent accidents shall be appropriately made. The design of DPR covers accident preventing measures in general and all the modifications pointed out by the JICA Survey Team need to be conducted completely. Those points are itemized below.

Accident Preventing Measures in General

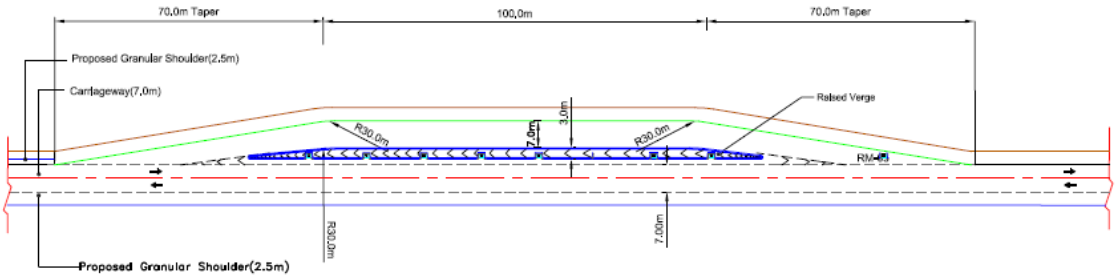
- Installation of a bus bay and a passenger shelter at a bus stop
- Installation of a truck layby
- Installation of kilo-post to indicate road distance
- Installation of guard rail and passenger crossings

Accident Preventing Measures for Sharp Curves and Steep Gradients

- Appropriate speed control and traffic management (appropriate speed limits and traffic control signs)
- Safety design of sharp curves (carriageway widening, superelevation, safe sight distances)
- Warnings for sharp curves (additional warning signs, road markings, delineators, etc.)
- Alleviation of small horizontal curves and securing safe sight distances



Typical Layout for Bus bay



Typical Layout for Truck Laybye

Source: DPR

Figure 7-62: Design of Bus Bay and Truck Layby in DPR

7.9.9 Grievance Procedure

In order to conduct socio-economic mitigation, it is necessary to acknowledge the grievance/dissatisfaction among the affected persons, identify the genuine grievances, finding the facts behind the grievances, and finally finding out ways to address those grievances.

A grievance redressal mechanism (GRM) is an integral part of the institutional arrangement in relation to social safeguard issues. Grievances related to employees and others are dealt on a case to case basis depending upon the nature of grievances. Consultation with the PAPs does not reveal the need of a grievance redressal committee but social safeguards related grievances are expected from affected persons and other interested groups during the project implementation and therefore, it is important to set up a GRM at PMU level for resolution of such grievances. Anticipated grievances could be:

- non-payment of resettlement and rehabilitation assistance,
- name of affected persons missing,
- affected persons missed out/ not enumerated during the survey,
- social category and vulnerability incorrect,
- difference in land area acquired/purchased and measured at site,
- type and use of land acquired/purchased not considered correctly,
- wrong measurement of structure/building affected,
- wrong valuation of structure/building,
- damage to adjoining property,
- Construction activities at the site, quality of works, safety, etc.
- Behavior of staffs and other Officials engaged with the project
- Road Safety
- Environnemental Hazard like dust, noise, air pollution
- Security of Women and girl both workers and locals

In view of the above, a Grievance Redressal Committee (GRC) will be constituted with the aim to resolve as many grievances as possible related to resettlement and rehabilitation and land acquisition/purchase through consultations and negotiation. The main responsibilities of the GRC will be to: (i) provide support to PAPs on problems arising from land/property acquisition; (ii) record PAP grievances, categorize, and prioritize grievances and resolve them; (iii) immediately inform the EA of serious cases; and (iv) report to PAPs on developments regarding their grievances and decisions of GRC. Other than disputes relating to ownership rights under the court of law, GRC will review grievances involving all resettlement benefits, compensation, relocation, replacement cost and other assistance.

The GRC will comprise the following seven (7) members.:

i. General Manager/ Deputy General Manager, NHIDCL - – Chairperson
ii. Representative of District Commissioner - Member
iii. Dedicated Person of NHIDCL, Assam- Convener-Member
iv. Representation of District Council/CALA- Convener-Member
v. Executive Engineer or his/her representative (from the concerned department - PWD/Irrigation, Municipal Engineering Directorate/KMC, District Engineer- Zilla Parishad) – Member
vi. Municipal Corporator/Councilor or Representative of Gram Panchayat of the concerned area – Member
vii. Any other Female Representation as nominated by District Council/CALA – Member

Complaint boxes will be placed at every major junctions locations which would be collected once a week by PIU. Grievances received through other modes (postal, email, or over the phone) will be compiled. A dedicated email and toll free phone number will be provided for receiving grievances/complaints through these methods. Toll free phone number, email, and address of PIU shall also be suitably displayed. Additionally, PIU will provide support to illiterate, physically challenged and other vulnerable PAPs to record their grievances. Any illiterate or other vulnerable persons over the toll free phone or physically can record the complaints which will be registered and a complain registration number will be given to the complainant. The physically challenged person can use the email, toll free phone or physically come to the PMU office to lodge any complain. He/she will be helped to make understand the complaint and registration of the same. Any physically challenged person can authorize any other person to register complain on his/her behalf.

At the PIU level there will be a dedicated person who will be responsible for the daily management of the GRM. He would also take the major responsibility to register the complain of the illiterate, physically challenged and other vulnerable PAPs. Grievances received by the PIU would be acknowledged by the PIU within seven days from the date of receipt of grievances. The GRC meeting will be convened once in a month or as per the requirements. Aggrieved persons will be duly intimated about the scheduled GRC meeting in sufficient advance time. On the day of GRC meeting, aggrieved persons will be given an opportunity to present his/her case before the committee in a free and fair manner. The decision of GRC will be intimated to the aggrieved person within 21 days from the date of the GRC meeting. In case the decision of the GRC is not acceptable to the aggrieved person in such case he/she may approach the court of law, if he/she so desires. Broad functions of GRC are as under:

- document all grievances received through different modes,
- undertake site visit (if required), ask for further information from aggrieved persons,
- co-ordinate and collect relevant information/data from concerned department/agencies (e.g. District Magistrate, DL& LRO, PWD, Zilla Parishad, etc.) ,

- fix a time frame for next hearing in case additional information is required from aggrieved persons and other agencies,
- inform PAPs about the status of their case and the decision of GRC

The GRC will be constituted within a month before the implementation of activities during the first year of project starts. A draft format for monitoring of grievances (received, type of grievances, grievances redressed, time required for resolving the grievances, etc.) must be provided.

Besides, a field level grievance redressal mechanism will be established to resolve grievances/complaints received mainly during the implementation of project activities. It is expected that majority of grievances will be related to the following:

- indirect impact of project activities on adjoining structure/building,
- project execution area not suitably barricaded, inadequate safety arrangements and signage in the project area,
- closure to access/street roads,
- loss of business,
- non-availability of project information board,
- un-certainty regarding timeline for resuming the normal operation, etc.

Majority of the site-specific grievances/complaints can be resolved by the site engineer through the contractor as per the provisions of the contract. In case the damage to the structure/building is caused due to the negligence of the contractor, then the contractor will be responsible for reinstating/ repairing the damaged structure/building otherwise, it will be resolved as per the provisions of the RAP.

A field-level GRC comprising Assistant Manager/AE (designated as Site Engineer) of PIU, Social Development Expert of NGO and representative of Contractor shall be constituted for redressal of grievances/complaints at the site itself. One employee of the PIU/Contractor will be assigned to register the grievances and he/she will be responsible for the daily work of the GRC at the field level. This person at field level will provide support to illiterate, physically challenged and other vulnerable PAPs to record their grievances. The Committee will meet twice a week at the project site office at a fixed time so that aggrieved persons from surrounding areas can approach and lodge their complaints. A compliant box shall be placed at the project site for the collection of complaints/grievances. Wide publicity of GRM (at field level and PIU level) shall be made in the surrounding areas by adopting suitable publicity methods. Grievances/complaints not resolved at the site shall be escalated to the PMU level for redressal.

For reference, a similar grievance redress mechanisms were planned in the previous projects assisted by JICA for improvement of other national highways in the north eastern states. According to report from executing agencies, for improvement of NH51 in Meghalaya, four grievances of PAPs were submitted and filed concerning inappropriate valuation of the affected properties, request for increase of compensation, individual names missing from the list of PAPs and unidentified affected structure. Following the grievance redress mechanism, the authority (West Garo Hills District Council) requested Meghalaya PWD to verify the grievances. For other part of the road improvement, such as Shillong-Dawki road in Meghalaya and Aizawl-Tuipang road in Mizoram, the projects are still in initial stage, and there is no grievance at present pertaining to land acquisition, resettlement and rehabilitation[26].

[26] This information is response to the advice given by a member of the JICA external committee for environmental and social considerations at the Working Group meeting on 31 Jul. 2020, such as "To Confirm the operational status of the

7.9.10 Organizational Responsibility

(1) Organization for Implementation

For the implementation of RAP, there will be a set of institutions involved at various levels and stages of the project. As per Indian acts and regulations, land acquisition, resettlement and rehabilitation activities must be executed by the state government. In practice, the state government entrusts tasks to the district government headed by the DC. Therefore, all activities will be implemented by the district government and the decision-making power lies within the DC. For Assam state, being under jurisdiction of the sixth schedule of the constitution, Autonomous District Councils (ADC) will also be involved in the approval of project.

The primary institutions who will be involved in this implementation process are follows. The proposed institutional arrangement with their roles and responsibilities are shown in Table 7-87.

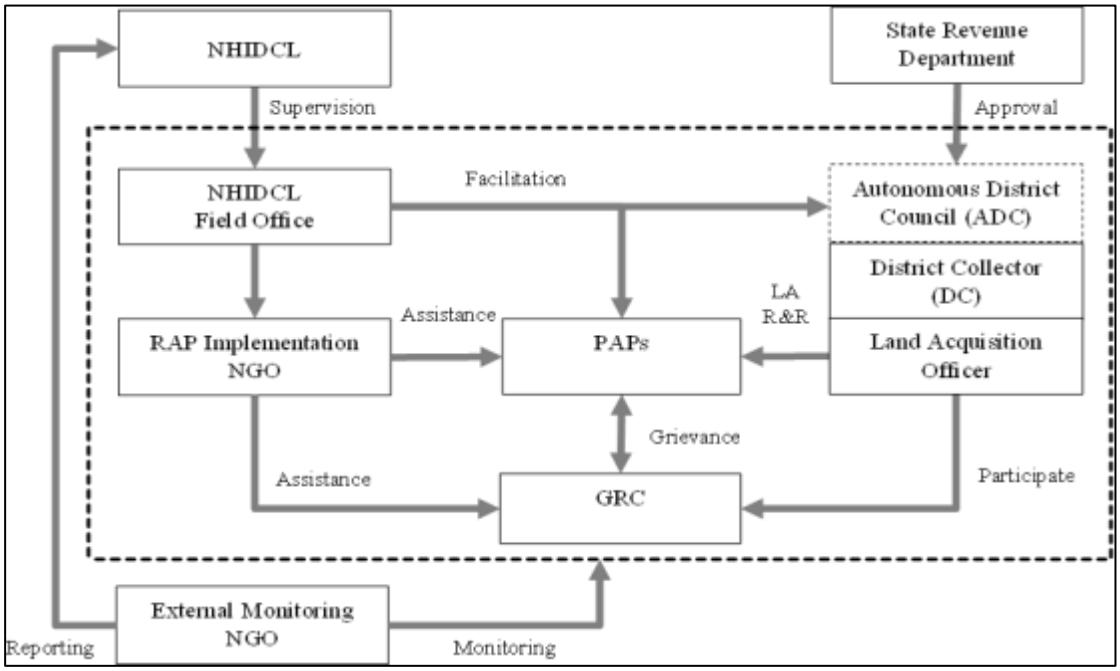
- National Highway and Infrastructure Development Corporation Ltd (NHIDCL)
- NHIDCL Regional Office
- Autonomous District Councils (ADC)
- Deputy Commissioner / District Collector (DC)
- Non-Government Organization (NGO)
- Grievance Redress Committee (GRC)

Table 7-87: Implementation Institute and Their Roles

Name	Members and Roles
Central Level Institution	
NHIDCL	• Project Implementation Agency • Ensure availability of budget for R&R activities • Responsible for coordination and monitoring of overall processes
Other Implementation Agencies	
NHIDCL Local Office	• Oversee and monitor R&R activities implemented by district governments, assisted by NGO • Conduct internal monitoring
Non-Governmental Organization (NGO)	• Act as a representative of PAPs in communicating with district governments and NHIDCL local office • Assist PAPs through Land Acquisition, Resettlement and Rehabilitation activities • Conduct external monitoring
Grievance Redress Committee (GRC)	• Coordinate and resolve grievances submitted by PAPs
Project affected persons (PAP)	• Participation in the process of PAP activities
Contractor	• Consult with DC and community regarding location of construction camps • Restore the land to equal or better condition upon completion

Source: JICA Survey Team

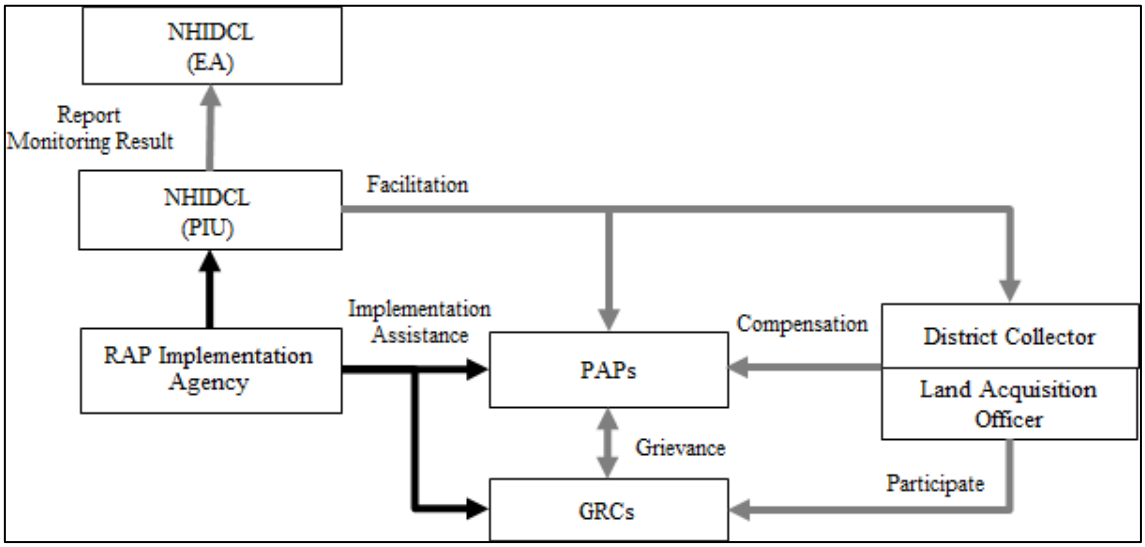
grievance redress mechanisms in the previous phases (contents of complaints, appropriateness of countermeasures, etc.) and describe them in the DFR."



Source: JICA Survey Team

Figure 7-63: Institutional Arrangements for RAP Implementation

Implementation of RAP will be supported by RAP Implementation agency as shown below.



Source: JICA Survey Team

Figure 7-64: Support Arrangement for RAP Implementation

The role and responsibilities of the various offices in resettlement and rehabilitation implementation are presented below:

(2) NHIDCL

The General Manager:

- In-charge of overall project activities.
- Participate in the State Level Committees to facilitate land acquisition, pre- construction activities and implementation of resettlement and rehabilitation activities.

Executing Agency:

- Co-ordinate the implementation of resettlement and rehabilitation activities with corporate and field staff.
- Appoint NGO for resettlement and rehabilitation implementation and monitoring and evaluation consultants for monitoring and evaluation.
- Plan and conduct training programs for staff capacity building as well as capacity of field level NGOs and partner agencies.
- Review the micro plans prepared by the NGO.
- Review monthly progress report.
- Monitor the progress on resettlement and rehabilitation and land acquisition.
- Advice PIU/NGO/M&E Agency on policy related issues during implementation.
- Ensure early release of money to PIUs for resettlement and rehabilitation activities.

(3) Project Implementation Unit (PIU)

This unit will coordinate the process for land acquisition. Relocation and rehabilitation, distribution of project provided assistance and PAPs access to government programs. NGO would be selected who would be working in close association with the Project Implementation Unit.

(4) RAP Implementation Field Offices and Tasks

The Field Office of PIU will be responsible to carry out the following tasks concerning resettlement of the project:

- Overall responsibility of Implementation of resettlement and rehabilitation activities of RAP.
- Responsible for land acquisition and resettlement and rehabilitation activities in the field.
- Ensure availability of budget for resettlement and rehabilitation activities.
- Liaison with District Administration for support for land acquisition and implementation of resettlement and rehabilitation.
- Participate in the district level committees.

(5) Competent Authority for Land Acquisition (CALA)

- Overall responsibility for Land Acquisition
- Co-ordinate with District Administration and NGO for land acquisition and resettlement and rehabilitation.
- Translation of resettlement and rehabilitation policy in local language.
- Ensure development of resettlement sites, wherever required.
- Participate in the allotment of residential, commercial and agricultural plots.
- Liaison with District Administration for dovetailing government's income generating and developmental programs for the displaced persons.
- Ensure the inclusion of those PAPs who may have not been covered during the census survey;

- Monitor physical and financial progress on land acquisition and resettlement and rehabilitation activities.
- Participate in regular meetings.
- Organize Bi-monthly meetings with the NGO to review the progress on resettlement and rehabilitation

(6) NGO

NGO will be principally responsible for the day-to-day implementation work.

- Survey and verification of the displaced persons.
- Verification of land records followed by verification on the spot related to identified plots and owners.
- Develop rapport with the displaced persons s.
- Verify and Photograph of each PAP for ID cards.
- Assist to issue identity cards to the displaced persons s.
- Co-ordinate with the DRO to implement resettlement and rehabilitation activities.
- Conduct market feasibility study.
- Valuation of properties/assets for finalization of replacement value.
- Participate with the DRO to undertake public information campaign at the commencement of the projects.
- Distribute the pamphlets of resettlement and rehabilitation policy to the displaced persons.
- Assist the PAPs in receiving the compensation.
- Facilitate the process of arranging loans for displaced persons.
- Facilitate the opening of joint accounts.
- Generate awareness about the alternate economic livelihood and enable the PAPs to make informed choice.
- Prepare micro-plans for resettlement and rehabilitation.
- Enable the PAPs to identify the alternate sites for agriculture, residential and commercial plots.
- Participate in the consultation on allotment of shops and residential plots.
- Ensure the PAPs have received their entitlements.
- Ensure the preparation of rehabilitation sites.
- Participate in the meetings organized by the PIU.
- Submit monthly progress reports.
- Identify training needs and institutions for the PAPs for income generating activities.
- Participate in the disbursement of cheques for the assistance at public places.
- Coordinate the training programs of the PAPs for income generating activities.
- Coordinate the meeting of District Level Committees.
- Accompany PAP to GRC.
- Awareness campaigns for highway related diseases.
- Ensure the PAP judiciously uses compensation and resettlement and rehabilitation assistance.

(7) District Level Committee (DLC)

At the Bodoland Territorial Authority, the RAP will be implemented through District Level Committees that will be established in the districts of Kokrajhar in Assam. The committee would include District Magistrate or his representative, District Land Acquisition Officer, Representatives from the District Council, Pradhans of Panchayat Samities, representative of affected villages including women, representative of Revenue Department, Line Departments, PWD, Mining Departments, people's representatives, NGO and representatives of affected population. The formation of DLCs would be facilitated by NGOs. The functions of the DLC will

be as follows: (i) to meet regularly to review the progress of land acquisition/ resettlement and rehabilitation; (ii) approval of the micro-plan on the basis of methodology defined in the RAP; and (iii) facilitate the implementation of the RAP programs in the project-affected area.

The DLC would also: (i) meet regularly at pre-decided dated specifically for grievance redressing purpose at the District Council Office; (ii) help in amicable settlement of disputes at community level; (iii) carry forward the ones which are not reconciled at the Grievance Redressal Committee (iv) coordination with local govt. authorities & field offices.

(8) Coordination with Other Agencies and Organizations

CALA or DLC will establish networking relationships with line departments and other Govt. & non-Govt. organizations. The Revenue Department has an influencing role in land acquisition proceedings, and initiation of resettlement process. Unless the compensation process is prompt and efficient, implementation process will get delayed. resettlement and rehabilitation Cell will coordinate with the Project Land Acquisition Officer to expedite the land acquisition process.

Income restoration will be sole responsibility of the Project Authority. NGO will facilitate linkages to be established with the agencies implementing centrally sponsored poverty alleviation programs to restore the income of PAPs.

Restoration of community assets such as hand pumps, bore wells will require help from PHED. EA will extensively work on developing lateral linkages for mobilization of resources to benefit the PAPs and to achieve the desired results expected from implementation of RAP.

The CALA or District Council is responsible for providing land records, acquiring land and other properties and handing them over to the proper authorities. The District Rural Development Agency (DRDA) will extend the IRDP and other developmental schemes to include the DISPLACED PERSONSs.

(9) NGO Participation

This will be required by the PIU. A good rapport with the affected community will facilitate a satisfactory resettlement and rehabilitation of the PAPs and minimize disturbance particularly physical and economic. To overcome this deficiency, experienced and well-qualified NGO in this field will be engaged to assist the EA in the implementation of the RAP. NGO hired for RAP implementation will also be responsible for HIV/AIDS, trafficking of women and children, child labour, etc. The NGO should have experience of addressing such social issues.

The NGO, in this sense, will have to ensure that due entitlements flow to the PAPs in the most effective and transparent manner. The success of the NGO inputs will largely depend on their liaison with the PAPs and other concerned government agencies. Other involved agencies are expected to collaborate with Project, based on instructions from the EA, in accordance with the policy framework and the RAP. These arrangements have to be made during the first month of Project implementation in order to set up the various committees and implementation mechanisms required for the project.

7.9.11 Implementation Schedule

(1) Introduction

Implementation of RAP mainly consists of compensation to be paid for affected structures and rehabilitation and resettlement activities. The time for implementation of resettlement plan will be scheduled as per the overall project implementation. All activities related to the land

acquisition and resettlement must be planned to ensure that compensation is paid prior to displacement and commencement of civil works. Public consultation, internal monitoring and grievance redress will be undertaken intermittently throughout the project duration.

However, the schedule is subject to modification depending on the progress of the project activities. The civil works contract for each project will only be awarded after all compensation and relocation has been completed for project and rehabilitation measures are in place.

(2) Schedule for Project Implementation

The proposed project resettlement and rehabilitation activities are divided in to three broad categories based on the stages of work and process of implementation. The details of activities involved in these three phases i.e. Project Preparation phase, RAP Implementation phase, Monitoring and Reporting period are discussed in the following paragraphs.

(3) Project Preparation Phase

The major activities to be performed in this period include establishment of PIU, submission of RAP for approval from NHAI, appointment of NGO and establishment of GRC etc. The information campaign & community consultation will be a process initiated from this stage and will go on till the end of the project.

(4) RAP Implementation Phase

After the project preparation phase the next stage is implementation of RAP which includes issues like compensation of award by EA, payment of all eligible assistance, relocation of displaced persons; initiation of economic rehabilitation measures; site preparation for delivering the site to contractors for construction and finally starting civil work.

(5) Monitoring and Reporting Period

As mentioned earlier the internal monitoring will be the responsibility of PIU and implementing NGO and will start early during the project when implementation of RAP starts and will continue till the complementation of the project. The independent monitoring and reporting will be the responsibility of Construction Supervision Consultant (CSC) to be hired for the project.

(6) Resettlement and Rehabilitation Implementation Schedule

A composite implementation schedule for resettlement and rehabilitation activities in the project including various sub tasks and time line matching with civil work schedule is prepared and presented in the form of Table. While the cut-off date will be notified formally for titleholder as the date of LA notification and for non-titleholders, currently it is scheduled as the date of census survey. However, the sequence may change or delays may occur due to circumstances beyond the control of the Project and accordingly the time can be adjusted for the implementation of the plan. The implementation schedule can also be structured through package wise. The entire stretch can be divided in to various contract packages and the completion of resettlement implementation for each contract package shall be the pre-condition to start of the civil work at that particular contract package.

Table 7-88: Implementation Schedule of RAP for NH-127B (Assam)

	2020												2021												2022											
	1Q			2Q			3Q			4Q			1Q			2Q			3Q			4Q			1Q			2Q			3Q			4Q		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Project Preparation Stage																																				
Screen project impact																																				
Public Consultation on alignment																																				
Prepare Land Acquisition Plan																																				
Carry out Census Survey																																				
Prepare Resettlement Action Plan (RAP)																																				
RAP Implementation Stage																																				
Obtain RAP approval from JICA																																				
Formation of GRC (Grievance Mechanism)																																				
Implementation of GRC																																				
Public Consultation																																				
Income Restoration Program																																				
Awareness Training																																				
Rehabilitation of DISPLACED PERSONs																																				
Monitoring and Reporting Period																																				
Internal monitoring and reporting																																				
External monitoring and reporting																																				

Source: JICA Survey Team

7.9.12 Cost and Budget

(1) Compensation

Refer to Section 7.9.5.

(2) RAP Implementation and Support Cost

The unit cost for hiring of the implementing NGO has been calculated on a lump sum basis for [redacted]. This is based on the similar earlier project experiences and informal consultation and feedback received from the local staff and keeping in consideration two-year duration of NGO's involvement. Costs will be updated during implementation.

A 10% contingency has been added in order to adjust any escalation.

For grievance redress process a lump sum of Rs. [redacted]. is provided for two years and cost of other RAP implementation and administrative activities will be a part of proposed departmental expenditure. The separate fund for grievance redressal for this project is made based on intensity of impacts. In addition the process will involve interdepartmental arrangement and include participation by representatives of displaced persons, particularly of vulnerable displaced persons, local government representatives, representative of local NGOs and other interest groups besides PIU and implementing NGO.

(3) Source of Funding and Fund Flow Management

The cost related to land acquisition and resettlement cost will be borne by the EA. EA will ensure allocation of funds and availability of resources for smooth implementation of the project resettlement and rehabilitation activities. The EA will, in advance, initiate the process and will try to keep the approval for the resettlement and rehabilitation budget in the fiscal budget through the ministry of finance. In the case of assistance and other rehabilitation measures, the EA will directly pay the money or any other assistance as stated in the RAP to displaced persons. The implementing NGO will be involved in facilitating the disbursement process and rehabilitation program.

(4) Land Acquisiton, Resettlement and Rehabilitation Budget

A detailed indicative resettlement and rehabilitation cost is given in Table 7-89.

Table 7-89: Resettlement and Rehabilitation Budget

Item	Rate (in Rs. Per Ha)	Total Area (Ha)/Number	Cost (in Rs.)
I. Compensation for losss of Private Property			
1. Loss of Land (agricultural, homestead, commercial or otherwise)			
Land Acquisition Cost for 142.688 Ha			
	Sub Total (A)		
2. Loss of Structure (house, shop, building or immovable property or assets attached to land			
Type of Structure	**Rs. Per Sqm**	**Area Sqm**	
Pucca			
Semi *Pucca*			
Kutchcha			
Boundary wall (in M)			
Subtotal (B)			
100% Solatium for Structure (C)			
3. Loss of Residence			
Special Cash Assistance of Rs. already decided with land			-
Shifting Assistance to displaced persons			
Transitional Allowance			
One Time Resettlement Allowance			
Subtotal (D)			
4. Loss of Shop/trade/commercial structure			
Special Cash Assistance of Rs. already decided with land			
Subsistence Allowance			
Transitional Allowance			
One Time Resettlement Allowance			
Subtotal (E)			
II. Impact to Squatters/ Encroachers			
1. Loss of Residence			
House Construction Assistance of Rs.			
Shifting Assistance to displaced persons			
Subsistence Allowance for 3 months			
Subtotal (F)			
2. Loss of Shop/trade/commercial structure			
Shop Construction Assistance of Rs.			
Shifting Assistance to displaced persons			
Subsistence Allowance for 3 months			
3. Loss of commercial Kiosk/vendor			
Special one time Assistance of Rs.			
Subsistence Allowance for 3months including 32 mobile vendors			
Subtotal (H)			
III. Impact to Vulnerable Household			
One time Assistance who have to relocate			
Subtotal (I)			
IV. Impact during Construction			
Subtotal (J)			-
V. Common Property Resource			
Religious Structures (Temple & Mosque)			
School/Community Property			
Govt./ Panchayat Buildings			
Subtotal (K)			
VI. Unforeseen Impacts			
Contingency of 10%	Total of (A to L)	10%	
Subtotal (L)			
VII. Implementation of RAP			
Support for implementation of RAP (lumpsum)[9]			
M & E consultant (lumpsum)			
Subtotal (M)			
Total(N) = (AtoM)			

Source: JICA Survey Team

The above estimate is based on rates vide Entitlement Matrix (April 2016) as per the norms of RTFCLARR Act, 2013, Assam RFCTLARR Rules, 2015 and in accordance with World Bank and JICA's Policies. An escalation of [redacted]% on the table is allowed, the current cost of resettlement and rehabilitation = [redacted] x [redacted] = [redacted].

7.9.13 Monitoring and Evaluation

Monitoring is an integral part of successful implementation of the RAP activities. Internal monitoring will be carried out by any designated Assistant Manager or above under the supervision of Deputy General Manager, NHIDCL. Data collected for monitoring activities shall be suitably analysed for project management and learning. Key progress indicators (indicative) for monitoring RAP implementation are as given below:

- disbursement of compensation and assistance to PAPs,
- establishment of grievance redressal mechanism (including processes and timeline for redressal of grievances),
- consultation meetings with PAPs and communities regarding resettlement and rehabilitation issues,
- other monitoring indicators will be considered as per the requirement.

Evaluation of the impact of resettlement activities will be conducted twice: once during the implementation of RAP (mid-term) and the other at the end of the completion of RAP implementation activities. For this purpose, PIU will engage an external agency. The evaluation will focus on:

- land acquisition or direct purchase of land (success, timeline, constraints, etc.),
- implementation of various RAP activities,
- income restoration of affected persons,
- grievance handling mechanism, etc.

(1) Stakeholders Consultation

A consultation workshop must be held at the site level. Detailed presentation on Resettlement Policy should be made which was followed by discussion and suggestions by the participants. The suggestions will be noted and incorporated suitably.

(2) Disclosure

In order to make the RAP preparation and implementation process transparent, salient features of RAP shall be translated in Assamese/Bengali which is widely spoken and understood in the project area and disclosed on the Project Authority's website. The documents available in the public domain will include Entitlement Matrix and RAP (summary in Assamese, Bengali) and the list of affected persons eligible for compensation and resettlement and rehabilitation assistance. Copy of all documents will be kept in PIU for ready reference. As per Access to Information Policy of the JICA, all safeguard documents will also be disclosed and available at the NHIDCL Portal.

Further to the web disclosure of the draft RAP on Project Authority's website, wide publicity would be given through newspaper advertisements about the disclosure and seeking public views and suggestions. Executive summary of the RAP translated in Assamese/Bengali would be distributed to the stakeholders. A consultation meeting on draft Resettlement Plan shall be organized by the PIU for inviting comments/suggestions/feedback from participants/stakeholders. The outcome of the consultation meeting shall be included, wherever feasible, in the final Resettlement Plan and disclosed on the Project Authority's website. The final RAP incorporating

given comments, if any, shall be forwarded to the JICA for its review and clearance and subsequent disclosure on the JICA's portal.

7.10 Action Plan for the Scheduled Tribe

7.10.1 A review of the Legal and Institutional Framework Applicable to Indigenous Peoples

(1) JICA Guidelines for Indigenous People

According to the JICA Guidelines for Environmental and Social Considerations, for projects that will require the measures for indigenous people, an Indigenous People Plan (IPP) must be submitted as well. According to the Guidelines, in principle, appropriate environmental and social considerations are undertaken, according to the nature of the project, based on the following:

8. Indigenous Peoples

1. *Any adverse impacts that a project may have on indigenous peoples are to be avoided when feasible by exploring all viable alternatives. When, after such an examination, avoidance is proved unfeasible, effective measures must be taken to minimize impacts and to compensate indigenous peoples for their losses.*

2. *When projects may have adverse impacts on indigenous peoples, all of their rights in relation to land and resources must be respected in accordance with the spirit of relevant international declarations and treaties, including the United Nations Declaration on the Rights of Indigenous Peoples. Efforts must be made to obtain the consent of indigenous peoples in a process of free, prior, and informed consultation.*

3. *Measures for the affected indigenous peoples must be prepared as an indigenous peoples plan (which may constitute a part of other documents for environmental and social consideration) and must be made public in compliance with the relevant laws and ordinances of the host country. In preparing the indigenous peoples plan, consultations must be made with the affected indigenous peoples based on sufficient information made available to them in advance. When consultations are held, it is desirable that explanations be given in a form, manner, and language that are understandable to the people concerned. It is desirable that the indigenous peoples plan include the elements laid out in the World Bank Safeguard Policy, OP4.10, Annex B.*

The World Bank's Operational Policy on Indigenous Peoples (OP 4.10) aims at ensuring that the development process fosters full respect for the dignity, human rights and cultures of indigenous peoples, thereby contributing to the Bank's mission of poverty reduction and sustainable development. To achieve this objective, Bank-assisted projects which affect indigenous peoples provide them a voice in design and implementation, avoid adverse impacts where feasible, or minimize and mitigate them, and ensure that benefits intended for them are culturally appropriate.

The Bank recognizes that indigenous peoples are commonly among the poorest and most vulnerable segments of society and in many countries they have not fully benefited from the development process. It also recognizes that the identities, cultures, lands and resources of indigenous peoples are uniquely intertwined and especially vulnerable to changes caused by development programs. Because of this, issues related to indigenous peoples and development are complex and require special measures to ensure that indigenous peoples are not disadvantaged and that they are included in and benefit from these programs as appropriate.

World Bank for purposes of its OP 4.10, uses the term "Indigenous Peoples" in a generic sense to refer to a distinct, vulnerable, social and cultural group possessing the following characteristics in varying degrees:

(a) self-identification as members of a distinct indigenous cultural group and recognition of this identity by others;

(b) collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories

(c) customary cultural, economic, social, or political institutions that are separate from those of the dominant society and culture; and

(d) an indigenous language, often different from the official language of the country or region.

Considering the above characteristics as requirements to define the scheduled tribe in the PAPs as the "Indigenous People" under the OP4.10, it seems they don't fulfil one or some of the requirements. Concerning the above characteristic (b), collective attachment of the scheduled tribe in the PAPs of distinct habitat or ancestral territories in the project area is not established, as such habitat/territories would not exist in the existing highway and the project area. In addition, concerning characteristic (c), the lifestyle of the ST in the project areas is virtually identical with that of the non-tribal general population.

However, for appropriate assessment and mitigation of the impacts on the Scheduled Tribe in the PAPs of the Project, in this section "Action Plan for Scheduled Tribe" is formulated which follows the requirement of Indigenous People Plan under the OP4.10.

(2) Scheduled Tribes in Constitution of India

The Sixth Schedule of the Constitution makes separate arrangements for the tribal areas of Assam, Meghalaya, Mizoram, and Tripura. Article 244A was added to the constitution through the 22nd Constitutional Amendment Act, 1969. In January 2019, Cabinet approved amendment to Article 280 and Sixth Schedule of the Constitution to increase autonomy, financial resources and powers of the autonomous district councils in Assam, Meghalaya, Mizoram and Tripura. It empowers Parliament to establish an autonomous State comprising certain tribal areas of Assam and for local Legislature or Council of Ministers or both can create.

The President of India under Article 342 of the Constitution uses the following characteristics to define "Scheduled Tribes (ST)," (i) tribes' primitive traits; (ii) distinctive culture; (iii) shyness with the public at large; (iv) geographical isolation; and (v) social and economic backwardness before notifying them as a Scheduled Tribe. Essentially, indigenous people have a social and cultural identity distinct from the 'mainstream' society that makes them vulnerable to being overlooked or marginalized in the development processes.

(3) The Bodoland Autonomous Council (Repeal) Act, 2003

It is expedient to provide for the establishment of a Bodoland Autonomous Council within the State of Assam with maximum autonomy within the framework of the Constitution comprising contiguous geographical areas between the river Sankosh and Mizhat /the river Pasnoi, for social, economic, educational, ethnic and cultural advancement of the Bodos residing therein.

Bodoland, officially the Bodoland Territorial Region, is an autonomous region in India. It made up of four districts on the north bank of the Brahmaputra River, by the foothills of Bhutan and Arunachal Pradesh. It is administered by an elected body known as the Bodoland Autonomous

Council which came into existence under the terms of a peace agreement signed in February 2003 and its autonomy was further extended by an agreement signed in January 2020. The region covers an area of over eight thousand square kilometres and is predominantly inhabited by the Bodo people and other indigenous communities of Assam. The districts are Kokrajhar, Chirang, Baksa and Udalguri.

(4) General Status of the Scheduled Tribes

These Acts not only recognize the rights to hold and live in the forest land under the individual or common occupation for habitation or for self-cultivation for livelihood, but also grant several other rights to ensure their control over forest resources which, inter-alia, include right of ownership, access to collect, use and dispose of minor forest produce, community rights such as *nistar*; habitat rights for primitive tribal groups and pre-agricultural communities; right to protect, regenerate or conserve or manage any community forest resource which they have been traditionally protecting and conserving for sustainable use.

These Acts also provide for diversion of forest land for public utility facilities managed by the Government, such as schools, dispensaries, fair price shops, electricity and telecommunication lines, water tanks, etc. with the recommendation of *Gram Sabhas*. In addition, several schemes have been implemented by the Ministry of Tribal Affairs for the benefit of tribal people, including those in the forest areas such as "Mechanism for marketing of Minor Forest Produce (MFP) through Minimum Support Price (MSP) and development of Value Chain for MFP". Funds are released out of Special Central Assistance to Tribal Sub Plan for infrastructure work relating to basic services and facilities viz. approach roads, healthcare, primary education, minor irrigation, rainwater harvesting, drinking water, sanitation, community halls, etc. for development of forest villages.

According to the Census of India 2011, 8.61 percent of the Indian population is classified as ST. In comparison to the national figure, Assam has 12.45 percent of its populations classified as ST. According to census survey of India, 2011, The STs in Assam comprised 3.88 million of the total State population of 31.21 million. The major tribes of Assam are (i) The Bodo Kachari Tribes, (ii) The Mishing Tribe, (iii) The Deori Tribes, (iv)The Rabha Tribes, (v) The Tiwa or Lalung Tribes, (vi) The khamti Tribe, (vii) The Sonowal Kachari Tribes, (viii) The Tai_Phake or Phakial Tribes, (ix) The Dimasa Kachari Tribes, (x) The Karbi Tribes, (xi) The Barmans of Cachar, (xii) The Hmar Tribe, (xiii) The Kuki Tribe, (xiv) The Rengma Naga Tribes, (xv) Zeme Nagas, (xvi) The Hajong Tribe, (xvii) The Garo Tribe, (xviii) The Khasi Tribe, (xix) The Jaintia Tribe and (xv) The Mech Tribe. Summary profile of ST population in comparison to total population is described in the table below.

Table 7-90: Summary Profile of ST Population

Name	Total Household (Million)	Total Population (Million)	Total Male (Million)	Total Female (Million)	Total ST Population (Million)	Male ST Population (Million)	Female ST Population (Million)	Percentage of ST Population compared to Total Population
India	249.45	1210.57	623.12	587.45	104.28	52.41	51.87	8.61
Assam	6.41	31.21	15.94	15.27	3.88	1.96	1.93	12.45
Names of Districts in Assam								
Kokrajhar	0.18	0.89	0.45	0.43	0.28	0.14	0.14	31.41
Dhubri	0.41	1.95	1.00	0.95	0.01	0.00	0.00	0.32
Goalpara	0.20	1.01	0.51	0.49	0.23	0.12	0.12	22.97
Barpeta	0.34	1.69	0.87	0.83	0.03	0.01	0.01	1.61
Morigaon	0.18	0.96	0.49	0.47	0.14	0.07	0.07	14.29
Nagaon	0.56	2.82	1.44	1.38	0.12	0.06	0.06	4.08
Sonitpur	0.39	1.92	0.98	0.94	0.23	0.12	0.11	12.07
Lakhimpur	0.20	1.04	0.53	0.51	0.25	0.13	0.12	23.93
Dhemaji	0.13	0.69	0.35	0.33	0.33	0.17	0.16	47.45
Tinsukia	0.27	1.33	0.68	0.65	0.08	0.04	0.04	6.18
Dibrugarh	0.28	1.33	0.68	0.65	0.10	0.05	0.05	7.76
Sivasagar	0.25	1.15	0.59	0.56	0.05	0.02	0.02	4.26
Jorhat	0.24	1.09	0.56	0.54	0.14	0.07	0.07	12.81
Golaghat	0.23	1.07	0.54	0.52	0.11	0.06	0.06	10.48
Karbi Anglong	0.18	0.96	0.49	0.47	0.54	0.27	0.27	56.33
Dima Hasao	0.04	0.21	0.11	0.10	0.15	0.08	0.08	70.92
Cachar	0.38	1.74	0.89	0.85	0.02	0.01	0.01	1.01
Karimganj	0.25	1.23	0.63	0.60	0.00	0.00	0.00	0.16
Hailakandi	0.14	0.66	0.34	0.32	0.00	0.00	0.00	0.10
Bongaigaon	0.15	0.74	0.38	0.36	0.02	0.01	0.01	2.55
Chirang	0.10	0.48	0.24	0.24	0.18	0.09	0.09	37.06
Kamrup	0.31	1.52	0.78	0.74	0.18	0.09	0.09	12.00
Kamrup Metropolitan	0.29	1.25	0.65	0.61	0.08	0.04	0.04	5.99
Nalbari	0.16	0.77	0.40	0.38	0.02	0.01	0.01	3.03
Baksa	0.19	0.95	0.48	0.47	0.33	0.17	0.17	34.84
Darrang	0.19	0.93	0.48	0.45	0.01	0.00	0.00	0.91
Udalguri	0.17	0.83	0.42	0.41	0.27	0.13	0.13	32.15

Source: The census of India in 2011

7.10.2 A summary of the Social Assessment (Impact on Scheduled Tribes)

(1) Impact on Land & Structures of Scheduled Tribes

10.6% of structures impacted by the proposed project belong to the Scheduled Tribes. Most of the impacted area presently falls under the cadastral land holding system the RoR (Records of Rights) is available for the title holders at the Land & Revenue Department of the District Council. Any kind of impact on land of the Scheduled Tribe (ST) community and non-cadastral land requirement in the project road will be analysed after the finalisation of LAP of the proposed road. The final status will be updated in the final RAP.

Table 7-91: Impacts on Scheduled Tribes in PAHs

Sl. No.	Type of Ownership	No of Affected Household Families	No. of Structures
1	Title Holder	177	55
2	Encroacher	30	31
3	Squatter	14	14
4	Kiosk	15	15
5	Tenants	13	
6	Employees to Commercial Structures and agricultural labourers	16	
Total		**265**	**115**

Source: Census & SES Survey, Jan-Mar 2020

Table 7-92: Impact on Structure of Scheduled Tribe in PAHs

Sl. No.	Use of Structures	Numbers
1	Residential	55
2	Commercial	49
3	Compound wall	3
4	Res-cum-commercial	1
5	Under Construction	2
6	Kiosk	4
7	Cattle Shed	1
Total		**115**

Source: Census & SES Survey, Jan-Mar 2020

(2) Impact on Socio Economic status of Scheduled Tribes

The proposed project can be viewed as boosting economic growth and poverty reduction, which will bring substantial social and economic development in the region. About 59% of the PAHs is ST who are mostly in the lower income group of Rs.30,000 to Rs. 50,000 annually.

Table 7-93: Annual Income Level

Sl. No.	Annual Income Categories in (Rs)	%
1	More than 30,000 but less than or equal to 50,000	59%
2	More than 50,000 but less than or equal to 100,000	26%
3	More than 100,000	15%
Total		**100.00%**

Source: Census & SES Survey, June - July 2020

(3) Impact on Community of Scheduled Tribes

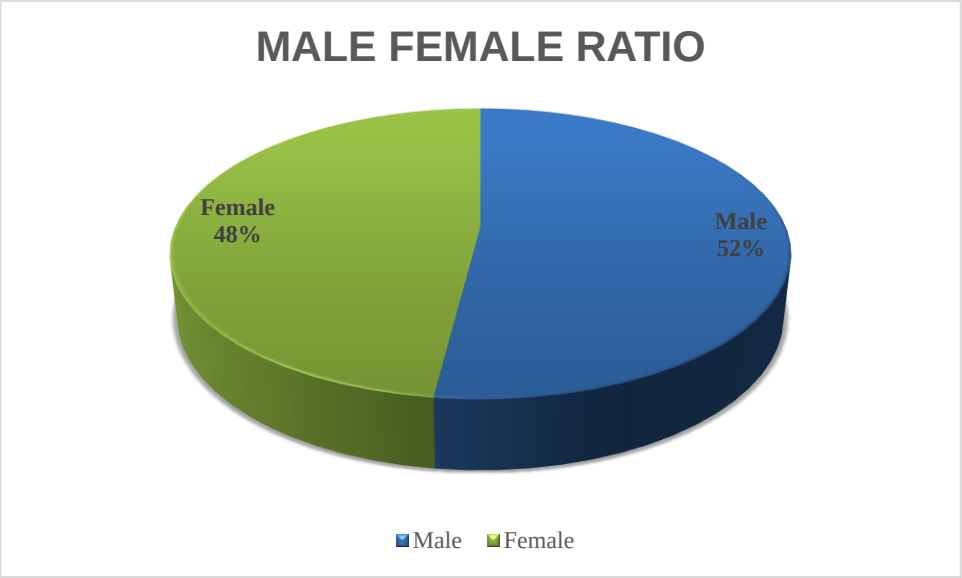
This project has ensured that the designed and implementation will be in such a way that it fosters full respect for Scheduled Tribes identity, dignity, human rights, livelihood systems, and cultural uniqueness as they define them. There is no impact on the community structure or community land of cultural or religious sentiment of the tribal population in the project impact area. The proposed project will ensure that receive culturally appropriate social and economic benefits, do not suffer adverse impacts as a result of the project, and can participate actively in the project that affect them.

(4) Impact on Gender of Scheduled Tribes

A culturally appropriate and gender-sensitive assessment was carried out for social impacts to assess the potential project impacts, both positive and adverse, on Scheduled Tribe's gender issues. It was identified that social and economic benefits for affected Scheduled Tribe which are culturally appropriate, gender and inter-generationally inclusive and develop measures to avoid,

minimize, and/or mitigate adverse impacts on Scheduled Tribe. Suggestion of noise barrier, reduction of dust, providing employment of the female members as unskilled labourers during construction were the results of the focus group discussions.

The gender composition of PAPs in Scheduled Tribe shows that the male accounts for 52% and female accounts for 48%. The gender disparity is visible in lower sex ratio among PAPs i.e. 929 against total project area having 968 as per socio economic survey Jan.-March 2020.

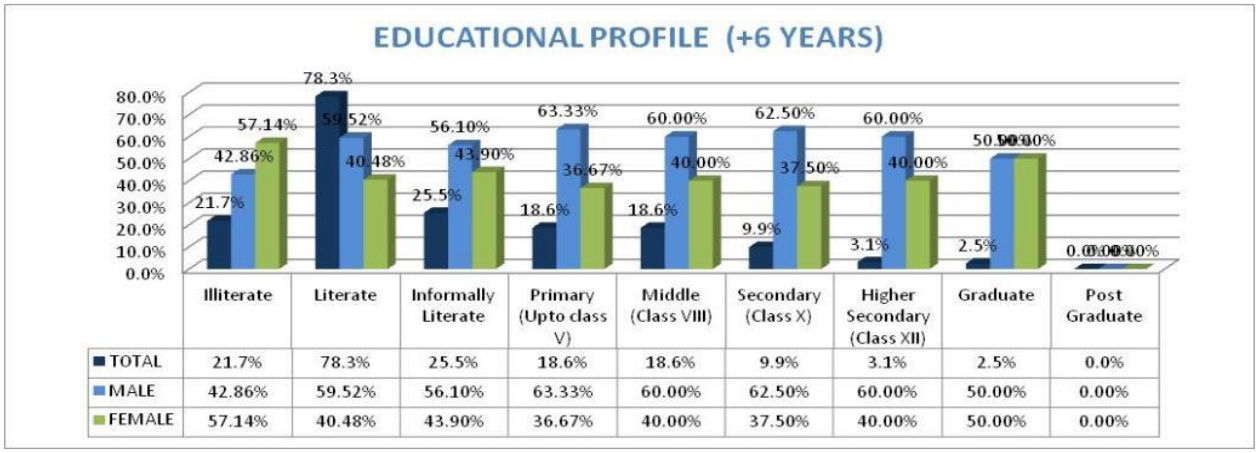


Source: Census & SES Survey, Jan-Mar 2020

Figure 7-65: Gender Ratio of Project Affected Scheduled Tribes

(5) Educational Status of Project Affected Scheduled Tribes

The educational status of PAPs above 6 years of age reveals that overall scenario of literacy level is not encouraging among the Scheduled Tribe's communities. Significant percentage of population, i.e., 21% are still illiterate. Around 25.5% of the ST in PAP are informally literate. Out of this 25.5% of the PAPs attained the education at primary level 56.1 % is male and the rest 43.9% is female. The educational status is presented in Figure 7-66.



	Illiterate	Literate	Informally Literate	Primary (Upto class V)	Middle (Class VIII)	Secondary (Class X)	Higher Secondary (Class XII)	Graduate	Post Graduate
TOTAL	21.7%	78.3%	25.5%	18.6%	18.6%	9.9%	3.1%	2.5%	0.0%
MALE	42.86%	59.52%	56.10%	63.33%	60.00%	62.50%	60.00%	50.00%	0.00%
FEMALE	57.14%	40.48%	43.90%	36.67%	40.00%	37.50%	40.00%	50.00%	0.00%

Source: Census & SES Survey, Jan-Mar 2020

Figure 7-66: Educational Profile of Project Affected Scheduled Tribes

(6) Occupational Profile of Project Affected Scheduled Tribe

The occupational status of PAPs reveals that 20% PAPs are depending on business and this includes the business they are carrying out along the road, mainly shops. About 26% PAPs are having agriculture as their source of income and 8% are engaged in government jobs. The details of occupations by the PAPs are presented in Table 7-94.

Table 7-94: Occupational Profile of Project Affected Scheduled Tribes (14-60 Yrs.)

Sl. No	Type of Occupation	Percentage
1	Agriculture & Allied Activities	26%
2	Government & Private Services	8%
3	Trade & Business	20%
4	Self Employed	10%
5	Casual Labour	15%
6	Student	6%
7	Housewife	7%
8	Unemployed	8%
Total		**100%**

Source: Census & SES Survey, Jan-Mar 2020

7.10.3 Action Plan for Potential Adverse Effects on Scheduled Tribes

From the starting point of the alignment of the project to 10.905 km, and 28.960 km to 29.960 km lies in the district of Kokrajhar which is under the administrative control of Bodoland Territorial Council as per the Sixth Schedule of Constitution of India. The rest of the road lies in the Dhubri district. The ST population is mainly settled at the Kokrajhar district.

This proposed road is not a new project or a greenfield alignment but an existing alignment. The project involves only in widening and upgrading the existing road. The ST population among the PAHs in the PIA are mostly living in the towns and villages along the highway and in the due course of time became the part of the mainstream population. The 19% of ST population present in the project affected area that might be impacted does not follow customs that are attach to their land and also not attached to their natural habitat for their living. The ST in the project affected area is living in the towns and villages and became the part of the mainstream population. Thus, there will be no culturally or socially impact on the ST population.

The Bodo is not within Particularly Vulnerable Tribal Groups (PVTGs).[27]

As per the Entitlement Matrix the ST population will receive a special vulnerable assistance of Rs. [redacted] over and above all other compensation and assistance that they are eligible for. The proposed project will also ensure that STs receive culturally appropriate social and economic benefits, do not suffer adverse impacts as a result of projects, and can participate actively in projects that affect them.

The STs are yet to foresee any serious adverse impact for the area in general, apart from obvious loss of land, properties, trees, structures, and increase of traffic accidents. Being situated at

[27] There are 75 tribal groups that have been categorized by Ministry of Home Affairs as PVTGs. PVTGs reside in 18 States and union territory of Andaman and Nicobar Islands. The Ministry of Tribal Affairs implements the Scheme of "Development of Particularly Vulnerable Tribal Groups (PVTGs)" exclusively for them. Under the scheme, Conservation-cum-Development (CCD)/Annual Plans are to be prepared by each State/UT for their PVTGs based on their need assessment, which are then appraised and approved by the Project Appraisal Committee of the Ministry. Activities for development of PVTGs are undertaken in Sectors of Education, Health, Livelihood and Skill Development, Agricultural Development, Housing & Habitat, Conservation of Culture etc.

roadside within the developed area, the people in general are accustomed with the probable risk of development in highway sector, such as spread of HIV/AIDS and STD, drug abuse that can trap the youth and trafficking of women and children. According to the people these hazards are already faced and conquered by them. The issues, however were discussed during FGD sessions, and the participants agreed to discuss the matter among the villagers with due seriousness The Village Authority and specially the Women's and Youth organizations asserted that at appropriate time they will take awareness generation initiatives. The project will provide HIV/AIDS, trafficking, and road safety awareness sessions for all communities. The NGO will provide orientation and sensitization workshops that will include awareness programmes on HIV/AIDS/Drug abuse and trafficking.

7.11 Outcome of the Stakeholder Consultation

7.11.1 Special Considerations in the Stakeholder Consultation

(1) Considerations of COVID-19

The stakeholders consultation of the project conducted in Jul. and Aug. 2020 then it coincided with the pandemic of COVID-19 in the world including India. It was conducted complying with the rules and regulations applied by the state and central government for prevention of COVID-19. The state government of Assam issued an order to prevent any social gathering from 2nd to 18th Aug. 2020. Thus implementation of the 2nd consultation (at draft final report level) delayed till the late Aug. 2020.

During implementation of the consultation, IFC's "Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19"[28] was referred to, for some recommended alternative measures to complete stakeholders engagement while protecting the health and safety of those involved.

While it was difficult to hold large-scale meetings due to COVID-19, the study team give consideration to ensure the participation of people who wish to express their opinions and to ensure sufficient time and opportunities for stakeholder discussions, adopting a method of Focus Group Discussion and Key Informant Interview with a small number of people, and establishing a consultation service after thoroughly disseminating information to the stakeholders.

(2) Scheduled Tribe

The World Bank OP 4.10 on Indigenous Peoples emphasizes a process of "free, prior, and informed consultation" (FPIC) with the affected ST communities at each stage of the project, and particularly during project preparation, to fully identify their views and ascertain their broad community support for the project." Consultations for this project adopted the following framework to ensure a process of FPIC.

a. Elaborate schedule of appropriate process for consulting with the Indigenous Peoples;
b. Using consultation methods appropriate to the social and cultural structures and values of the affected Indigenous Peoples' communities and their local conditions, and in designing these methods, elaborate consultation sessions paying special attention to women, youth, and children of the Indigenous Peoples and their access to development opportunities and benefits; and

[28] https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_tipsheet_covid-19_stakeholderengagement retrieved on 31 Aug. 2020.

c. Disseminate relevant information about the Project (including an assessment of potential adverse effects induced by the Project on the Indigenous Peoples' communities) in a culturally appropriate and accepted manner.

Leaflets explaining the project and its impacts were given to the ST Resource Person much prior to the consultation. Meaningful focus group discussions with the ST women and affected ST communities and concerned ST organizations were carried out to solicit their participation (i) in designing, implementing, and monitoring measures to avoid adverse impacts or, when avoidance is not possible, to minimize, mitigate, or compensate for such effects; and (ii) in tailoring project benefits for affected ST communities in a culturally appropriate manner.

(3) Disclosure of Information

Resource persons/ Village Head/ Gaon Bura were given the printed leaflets. Leaflets were given to the resource persons and also were distributed randomly throughout the alignment much prior to the consultation. The statement in the leaflets was explained to the resource persons so that they could disseminate the information at the individual PAP level. These resource persons informed local people about the dates of the meeting and regularly update the information. One email address and one dedicated mobile number which is shared with the leaflets for satisfying mainly the PAPs and the locals regarding any queries or complain.

(4) Gender

Since women tend to have lower literacy rates than men, the study team considered as much as possible and take measures to let women understand the project, under the circumstances of COVID-19 based on the experience of related projects so far. In advance of the stakeholder consultation, the female Panchayat members were explained in details to disseminate the information to the local female residents. The leaders of the female Self Help Groups (SHGs) were also consulted and explained the same in details then subsequently they disclosed the same in simple language to the local female members. The female ST members and leaders of the groups were explained in detail then they disclosed subsequently the same in simple language to the local female residents.

7.11.2 Stakeholder Consultation at the Scoping Level (20-24, Jul. 2020)

(1) Methodology

A detailed public consultation was organized with the potential project affected persons, people's representatives, shopkeepers, businessmen, and others regarding the project benefits and vis-à-vis estimated loss. The main point of discussions were minor realignments to save certain structures, compensation and assistance, road safety etc. It has been observed that the benefits of the proposed project area acknowledged by the local people but they want the Executing Agency, to take care of the implementation of the project to bring about promised benefits with proper safety measures.

The information and recommendations gathered from the various stakeholder consultations has been incorporated into the design of the project to ensure that the investments align with local priorities and development plans, and that they will deliver equitable socio-economic benefits to the intended project beneficiaries.

Due to the extreme pandemic situation in the whole world, the project affected area is not an exception. There is lockdown, social distancing and various conditions that are not conducive for Public Consultation. As per the guidelines only five persons could be called for Consultation at Panchayat Office thus those are the Public Representatives and the Public Consultation is rather

Key Informant Interview in Nature. Informal FGDs have been done at the villages, marketplace and other common places to gather and disseminate information about the proposed project.

Still there might be persons who could not be informed or not satisfied with the present information, for them a special system is introduced by the survey team. One email address and one dedicated mobile number which is shared with the leaflets for satisfying mainly the PAPs and the locals regarding any queries or complain.

Any call at the mobile would be answered by the surveyors, if the caller is not satisfied then call could be transfer to some senior positions or the caller number and queries is recorded and passed on to some senior positions for satisfying the caller. This email and mobile number will be shared/handed over to the Project Implementation Unit (PIU) for future.

(2) Result of the Public Consultation at Scoping Level

Table 7-95: Brief Description of Some Sample Public Consultation

Date / Place	No of Participants	Major Issues	Agreed upon	Mitigation Measures - Input to technical Design
Place: Srirampur Bazar, 20/07/2020	Total-13 Male-13 Female-0	The existing alignment passes through the town area. It is also a junction town and many goods and vehicles pass through the town. There are both commercial and residential establishments along the alignment. It has been revealed from the public consultations that the people on both side of the road, considering future potential in development, but afraid of road accident and menace like trafficking and HIV. Some of them also put the issue of construction of concrete drains for the development of the sewage system of the town.	Combined effort of the local authorities with the government officials as well as the other stake holders would remove all the obstacles for development.	The local authorities also assured that they would help in development of roads project. A road safety awareness campaign should be made at schools.
Place: Malkapur, 20/07/2020 **Female FGD**	Total-3 Male-0 Female-3	During discussion it has been observed that the benefits of the proposed project area acknowledged by the local people but they want the Executing Agency, to take care of the implementation of the project to bring about promised benefits and the traffic safety. Simultaneously a focus group discussion with all female participants was held in the same area.	The female participants apprehend about the increase in the number of road accidents and would be dangerous to the children and students who usually not careful using the roads.	It has been suggested to make traffic safety awareness campaign at the schools and localities. It is also learnt that an NGO would be recruited for developing the awareness of the people of PIA regarding, trafficking, gender issues and other social stigmas.

Date / Place	No of Participants	Major Issues	Agreed upon	Mitigation Measures - Input to technical Design
Place: Majadabri-2, 20/07/2020	Total-6 Male-6 Female-0	If the existing road is to be improved, there is loss of residential & commercial and religious structure. The livelihood loss of the people is apprehended. Therefore, the local people had trade of this loss for future development. The local were positive about development. As per the suggestions received through public consultation, the proposed project and its benefits is the only feasible option for development of the area. The main point of discussion was to keep safe two religious structures.	The proposed road project is the only feasible option for development.	The people agreed to cooperate and help in all possible ways for the successful of the project. As the people are very much against the demolishing the religious structures some less PRoW would be acquired.
Place : Kayarappur, 20/07/2020	Total-7 Male-7 Female-0	The town is basically a trading hub. The cultivators as well as the traders are concern of selling their agricultural and industrial output at proper price. Though the town lacks in many infrastructural facilities, but they think that with better communication there would be economic development their prosperity. All other issues would be solved automatically. As this proposed road is the only communication to the outer world they want the road to be completed within schedule time.	The road after constructed would have major impact on both the economic and social life of the locals of the area.	The road is expected to be completed by two years.
Place : Uzanpetla, 21/07/2020	Total-8 Male-8 Female-0	The livelihood loss of the people is apprehended. The local people want some jobs of unskilled labour and petty supplier to the Civil Contractor. The local were positive about development. As per the suggestions received through public consultation, the proposed project and its benefits is the only feasible option for development of the area.	The proposed road project is the only feasible option for development.	The people agreed to cooperate and help in all possible ways for the successful of the project. The PWD assure to provide jobs and petty contract as many as possible to the local people.
Place : Baniyamari, 22/07/2020	Total-5 Male-5 Female-0	The existing alignment passes through the town area. It is also a junction town and many Goods vehicles passes through the town. There are both commercial and residential establishments along the alignment. As the proposed road will allure the motorist to drive fast there would be increase in road accident.	Combined effort of the local authorities with the Government officials as well as the other stake holders would remove all the obstacles for development. Road Safety will be looked after.	The local authorities also assured that they would help in development of road project. Road safety awareness campaign should be made at schools. There would ample signage and other road furniture to reduce the accident.

Date / Place	No of Participants	Major Issues	Agreed upon	Mitigation Measures - Input to technical Design
Place : Bhatipetla, 22/07/2020	Total-7 Male-6 Female-1	A detailed public consultation was organized with the potential project affected persons, people's representatives, shopkeepers, businessmen, and others regarding the project benefits and vis-à-vis estimated loss. The most important topic of discussion was the alignment which passes through the two-market complex, which is fully affected. The residents with their representatives all disagree in demolishing of the market complex, partially or fully.	The local people had agreed in the view of the proposed road project which will bring some hope to the movement of the heavy vehicles and development of the area but against any damages to the market structures..	There is no impact to the market as there is available for RoW outside the market. The PWD officials had agreed to take special care for traffic movement and road safety.
Place : Paglahat, 23/07/2020 **Female FGD**	Total-8 Male-0 Female-8	Focus Group discussion with the Female population reveals that there is need for training of the locals in handicrafts mainly weaving. During discussion it has been observed that skills of weaving, tailoring, making of small artefacts of bamboo are almost at a dead end. The local females want the Executing Agency to take care of the proper training and marketing of the same. The female participants apprehend about the increase in the number of road accidents.	The female agree to form Self Help Group at the localities to jointly produce and market the handicrafts of the PIA.	An NGO would be recruited for developing the awareness of the people of PIA regarding road safety, trafficking, gender issues and other social stigmas. The NGO would also entrusted to train and to do market survey for marketing of the handicraft products.
Place : Paglahat, 23/07/2020	Total-14 Male-14 Female-0	It is also a junction town and many goods and vehicles pass through the town. There are both commercial and residential establishments along the alignment. Some of them also put the issue of construction of concrete drains for the development of the sewage system of the town.	Combined effort of the local authorities with the Government officials as well as the other stake holders would remove all the obstacles for development.	The local authorities also assured that they would help in development of roads project. Road safety awareness campaign should be made at schools.
Place : Dumardaha, 24/07/2020	Total-6 Male-5 Female-1	If the existing road is to be improved, there is loss of residential & commercial and religious structure. But the local were positive about development. The main point of discussion was health and education which is poor in the area due to lack of communication.	The proposed road project is the only feasible option for development.	The people agreed to cooperate and help in all possible ways for the successful of the project.

Date / Place	No of Participants	Major Issues	Agreed upon	Mitigation Measures - Input to technical Design
Place: Kachari Hat, 20/07/2020	Total-8 Male-8 Female-0	There is no major issues to be confronted. The town is basically a trading hub. The cultivators as well as the traders are concern of selling their agricultural and industrial output at proper price. Though the town lacks in many infrastructural facilities, but they think that with better communication there would be economic development their prosperity. All other issues would be solved automatically.	The road after constructed would have major impact on both the economic and social life of the locals of the area.	The road is expected to be completed by two years and being look as a positive step to future..
In addition to the above specific public consultations and FGDs the peoples were also consulted. In the villages the impact of social and economic are more. In all the villages the access to the market would increase and based on this the valuation of land and properties would also increase.				

Source: JICA Survey Team

Community perceptions about the project during the scoping level consultation can be summarized as follows:

- The stakeholders become much aware of the development schemes.
- At the same time influence and share the control over these initiatives, decisions and resources.
- A major outcome of consultation during the initial stage of project implementation can be noted in terms of assessment of the affected area having PWD land and the private land.
- Community consultations will help to avoid opposition to the project, which is otherwise likely to occur at any stage or time.
- The Community were ready to support the project implementing authority as they understood that the project will improve local infrastructures and businesses as well as establish improved connection with other parts of the state in terms of education, health care, trade and commerce and tourism etc.

(3) Pictures and Supplementary Information of the Consultation at Scoping Level

	Focus Group Discussion with the distinguish personalities at the Panchayat Office at Dumardaha Dhubri District on dated 24/07/2020. The detail alignment of the proposed road was discussed and also the benefits of the proposed road were discussed at a length. The persons attend the meeting have put forward some suggestions which was conveyed to the local PWD. Six participants (all male) attended the meeting.
Focus group discussion at Majadabri-2 Market Of Kokrajhar District on dated 20/07/2020 was held with the landowners and agricultural labourers (six persons all male). The PAPs were aware of the project but anxious to know the benefits (compensation and assistance) the project would provide them in lieu of land acquisition.	

	Focus group discussion maintaining social distance was held with the landowners and agricultural labourers (five persons all male) who would be affected by the project and the alignment were explained in detail. Detailed understandings regarding the affected peoples' perceived benefits and losses in relation to the project were developed and the affected peoples' views on the project were recorded. People are aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development at Baniyamari village on dated 22/07/2020.
Focus Group Discussion with about fourteen persons (all male) was held maintaining social distancing. The Panchayat Member of the village, in presence of the Survey Coordinator, explains the local people about the detail of the project. All the queries of the villagers were answered. Detailed understandings regarding the affected peoples' perceived benefits and losses in relation to the project were recorded Place: Paglahat at Dhubri District Dated 23/07/2020.	
	Meetings were held with the affected people. People are aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. Place: Sriram Pur Bazar At Kokrajhar District Date: 20/07/2020 About thirteen persons attended the meeting of which no are female.
FGD with the female members (eight members all female) of the PAHs at Paglahat on dated 23/07/2020 is being carried on the proposed project road. The Affected persons were also explained in detail about the projects and their entitlements. People are made aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. It was noted that the women apprehended with the improvement of the road they would have more strangers coming to their habitation and does not feel safe with increased number of strangers.	

	Informal consultation with the youths at Kyarappur Market area is being done on dated 20/07/20 on the proposed project road to understand their views and needs. The youths were also explained in detail about the projects and their entitlements about trainings. It was noted that the participants apprehended that with the improvement of the road they would have more strangers coming to their habitation.
	Detailed discussion in front of a community structure was held to understand the requirement of the affected community and their vision for the rehabilitation of the same. The perceived benefits and losses in relation to the project were also discussed and the views of the local people regarding the project were recorded. People are aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. Place: Kachari Hat at Dhubri District Date: 25/07/2020, About eight persons all are male attended the meeting.
The work was progress on affected people and collected the data from the villagers. People are made aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. About three persons attended the meeting of which all are female. Place: Malkapur in Kokrajhar District Date: 20/07/2020	
	Conducting information of the affected people is being done on the proposed project road. The Affected persons were also explained in detail about the projects and their entitlements. People are made aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. The conception and myths regarding the developmental works were also noted. About eight persons attended the meeting of which all are male. Place: Uzanpetla at Dhubri District Date: 21/07/2020

	Meetings were held with the affected people. People are aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. About seven persons attended the meeting of which six are male and one female. Place: Bhatipetla at Dhubri District Date: 22/07/2020
Key Informant Interview was Held On Balajan Panchayat Office At Dhubri District on dated 21/07/2020.	
	Key Informant Interview on Modhusulmari Panchyat Office at Dhubri District on dated 25/07/2020.
Key Informant Interview at Golakganj BDO office in Agomani area at Dhubri District on dated 23/07/2020.	

	Key Informant Interview at Tiyamari Pradhan Office at Dhubri District on Dated 21/07/2020.
Key Informant Interview at Paglahat Panchyet Pradhan at Dhubri District on Dated 23/07/2020.	

Source: JICA Survey Team

Figure 7-67: Pictures and Supplementary Information of the Consultation at Scoping Level

7.11.3 Stakeholder Consultation at the Draft Final Report Level (12-19, Aug. 2020)

(1) Methodology

Discussion with the Block Development Officer was arranged. Resource persons from each cluster/village/ habitation were invited in the meeting on 03.08.2020 at the office of the BDO of Hatidura, Golukganj and Gouripur at Dhubri District. At the meetings with the Panchayat of Tamarhat, Tiyamari-Madhusuimari and Madhusuimari, resource persons/ Village Head/ Gaon Bura were given the printed leaflets and the meeting dates were fixed.

The statement in the leaflets was explained to the resource persons so that they could disseminate the information at the individual PAP level. These resource persons informed local people about the dates of the meeting and regularly update the information.

Local Persons were inducted in the JICA Survey Team to facilitate the consultation. When the schedule of the meetings was changed, it was updated through the resource persons. Resource persons discussed to finalize the place of the meeting.

The female Panchayat members were explained about the project and its impacts in details to disseminate the information to the local female residents. The leaders of the female Self Help Groups (SHGs) were consulted and explained the same in details, then subsequently disclosed the same in simple language to the local female members.

Due to Pandemic situation large gatherings were avoided and the consultations with the representatives were carried out at some places.

On the appointed date and time, JICA Survey Team carried out the consultations and focus group discussions (FGDs) with the local population, mainly their representatives. A dedicated mobile number and an email address printed in the leaflets were shared with all the population for further queries and explanation.

(2) Result of the Public Consultation at DFR Level

The second stage Public Consultation which is based on draft final report of the project has been conducted in eight locations from 16.08.2020 to 24.08.2020 after informing stakeholders as per JICA guidelines. The second stage public consultations were planned from 06.08.2020 but due to the pandemic situation social gatherings were prohibited by the state government in early August so the public consultations were delayed.

There was no objection to the implementation of the project itself during the consultation.

Table 7-96: Consultations Performed at DFR Level

Sl. No.	Type of Consultation	Number	No. of Attendant
1	FGD	8	71
2	FGD-Female	2	18
3	KII	3	8

Source: Socio-Economic Survey on June- July2020

Table 7-97: Questions/Opinions and Response by NHIDCL or Local Authority during Public Consultation

Sl. No.	Questions/opinions	Response by NHIDCL or Local authority
1	Have no title documents but have standing crop, plants ahd fish farming. What will be compensation process?	NHIDCL officials and PWD explained him the provisions of the Right to fair compensation and transparency in land acquisition, rehabilitation and resettlement act, 2013 (RFCTLARR 2013) and Assam RFCTLARR Rules, 2015 and Policy guidelines of JICA will be applicable for livelihood impact.
2	My farmland may get impacted by road construction due to dumping of soil and other construction material, can it be avoided? Is there compensation for such damage if they occur?	PWD mentioned that any such damage will be covered by the NHIDCL and the provisions of Right to fair compensation and transparency in land acquisition, rehabilitation and resettlement act, 2013, Assam RFCTLARR Rules, 2015 and Policy guidelines of JICA will be applicable.
3	Is there any provision for training the ST being impacted	Yes, as per RFCTLARR-2013, Assam RFCTLARR Rules, 2015 and Policy guidelines of JICA there is a provision for resettlement & rehabilitation. BTC also has elaborate programs for Rehabilitation and upgradation of ST.
4	My livelihood is being impacted; will I get regular job?	RFCTLARR-2013, Assam RFCTLARR Rules, 2015 and Policy guidelines of JICA has provisions for training/skill development and also it's possible to work at the project site if you're qualified.
5	Request from Dhubri market people was to highlight the road alignment. They want the alignment to shift as to minimise the impact on structures at market.	The selected alignment does not affect Dhubri market. The impact assessment considering all related aspects was conducted before arriving at best possible alignment.
6	My house is getting impacted, please tell me know the resettlement and rehabilitation plan.	As per the provisions of RFCTLARR-2013, Assam RFCTLARR Rules, 2015 and Policy guidelines of JICA will be applicable and necessary compensation will be provided to the affected people
7	Can you please share the details about compensation for structure for various categories that will get impacted? Can it be made available through SDM office to all PAP's	The compensation will be done as per RFCTLARR-2013, Assam RFCTLARR Rules, 2015 and Policy guidelines of JICA for the complete structure.
8	Why are you following an outdated act of 2013 in the year 2019? Why not update the act as per today?	NHIDCL officials clarified that RFCTLARR-2013 act is same however, the market rates for compensation and rehabilitation are subject to the local current average market rates.
9	What is the plan for training and reskilling of effected people?	NHIDCL conducts multiple training from time to time for local PAP in conjunction with local administration and contractors.
10	Temple is being impacted by the road widening. Request you to change the alignment to save the structure and respect the religious sentiments of locals.	The boundary of the big temple will be partly affected and compensated. The small temple ($1m^2$) opposite the big temple across the road is affected, but it is relocated nearby.

Source: JICA Survey Team

Table 7-98: Description of the Public Consultation at DFR Level

Date / Place	No of Participants	Issues Discussed	Mitigation Measures Adopted
Place: Kalyanpur, 17.08.2020	Total 7 persons 5 male and 2 female	1. The people are enthusiast about development of the road as this is the only mode of communication to the outer world but worried about the safety of the students coming to the school by foot or bicycle as they frequently have to go to earthen shoulder with the movements of heavy vehicles. 2. The teacher demanded speed breaker on both the side of the school. 3. To increase awareness about the road safety measures as the area witness high and heavy traffic	1. The PWD assures that there would be paved shoulders and also the black top would be more 7.5m at this place 2. It was agreed to put traffic calming measures all along the school zone. 3. It was also agreed that a road safety campaign would be undertaken in collaboration with the schools.
Place: Barundanga on 17/08/2020 (Female FGD)	Total 10 persons female is 9 and male is 1	1. Most of the women are petty shopkeepers or customers and they want a proper market to be constructed by the authority. 2. There is no permanent shade for bus stop/auto stand. 3. The condition of the road is very bad during monsoon. 4. There is no government transport facility available at this area.	1. The PWD assures to inform the Authority for construction of the market as this is beyond the scope of this project. 2. Proper bus stop/auto stand is proposed in the design. 3. The proposed road will be all weather road and the condition would be much better. 4. It would be proposed to the Transport Department to provide transport facilities in this area.
Place: Paglahat Village Date: 17.08.2020	Total 8 persons all are male	1. A detailed public consultation was organized with the potential project affected persons, people's representatives, shopkeepers, businessmen, and others regarding the project benefits and vis-à-vis estimated loss. 2. There is huge movement of heavy vehicle carrying river bed materials/sands from the river during summer which causes major problem for the local traffic and residents.	1. The local people were assured that there would be proper compensation and assistance as per the legal provision of the state of Assam as well as per the guidelines of ADB. 2. The PWD officials had agreed to take special care for traffic movement and road safety.

Date / Place	No of Participants	Issues Discussed	Mitigation Measures Adopted
Place: Uzanpetla at Dhubri District 18.08.2020	Total 10 male and 7 female members of the locality who are going to be impacted	1. With the proposed alignment of the existing road, there will be loss of residential, commercial and religious structures. The people want to know the compensation, assistance and other benefits that would be provided by the project. 2. The livelihood loss of the people is apprehended. The measure that the project is proposing to restore their loss in livelihoods. 3. The other point of discussion was health and education which is poor in the area. The local people want a higher secondary school at their area.	1. It was assured that there will be proper compensation and assistance to all the impacted persons as per the Assam RFCTLARR Rules, 2015 and as per the guidelines of JICA. All the CPRs would also be reconstructed or restored. The Entitlement Matrix is shared. 2. The project would provide training to upgrade/acquire skills to restore livelihoods. There would be also support from the projects in various ways to restore the livelihoods of the impacted persons. 3. It was assure by the PWD that there demand of higher secondary school would be forwarded as it is beyond the scope of this project.
Place: Madhusulmari, BDO Office Dhubri District 18.08.2020	Total 4 persons all are Male	1. BDO was interested with the project and appraise about the village members about the details of the project 2. Requested to provide petty contracts to the local youths	1. The compensation and Assistance would be provided as per the Entitlement Matrix. 2. The civil contractor will also be advised to provide petty contracts to the local youth.
Place: Paglahat, BDO Office Dhubri District 16.08.2020	Total 5 persons all are Male	1. The main point of discussion was to save a temple or reconstruct the temple. The temple committees chairman also agreed to provide land for new construction of the temple. 2. A detailed public consultation was organized with the potential project affected persons, people's representatives, shopkeepers, businessmen, and others regarding the project benefits and vis-à-vis estimated loss.	1. It was assured that all the CPRs that might be impacted will be restored/reconstruct /resettle/ rehabilitated. 2. The local people were assured that there would be proper compensation and assistance as per the legal provision of the state of Assam as well as per the guidelines of JICA.
Place: Balajan, Panchayat Office Dhubri District 16.08.2020	Total 6 persons all are Male	1. A detailed public consultation was organized with the representatives of the potential project affected persons, people's regarding the project benefits and vis-à-vis estimated loss.	1. The elected representatives of the area were explained the detail compensation, assistance, training and other benefits of the project.

Date / Place	No of Participants	Issues Discussed	Mitigation Measures Adopted
Place: Srirampur at Kokrajhar District	Three male and three female land owner family and friends	1. There is very mild impact of the residential structures at the Villages and the people are mostly interested in construction of the road. 2. Public consultation was organized with the potential project affected persons, regarding the project benefits and vis-à-vis estimated loss. 3. The road accident will increase 4. There should be a waiting shed at the area. 5. There should be a proper drainage facilities 6. The people are anxiously waiting for the completion of the road and the project should not be kept in waiting for years.	1. The EA assured to minimize the impact on the structures during actual implementation. 2. The Compensation and assistance as per the laws and policies they are eligible was discussed. 3. It was assured that the design will ensure safer movement of traffic 4. There would be waiting shed as per the design. 5. Road drains are part of the design. 6. The project is expected to be completed by two and half years
Place: Baniyamari Panchyat Pradhan at Dhubri District on 17/07/2020	Panchayat Pradhan	The person was keen to know the details of the eligibility and entitlement of the project	The Panchayat Pradhan was explained in details the eligibility and entitlement of the project and was assured that there would be proper compensation and assistance as per the legal provision of the state of Assam as well as per the guidelines of JICA.
Place: Kumargang Dhubri 18.08.2020	Total 17 male members of the locality who are going to be impacted	1. With the proposed alignment of the existing road, there will be loss of residential, commercial and religious structures. The people want to know the compensation, assistance and other benefits that would be provided by the project. 2. The livelihood loss of the people is apprehended. The measure that the project is proposing to restore their loss in livelihoods. 3. The other point of discussion was health and education which is poor in the area due to lack of communication.	1. It was assured that there will be proper compensation and assistance to all the impacted persons. All the CPRs would also be reconstructed or restored. 2. The project would provide training to upgrade/acquire skills to restore livelihoods. There would be also support from the projects in various ways to restore the livelihoods of the impacted persons. 3. It was assured by the PWD that there demand of PHC would be forwarded as it is beyond the scope of this project.
Place: Vatipetlla in Dhubri District 18.08.2020	18 members all are female	1. During discussion it has been observed that the benefits of the proposed project area acknowledged by the local people but they want the Executing Agency, to take care of the implementation of the project to bring about promised benefits and the traffic safety. 2. The most important topic of discussion was the increase of the numbers of strangers.	1. The road could be widening by avoiding any major impact on both the settlement. It has been suggested to make traffic safety awareness campaign at the schools and localities. 2. It is also learnt that a NGO would be recruited for developing the awareness of the people of PIA regarding, trafficking, gender issues and other social stigmas.

Date / Place	No of Participants	Issues Discussed	Mitigation Measures Adopted
Place: Tamarhat in Dhubri District 12.08.2020	14 males and 4 females	1. Public consultation was organized with the potential project affected persons, regarding the project benefits and vis-à-vis estimated loss. 2. There would be no impact to the structures and the people are anxiously waiting for the completion of the road.	1. The compensation and assistance as per the laws and policies they are eligible was discussed. 2. The project is expected to be completed by two and half years.
Place: Basantpur in Dhubri District 18.08.2020	Eight Persons all are male	1. A detailed public consultation was organized with the potential project affected persons, people's representatives, shopkeepers, businessmen, and others regarding the project benefits and vis-à-vis estimated loss. 2. The local residents with their representatives demanded proper road safety structures to be introduced in the design.	1. The compensation and assistance as per the laws and policies they are eligible was discussed, 2. It was assured that the design will ensure safer movement of traffic.

Source: JICA Survey Team

(3) Pictures and Supplementary Information of the Consultation at DFR Level

	Focus Group Discussion with about eighteen persons (all male) was held maintaining at Naisapur village of Kokrajhar District on 19/08/2020. The Survey Coordinator, explains the local people about the detail of the project. All the queries of the villagers were answered. Detailed understandings regarding the affected peoples' perceived benefits and losses in relation to the project were recorded.
Handing over the leaflet as part of the disclosure process at Majadabri-2 Village of Kokrajhar District on 19/08/2020 was held with the landowners and agricultural labourers (six persons of them three are male and three female). The PAPs were aware of the project but anxious to know the benefits (compensation and assistance) the project would provide them in lieu of land acquisition.	

	Focus group discussion maintaining social distance was held with the landowners and agricultural labourers who would be affected by the project and the alignment were explained in detail. People are aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development at Kalyanpur village on 17/08/2020.
Focus Group Discussion with about eight persons (all male) was held maintaining social distancing. At the residence of Village Headman and local Panchayat representatives as a part of the disclosure explained the local people about the detail of the project benefit and compensation. All the queries of the villagers were answered. Place: Paglahat at Dhubri District Dated 17/08/2020.	
	Meetings were held maintaining social distancing with the affected persons and also the women member of the village panchayat. Place: Srirampur at Kokrajhar District Date: 19/08/2020 About six persons attended the meeting of them five are female and two male and the details of the compensation, training and other benefits of the project is discussed as part of the project disclosure.
FGD with the female members (eight members all female) at Barundanga on 17/08/2020 is being carried on the proposed project road. The Affected persons were also explained in detail about the projects and their entitlements as part of the project disclosure. People are made aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. It was noted that the participants apprehended that with the improvement of the road they would have more strangers coming to their habitation.	

	Informal consultation on 19/08/20 with the village artisans at Kyarappur village area is carried out as a part of the disclosure to understand their need and ambition. The youths were also explained in detail about the projects and their entitlements about trainings. It was noted that the participants apprehended that with the improvement of the road they would have more strangers coming to their habitation. About four persons attended the meeting all are female.
	Informal consultation with the affected people from the villages. The perceived benefits and losses in relation to the project were also discussed and the views of the local people regarding the project were recorded as a part of the disclosure. People are aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. Place: Kachari Hat at Dhubri District Date: 18/08/2020, About eight persons all are male attended the meeting.
The women panchayat member is made aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. About three persons attended the meeting of which all are female. Place: Kembolpur No. 2 in Kokrajhar District Date: 19/08/2020	
	Conducting a formal Public Consultation at the Residence of the Village Chairman as a part of second stage consultation. The information of the meeting was given on 12.08.2020 and the affected people had attended the meeting on 18.08.2020. The Affected persons were explained in detail about the projects and their entitlements. It was noted that the participants apprehended that with the improvement of the road they would have more strangers coming to their habitation. About eighteen persons attended the meeting of which eight are male and ten are female. Place: Uzanpetla at Dhubri District Date: 18/08/2020

	Informal meeting were held with the affected people. People are aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. Place: Bhatipetla at Dhubri District Date: 18/08/2020
Informal meetings were held with the affected peopl in Anandapur of Kokrajhar District on 19/08/2020. People are made aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. About six persons attended the meeting of which five are female and one male.	
	Focus group discussion at KamalarJhar Village Of Dhubri District on 19/08/2020 was held with the landowners and agricultural labourers (six persons of themthree are male and three female). The PAPs were aware of the project but anxious to know the benefits (compensation and assistance) the project would provide them in lieu of land acquisition.
	Second Stage Public consultation was held at Madhusulmari Panchayat Office of Dhubri District on 18/08/2020 with the elected representatives of the area regarding the detail compensation, assistance, training and other benefits of the project.

Second Stage Public consultation was held at Paglahat Panchayat Office of Dhubri District on 16/08/2020 with the elected representatives of the area regarding the detail compensation, assistance, training and other benefits of the project.	
	Second Stage Public consultation was held at Balajan Panchayat Office of Dhubri District on 16/08/2020 with the elected representatives of the area regarding the detail compensation, assistance, training and other benefits of the project.
Leaflet was pasted as a part of the information disclosure at Barundanga AP School at Dhubri District on 16/08/2020.	
	Leaflet was pasted as a part of the information disclosure at the Wating shed at Matarjhar of Dhubri District on 16/08/2020

Leaflet was pasted as a part of the information disclosure at the Baniyamari Panchyet Pradhan at Dhubri District on 16/08/2020.	
	Formal second stage consultation with the Baniyamari Panchyat Pradhan at Dhubri District on 17/08/2020
Submitting the detail entitlements to the Panchayat Secretary of Paglahat Panchyat at Dhubri District on 17/08/2020	
	Distributing Leaflets at Barundanga to a local person of Dhubri District on 17/08/2020

Distributing Leaflets to a local person at Srirampur, Kokrajhar District on 19/08/2020	
	Formal meeting was held with the affected people shopkeepers and their representatives at Kumargang, Dhubri District on 17.08.2020. People are aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development but anxious about the entitlements and support the project would provide. They agreed to move their structures only after getting the compensation and assistance. About twenty-five persons attended the meeting of which all are shopkeepers or traders.
Formal discussions with women panchayat representatives and women members of SHG (Self Help Group) regarding the training and alternative livelihood options especially for the women of the area. About eighteen persons attended the meeting of which all are female. Place: Vatipetlla in Dhubri District Date: 17/08/2020	
	Formal Focus Group Discussion with about eighteen persons (four female and fourteen male) was held maintaining at Tamar Hat village of Dhubri District on 12/08/2020. As a part of the disclosure all queries of the villagers were answered. Detailed understandings regarding the affected peoples' perceived benefits and losses in relation to the project were recorded.

Meetings with the traders were held at Basantapur, Dhubri District on 18/08/2020. The traders were made aware about the positive impacts of the and also the project benefits. About eight persons attended the meeting all are male.	

Source: JICA Survey Team

Figure 7-68: Pictures and Supplementary Information of the Consultation at DFR Level

7.11.4 Consultation in Bodoland Territorial Council (BTC) Area

(1) Methodology

Discussion with the Executive Engineer of Bodoland Territorial Council was arranged. Resource persons from each cluster/village/ habitation were invited in the meeting on 04.08.2020 at the office of the Executive Engineer of Bodoland Territorial Council at Kokrajhar.

Resource persons/ village chairman were given the printed leaflets and the meeting dates were fixed. The writing of the leaflets were explained to the Resource Persons so that they could disseminate the information at the individual PAP level. These resource persons informed local people about the dates of the meeting and regularly update the information.

ST population were also informed about the project through the District Council. Local people were inducted in the JICA Survey Team to facilitate consultation. When schedule of a meeting was changed, it was updated through the resource persons. Resource persons were discussed for finalization of the place of the meeting.

The female ST members and leaders of the groups were explained in detail then they disclosed subsequently the same in simple language to the local female residents.

Due to Pandemic situation, large gatherings were avoided and the consultations with the representatives were carried out at some places.

On the appointed date and time, JICA Survey Team carried out the consultations and focus group discussions (FGDs) with the Schedule Tribe population, mainly their representatives. ST people who are eager to join it were entertained too. Leaflets were distributed among all the ST persons available. A dedicated mobile number and an email address printed in the leaflets were shared with all the ST population for further queries and explanation.

(2) Result of the Public Consultation in BTC Area

The result of the consultation in BTC area is shown in the table below.

Table 7-99: Result of the Public Consultation at BTC Area

Date / Place	No of Participants	Issues Discussed	Mitigation Measures Adopted
Place: Kyarappur Village 17.08.2020	Total 4 persons both Male	1. The church is not pleased with the present alignment as the proposed road enters the ground in front of the church. 2. There should be parking place in front of the church. 3. The church apprehends that the development will bring evil with it in the present society.	1. It was assured that the church will be safe and there would be no damage of any of the church area/property. Only the part of the ground outside the church boundary would be impacted. 2. The ERoW would be at least 30m in front of the church which will not hamper the parking facilities. 3. It is also explained that an NGO would be recruited for developing the awareness of the people of PIA regarding, trafficking, gender issues and other social stigmas.
Place: Anandapur Village Date: 18.08.2020	Total 9 persons all are male	1. With the proposed alignment of the existing road, there will be loss of residential, commercial and religious structures. The people want to know the compensation, assistance and other benefits that would be provided by the project. 2. The livelihood loss of the people is apprehended. The measure that the project is proposing to restore their loss in livelihoods. 3. The other point of discussion was health and education which is poor in the area. The Local people want a PHC/HWC (Primary Health Centre/ Health and Wellness Centre) in the area.	1. It was assured that there will be proper compensation and assistance to all the impacted persons as per the Assam RFCTLARR Rules, 2015 and as per the guidelines of JICA. All the CPRs would also be reconstructed or restored. The Entitlement Matrix is shared. 2. The project would provide training to upgrade/acquire skills to restore livelihoods. There would be also support from the projects in various ways to restore the livelihoods of the impacted persons. 3. It was assured by the PWD that there demand of PHC would be forwarded as it is beyond the scope of this project.
Place: BCDC Office, 17.08.2020	Total 4 persons all are Male	1. A village Chairman proposed to provide employment of a few locals in the project. 2. Also proposes to provide petty contracts to the local youths.	1. Providing permanent employment is beyond the scope of this project. But the Civil Contractor will be advised to employ as many as local youths as possible. 2. The Civil Contractor will also be advised to provide petty contracts to the local youth.

Date / Place	No of Participants	Issues Discussed	Mitigation Measures Adopted
Place: Naisapur, Kokrajhar 18.08.2020	Three male and three female landowners	1. There is very mild impact of the residential structures at the villages and the people are mostly interested in construction of the road. 2. Public consultation was organized with the potential project affected persons, regarding the project benefits and vis-à-vis estimated loss. 3. The road accident will increase. 4. There should be a waiting shed at the area. 5. There should be a proper drainage facility. 6. The people are anxiously waiting for the completion of the road and the project should not be kept in waiting for years.	1. The EA assured to minimize the impact on the structures during actual implementation. 2. The compensation and assistance as per the laws and policies they are eligible was discussed. 3. It was assured that the design will ensure safer movement of traffic. 4. There would be an waiting shed as per the design. 5. Road drains are part of the design. 6. The project is expected to be completed by two and half years
Place: Kembolpur, Kokrajhar 18.08.2020	Five female landowners including the Panchayat Member	1. Public consultation was organized with the potential project affected persons, regarding the project benefits and vis-à-vis estimated loss. 2. There should be a waiting shed at the area. 3. There should be street lighting throughout the alignment.	1. The Compensation and assistance as per the laws and policies they are eligible was discussed. 2. There would be waiting shed as per the design. 3. Street lighting will be provided as per the IRC codes.

Source: JICA Survey Team

(3) Pictures and Supplementary Information of the Consultation at BTC Area

	Second Stage public consultation started with the meeting with Executive Engineer of Bodoland Territorial Council at his Kokrajhar Office on 04/08/2020 with the village chairman/representatives of the area regarding the fixation of the date of meeting for discussion regarding the details of compensation, assistance, training and other benefits of the project. The dates were fixed from 06.08.2020 but delayed for the Pandemic situation and started on 16.08.2020
Group Discussion at Anandapur at Kokrajhar on 18.08.2020. Meetings were held with the affected people. Detailed understandings regarding the affected peoples' perceived benefits and losses in relation to the project were developed and the affected peoples' views on the project were recorded. People are aware about the about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. The affected people were provided with the details about the financial compensation / assistance that to be provided against their losses in commercial and residential structures.	
	Second stage public consultation was held at Kyarappur Church at Kokrajhar District on17/08/2020. The pastor of the church and elected representatives of the area were consulted regarding the detail compensation, assistance, training and other benefits of the project.

Second stage public consultation was held at Jacobpur Panchayat Office of Dhubri District on17/08/2020 with the elected representatives of the area regarding the detail compensation, assistance, training and other benefits of the project.	
	Second stage public consultation was held at BCDC Office at Jacobpur at Kokrajhar District on17/08/2020 with the elected representatives of the area regarding the detail compensation, assistance, training and other benefits of the project.
Focus Group Discussion with about eighteen persons (all male) was held maintaining at Naisapur village of Kokrajhar District on 19/08/2020. All the queries of the villagers were answered. Detailed understandings regarding the affected peoples' perceived benefits and losses in relation to the project were recorded.	
	The women panchayat member is made aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. About three persons attended the meeting of which all are female. Place: Kembolpur 2 No in Kokrajhar District Date: 19/08/2020

Source: JICA Survey Team

Figure 7-69: Pictures and Supplementary Information of the Consultation at BTC Area

7.12 Climate Change and other gaseous emissions

7.12.1 Climate Change Analysis

(1) Mitigation Measures

GHG emissions were estimated for each year using Highway Development and Management Model (HDM-4) version 2.1. It was calculated for normal traffic and diverted traffic (where applicable), and the benefit was estimated as the sum of these savings. Major input figures by vehicle type used as basis for calculation for emissions for NH127B Assam are presented in the tables below.

Table 7-100 Unit Values for VOC by Vehicle Type for NH127B Assam

(Unit: INR)

Vehicle Type	New Vehicle/ Purchase Cost	Replace Tyre	Fuel (per litre)	Lubr. Oil (per litre)	Maint-Labour (per hr)	Crew Wages (per hr)	Annual Overhead
Motorcycle	50,000	2,000	34.00	102.00	32.00	0.00	2,160
Small Car	500,000	4,000	32.00	102.00	50.00	0.00	25,000
Mini Bus	1,000,000	4,500	34.00	102.00	50.00	120.00	50,000
Heavy Bus	1,500,000	7,000	34.00	102.00	50.00	120.00	67,500
LCV	600,000	4,050	34.00	102.00	50.00	60.00	50,000
2-Axle truck	2,000,000	9,000	34.00	102.00	50.00	60.00	80,000
3 Axle truck	2,500,000	9,000	34.00	102.00	50.00	60.00	90,000
Multi Axle	3,000,000	9,000	34.00	102.00	50.00	60.00	120,000
Tractors with Trailors	600,000	10,000	34.00	102.00	42.00	50.00	40,000
Rickshaw	10,000	-	-	-	-	40.00	-
Bicycle	2,700	-	-	-	-	50.00	-

Source: JICA Survey Team

Table 7-101: Unit Values for TTC by Vehicle Type for NH127B Assam

(Unit: INR)

Base Type	Passenger Work Time (per hr)	Passenger Non-Work (per hr)	Cargo Holding (per hr)
Motorcycle	58.00	17.00	0.00
Small Car	81.00	24.00	0.00
Mini Bus	46.00	14.00	0.00
Heavy Bus	46.00	14.00	0.00
LCV	0.00	0.00	5.00
2-Axle truck	0.00	0.00	10.00
3 Axle truck	0.00	0.00	10.00
Multi Axle	0.00	0.00	20.00
Tractors with Trailors	0.00	0.00	3.00
Rickshaw	30.00	-	0.00
Bicycle	0.00	-	0.00

Source: JICA Survey Team

CO2 reduction can be mainly attributed to less of traffic congestion. The emissions will be reduced after 2023 due to the decrease in congestion.

Table 7-102: Result of the Emissions

	WITHOT	WITH	Difference
	Carbon dioxide CO2	Carbon dioxide CO2	Carbon dioxide CO2
2022	40,822	40,822	-
2023	43,302	41,619	- 1,684
2024	47,696	42,106	- 5,590
2025	49,839	44,259	- 5,580
2026	52,740	46,505	- 6,236
2027	55,318	48,866	- 6,452
2028	58,147	51,348	- 6,800
2029	61,058	53,957	- 7,102
2030	64,589	56,702	- 7,887
2031	67,522	59,592	- 7,930
2032	71,443	62,636	- 8,806
2033	75,680	65,844	- 9,836
2034	79,078	69,227	- 9,851
2035	83,842	73,072	- 10,770
2036	89,038	78,447	- 10,591
2037	93,798	81,535	- 12,264
2038	98,849	85,750	- 13,099
2039	105,078	90,904	- 14,173
2040	109,417	94,343	- 15,075
2041	117,640	100,868	- 16,772

Source: JICA Survey Team

(2) Adaptation Measures

Reduction and destruction of operability of important road infrastructure facilities due to extreme weather

- Closure of roads due to sediment landslides and mud flow into roads, and the consequent social impacts
- Safety deterioration of roads due to inflow of sediment and landslide, and damage to infrastructure.

Closure of transportation instruments and reduction in return on investment due to road closures

- Flooding causes river migrations in fans and flooding of roads

Thunderstorm rain and sea level rise in coastal areas

- Progression of corrosion due to increased salinity
- Road erosion, seawater inundation, or seawater influx into groundwater due to increased waves and floods, and the incidence of groundwater flooding associated therewith

- Damage to coastal infrastructure protection equipments, including roads, due to the increase in storm surges and high waves. Induction of collapse of abutments and embankments.

Effects of temperature and precipitation pattern changes

- Deterioration of construction efficiency due to shortage of water supply during construction
- Penetration of water into the filler due to increase in groundwater content and the collapse of roads associated therewith
- Permanent flooding of roads due to surface waters and groundwater flooding (increase water level)
- Damage to bridges due to increased debris flow in the catchment of water

Damage to the infrastructure due to strong winds

- Damage of vertical signs (signs, etc.) due to strong winds
- Increase in accidents and road closures caused by fallen trees

The following are examples of adaptation options for hard and soft surfaces in the road sector.

Hardware Adaptation Options

- Rehabilitation of infrastructure to ensure protection, redesign or relocation of road facilities
- Protect roadway corridors by installing physical protection structures such as revetments and levees (such as revetment equipments)
- Introduction of enhanced drainage systems that can cope with heavy rains and flooding
- Consider future temperature changes when selecting asphalt cements and emulsions

Soft adaptive options

- Provides road access to hospitals and shelters, and enables the distribution of medical supplies, especially in emergencies
- Improve early warning systems and hazard maps for floods, storms, and soil engineering risks

These adaptation measures should be introduced considering the technical feasibility, cost-effectiveness, geographic conditions of the area, and socio-economic characteristics of the population served by the NH208.

Chapter 8. Implementation Plan

8.1 Procurement Plan

8.1.1 Development of Procurement Model for Road Projects in India

The Government of India (GOI) has decided to build national highways with Public Private Partnership (PPP) scheme since 2005, and has been using the build-operate-transfer (BOT) model for the procurement contracts. However, the GOI faced problems such frequent cost and time overrun because of aggressive bidding, stretched financial position of road developers, and decelerating global and domestic economic growth.

Due to these problens, the GOI has frequently had unsuccessful biddings and contractual defaults which have led to a review of the contract models. Under such ciscumstance, MORTH has decided to shift from the PPP models to road construction using government funds.

In 1980's GOI ceased using the conventional contract model of design-bid-build (DBB) and instead, conducted research and developed the "Standard Agreement for Road & Bridge Works on Engineering-Procurement-Construction (EPC) Model" in 2012, referring to "Conditions of Contract for EPC/Turnkey Projects (1/1999)" by FIDIC. The EPC contract model has been being used for more than 80% of national highway projects since 2013.

8.1.2 Review of Model EPC Contract and Bidding Process

The EPC contact places overall responsibility for the design and construction of the project on the contractor. Therefore, it is used when the certainty of price and completion date is important. It allows the client to have greater certainty as to a project cost, while the contractor assumes greater time and cost risks.

ADB, WB, and JICA have been conferring with GOI on alterations of the Indian EPC Standard Agreement for financing national highway projects. In response to this, the GOI published a Modified RFP Document on January 16, 2017 and Modified Standard Agreement on January 17, 2017. In March, 2019, MORTH issues the circular amended standard EPC Agreementdocument incorporating various amendments made from time to time.

For national highway development project by NHIDCL, bidders are normally required to submit bids within 30 to 45 days from the notice of tender invitation which is too short and at least 75 to 90 days should be given to prepare proper proposal. NHIDCL adopts Single-Stage Two-Envelope System. In case of JICA loan projects, time for JICA concurrence in accordance with the Loan Agreement shall be considered at required steps.

(1) Review Bidding Process

(a) Standard Bidding Document
Bidding Process is stipulated in 'Standard RFP for NH and Centrally sponsored road works proposed to be implemented on EPC Mode' dated 5th March 2019 issued by Ministry of Road Transport &Highways of Government of India.

(b) Standard Bidding process
The Authority has adopted a single stage two part system for selection of the Bidder for award of the Project. Under this process. The bid shall be invited under two parts. Eligibility and qualification of the Bidder will be first examined based on the details submitted under first part (Technical Bid) with respect to eligibility and qualifications

criteria prescribed in RFP (the above Standard Bidding Document is amended to adopt particular project)

The Financial Bid under the second part shall be opened of only those Bidders whose Technical Bids are responsive to eligibility and qualifications requirements as per the RFP. Generally, the Lowest Bidder shall be the selected Bidder. Unless the Lowest Bidder withdraws or is not selected for whatsoever reason. The Authority shall annul the Bidding Process and invite fresh Bids in case the Lowest Bidder has withdrawn.

The First Part-Technical Bid. The following information shall be provided
In accordance with the Forms attached to the Bidding Document, but not limited

i) Detail of Bidder
ii) Technical Capacity
iii) Financial Capacity
iv) Annual Turnover
v) Detail of Past Eligible Projects
vi) Failed project List
vii) Others such as JV information

(c) Brief Process up to Signing of Contract

1. Invitation of RFP (Request for proposal)
2. Authority receives queries
3. Pre-Bid meeting
4. Authority response to queries
5. Bidding with Bid Security
6. Opening First Part- Technical Bids (First Part)
7. Declaration of eligible /qualified Bidders
8. Opening Second Part- Financial Bid (Determination of the Lowest Bidder)
9. Letter of Acceptance
10. Submission of Performance Security
11. Signing of Agreement

Conclusion
The Bid process and the content of Instruction to Bidders is similar to 'Option B-Two Envelope without Prequalification of Standard Bidding Document under ODA Loan'. JST do not consider that any amendment is required.

8.1.3 Selection of Consultant

Consultant for supervision services (Authority's Engineer) will be procured by International Competitive Bidding (ICB) following the Guidelines for the Employment of Consultants under Japanese ODA Loans, April 2012. Selection of consultant starts from the announcement of Expression of Interest (EOI), then evaluation of EOI and shortlisting, issue of the Request for Proposal (RFP), evaluation of technical proposal, evaluation of financial proposal, contract negotiation and signing and award of the Contract. In each step, no objection from JICA should be obtained. The consultant service is to be one package only.

8.1.4 Packaging Plan and Selection of Contractors (This subsection is removed.)

8.2 Project Implementation Framework

8.2.1 Organization of NHIDCL

NHIDCL, as a fully owned company of MORTH was established on January 01, 2015 and it promotes surveys, planning, designs, constructions, operations, maintenance and improvements of national highways and strategic roads such as cross border roads sharing international boundaries with neighboring countries. NHIDCL is still young and is expanding with new recruitments to fill vacant planned positions.

NHIDCL headquarters is based in Delhi, and the operation of the organization is managed by the Board of Directors consisting of a Chairman, Managing Director, and Directors. Under the Board of Directors, there are the Executive Director, General Managers, Deputy General Managers, Mangers, Deputy Managers and Office Assistant.

There is a regional office in Guwahati with Executive Director and Deputy General Manager. In each state, Office Manager and Deputy General Manager are assigned.

The financial status of NHIDCL is shown in the table below. Revenue from operation consists of agency charge (1% on copmpensation for land acquisition, forest clearance and utility shifting etc., 3% on DPR preparation, civil works and contingencies, and 9% on maintenance of highways). Other income includes interest income, other miscellaneous income and profit on sales of fixed assets. Total expenditure includes employee benefit, bank chages and other expenses such as rent, advertisement, outsources manpower, travelling, CSR etc. Profit after tax has been increasing and recorded approximately 776 million yen in FY 2019.

Table 8-1: Financial Status of NHIDCL

Particulars	FY19 in JPY. (1.4.2018-31.3.2019)	FY18 in JPY. (1.4.2017-31.3.2018)	FY17 in JPY. (1.4.2016-31.3.2017)	FY16 in JPY. (1.4.2015-31.3.2016)
Revenue from Operations	1,878,420,058	1,368,434,858	622,920,261	345,396,550
Other Income	125,908,665	97,126,677	104,955,018	133,910,462
Gross Receipts	2,004,328,723	1,465,561,535	727,875,279	479,307,012
Total expenses excluding depreciation*	817,365,000	584,767,433	401,800,293	218,293,543
Profit before Depreciation and Tax	1,186,963,723	880,794,102	326,074,986	261,013,469
Depreciation*	22,475,000	18,965,984	14,819,138	8,260,431
Profit after depreciation	1,164,488,723	861,828,118	311,255,849	252,753,038
Prior Period Expenditure*	57,275,000	144,884	2,738,583	-
Profit before Tax and after Prior Period	1,107,213,723	861,683,234	308,517,266	252,753,038
Provision for Tax including deferred tax*	330,310,000	299,213,152	109,072,502	89,937,536
Profit after tax	776,903,723	562,470,081	199,444,764	162,815,502

INR=1.45 JPY

Note: for items with * for FY19, rounded up figures are presented as the precise numbers were not avaialbe in the annual report

Source: JICA Study Team based on NHIDCL's annual report

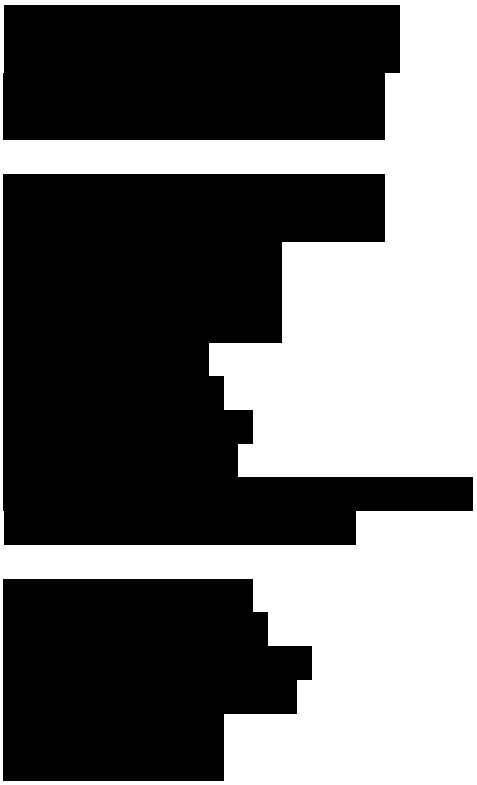
8.2.2 Project Implementation Unit

The structure of proposed project management unit (PMU) is shown below. Under the supervision of NHIDCL HQ, GM (Projects) of NHIDCL Assam will be responsible for the PMU and oversea the contractor for each package with the assist of consultant (Authority's Engineer).

8.2.3 Supervision Consultant

As mentioned in Section 8.1.3, the supervision consultant is expected in one package. The team is lead by the Team leader, respective designers who will review and verify the Contractors' detailed design and the supervision team who will be responsible for all the packages as well as back support staff. For site supervision of each package, Resident Engineer/Highway Enginner

and Material/QC Engineer as well as field engineers (5 nos), surveyor (1 no.), laboratory technician (1 no.) and CAD engineer (1 no.) will be deployed.



8.3 Project Implementation Schedule

Assuming that the loan agreement will be signed by December 2020, the construction work can commence from March 2022 and completed by February, 2024. The timing of each process of the implementation schedule is based on the following assumptions:

(1) Signing of Loan Agreement

The signing of the Loan Agreement between GOI and GOJ will be done by the end of December, 2020.

(2) Bid Document Preparation

The bid documents have already been drafted by the DPR consultants, and it will be finalized by NHIDCL by the end of May, 2021.

(3) Resettlement, Land Acquisition & Compensation

A consultant for RAP (Resettlement Action Plan) will be procured by NHIDCL and the Assam State Government will complete the resettlement, land acquisition and compensation by the end of February 2022. According to a circular notice from MORTH, land acquisition of ROW must be reach 80% before the public announcement of the bidding and 90% before awarding the civil works.

(4) Consultant Procurement

NHIDCL will commence the procurement of a consultant service for construction supervision services (authority's engineer) after the loan agreement is signed between GOI and GOJ. It can start after the pledge of the yen loan to GOI is made by JICA if GOI wishes to expedite. The awarding of the consultant service should be done by the end of February, 2022.

The procured consultant will assist NHIDCL in all stages during construction supervision service including the five years of maintenance period.

(5) Civil Works

The procurement of the contractors for civil works will be completed by February, 2023 and the contractors will commence the detailed engineering design followed by the physical works. The construction period including detailed design is 24 months for all packages until February, 2024. Five (5) years of maintenance period will follow the completion of the works until February, 2029.

8.4 Operation and Maintenance Plan

The EPC contractors of each package will be responsible for the maintenance of the road for 5 years after the completion of the construction works. The contractor will be obliged to prepare (in consultation with the engineer of NHIDCL) a maintenance program prior to the month in which the O&M will commence. The contractor will also be obliged to conduct a road inspection together with the authority's engineer. The required maintenance level shall be based on the Schedule-E Maintenance Requirement of the contract. The contractor's obligation based on the contract will include the following items during the period of the maintenance.

- Permitting safe, smooth and uninterrupted flow of traffic on the Project Highway
- Undertaking routine maintenance including; prompt repairs of potholes, cracks, joints, drains, embankments, structures, pavement markings, lighting, road signs and other traffic control devices
- Undertaking repairs to structures
- Informing the Authority of any unauthorized use of the Project Highway
- Informing the Authority of any encroachments on the Project Highway
- Operation and maintenance of all communication, patrolling, and administrative systems necessary for the efficient maintenance of the Project Highway in accordance with the provisions of the contract

Besides the fund from GOI including MDoNER, SARDP etc., NHIDCL also receives fund for maintenance and repair of highway such as special repair funds (SRF). The amount of SRF has been increasing and was 168 Crore INRs in 2017-18 and 89 Crore INRs in 2018-19. NHIDCL also outsource routine maintenance works of the existing road and so far according to the annual reports, such contracts have been awarded in states like Manipur, Andaman and Nicobar islands, Uttarakhand, Sikkim, Jammu and Kashmir.

Chapter 9. Economic Analysis

9.1 Overview

In this chapter, economic analysis of NH127B Srirampur-Dhubri (Assam) was carried out. The analysis took into consideration, among other things, the demand forecast, project scope, project cost, and implementation schedule. Economic internal rate of return (EIRR) was used as an indicator of the analysis which was calculated using the costs and benefits of the Project estimated by comparing the with- and without-project cases. The evaluation period was set at 20 years from the estimated start of the Project in 2022 to 2041 (including construction period). The methodology and results are presented below.

The result of the analysis indicates that the estimated economic return is high enough to justify the implementation of the Project for improvement of NH127B Assam from the perspective of India's national economy.

9.2 Methodology

In the economic analysis, costs and benefits were estimated by comparing the with- and without-project cases. Two types of benefits quantified in the economic analysis include travel time cost (TTC) savings, and vehicle operating cost (VOC) savings, both of which were generally used in road projects. These benefits were calculated using the equations below:

$$(\text{TTC Savings}) = \text{TTC}_\text{o} - \text{TTC}_\text{w}$$

$$\text{TTC}_\text{i} = \sum_\text{j} \sum_\text{i} (\text{Q}_\text{js} \times \text{T}_\text{ijs} \times \alpha_\text{j}) \times 365$$

$$(\text{VOC Savings}) = \text{VOC}_\text{o} - \text{VOC}_\text{w}$$

$$\text{VOC}_\text{i} = \sum_\text{j} \sum_\text{i} (\text{Q}_\text{js} \times \text{L}_\text{is} \times \beta_\text{ij}) \times 365$$

Where

TTC_i	: Travel time cost in case *i* (Rs./year)
VOC_i	: Vehicle operating cost in case *i* (Rs./year)
Q_js	: Traffic volume of vehicle type *j* on section *s* (vehicle/day)
T_ijs	: Travel time of vehicle type *j* on section *s* in case *i* (hr)
L_is	: Length of section *s* in case *i* (km)
α_j	: Unit value of TTC of vehicle type *j* (Rs./hr-vehicle)
β_ij	: Unit value of VOC of vehicle type *j* in case *i* (Rs./vehicle-km)
i	: Without-Project case (*O*) and With-Project case (*W*)
j	: Vehicle types
s	: Section

9.3 EIRR Estimation

9.3.1 Cost

Based on the following assumptions, the economic costs of the investment were calculated for each year.

- **Project cost:**
  - The Project cost is a total of construction costs, costs for shifting of utilities and environmental mitigation, consulting services cost, physical contingencies, land acquisition cost, and administration/agency costs. Taxes and duties as well as resettlement costs are excluded from economic costs as these are transfer payments[1]. Land acquisition cost, as proxy of opportunity cost of land, is initially added as Project cost but in the last year, 2041, deducted from the cost along with residual cost[2].
  - A total of these Project costs is calculated for each year during 2022-2023 (estimated 2-year construction period).
  - Maintenance cost during Defect Liability Phase, [redacted] is included by splitting it over the span of 5 years from 2024 to 2028.
  - The residual value of the Project road is estimated assuming that the average economic life of the road is 35 years.
  - A standard conversion factor of 0.85 is assumed to convert local currency portion of the financial costs to economic costs to account for price distortion.[3]

- **Road Maintenance Costs after Defect Liability Phase:**
  - The maintenance costs after the Project period (including DLP) are assumed to be generated equally in the with- and without-project cases, and therefore will offset one another. This is based on the assumption that, with road widening improvement, the surface area would be larger in the new/rehabilitated road than the existing road, while the existing road would require relatively large maintenance associated with the outdated infrastructure in the future[4].

9.3.2 Benefits

Both travel time cost (TTC) savings and vehicle operating cost (VOC) savings were estimated for each year using Highway Development and Management Model (HDM-4) version 2.1. Both TTC and VOC savings were calculated for normal traffic and diverted traffic (where applicable), and the benefit was estimated as the sum of these savings. Major input figures by vehicle type used as basis for calculation of TTC and VOC savings for NH127B Assam are presented in Table 9-1 and Table 9-2.

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[1] Resettlement costs were not included following JICA, *IRR Calculation Manual*, September 2017.

[2] Please refer to https://www.adb.org/sites/default/files/institutional-document/32256/economic-analysis-projects.pdf (page 92 Appendix 9) and
https://www.atap.gov.au/tools-techniques/cost-benefit-analysis/4-step-3-estimate-investment-costs (point 3-4)

[3] This was set based on Detailed Project Report (DPR) of each section prepared by the local DPR consultant. The Conversion Factor of 0.85 can be justified based on "*IRC:SP:3-2009 Manual on economic evaluation of highway projects in India*" and "*ADB Madhya Pradesh District Connectivity Sector Project (RRP IND 47270)*".

[4] This assumption follows the assumption employed in JICA, Basic Information and Data Collection Study on Connectivity Improvement in North Eastern Region of India, Final Report – National Highway 208 (Kailashahar-Teliamura), February 2020.[5] Effects of Road Maintenance on Vehicle Emissions Evaluating by the Model of Highway Development and Management, Zhang, M., 4th International Conference on Sustainable Energy and Environment Engineering, 2015

Table 9-1: Unit Values for VOC by Vehicle Type for NH127B Assam

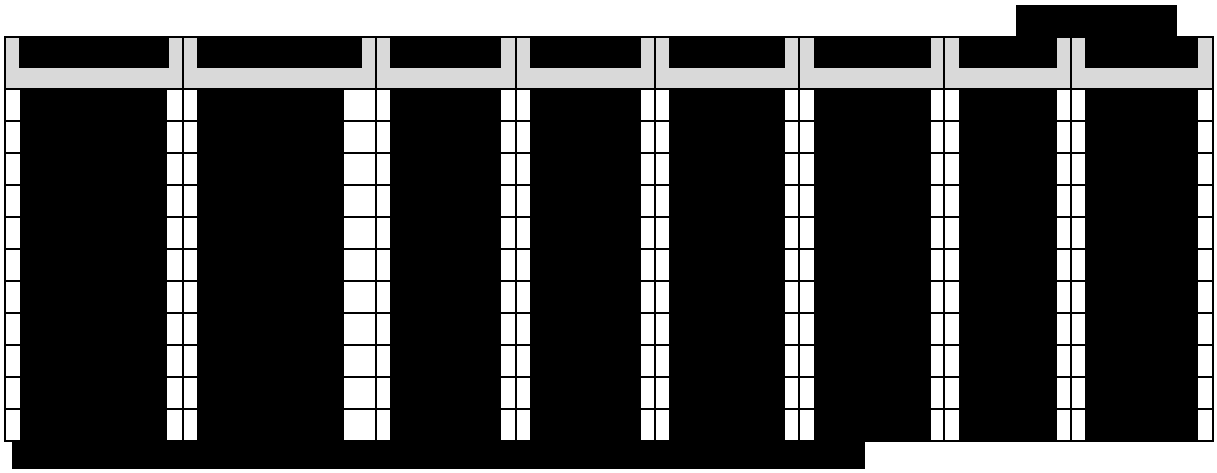
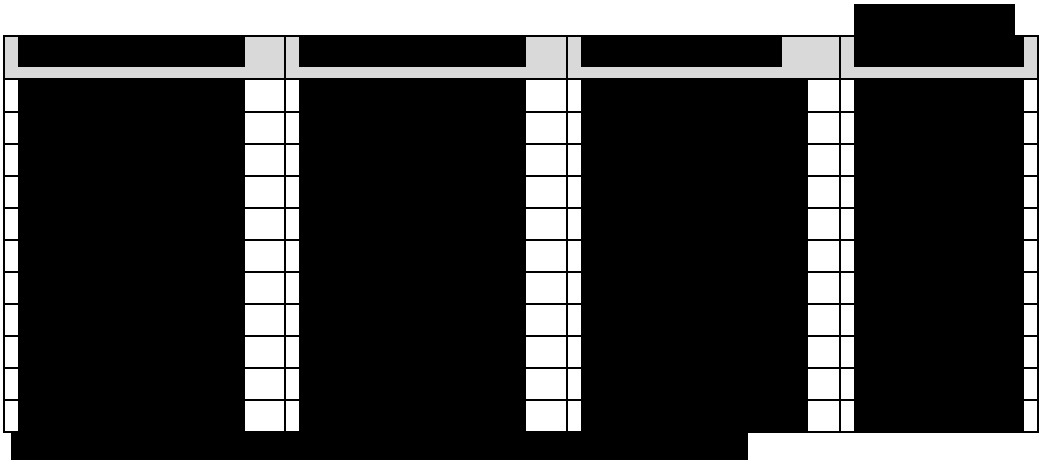


Table 9-2: Unit Values for TTC by Vehicle Type for NH127B Assam



CO2 emissions were also estimated using HDM-4, however, the reductions in emissions were not taken into consideration as a benefit in estimating EIRR as the reduction levels were not large enough. The underlying reason for limited CO2 reduction can be attributed to improved vehicle speed. While lower road roughness is associated with lower emissions due to less fuel consumption, it also leads to higher vehicle speed. High vehicle speed exceeding the ideal range of 30-50 km/hr. (depending on the vehicle) results in more fuel consumption, ultimately increasing emissions[5] [6]. Table 9-3 summarizes the vehicle operating speed in present year 2020 and estimated operating speed after improvements to the Survey Corridor.

[5] Effects of Road Maintenance on Vehicle Emissions Evaluating by the Model of Highway Development and Management, Zhang, M., 4th International Conference on Sustainable Energy and Environment Engineering, 2015
[6] The Effects of Driving Style and Vehicle Performance on the Real-World Fuel Consumption of U.S. Light Duty Vehicle, Berry, I. M., Massachusetts Institute of Technology, 2010

Table 9-3: Vehicle Operating Speed

(Unit: km/hour)

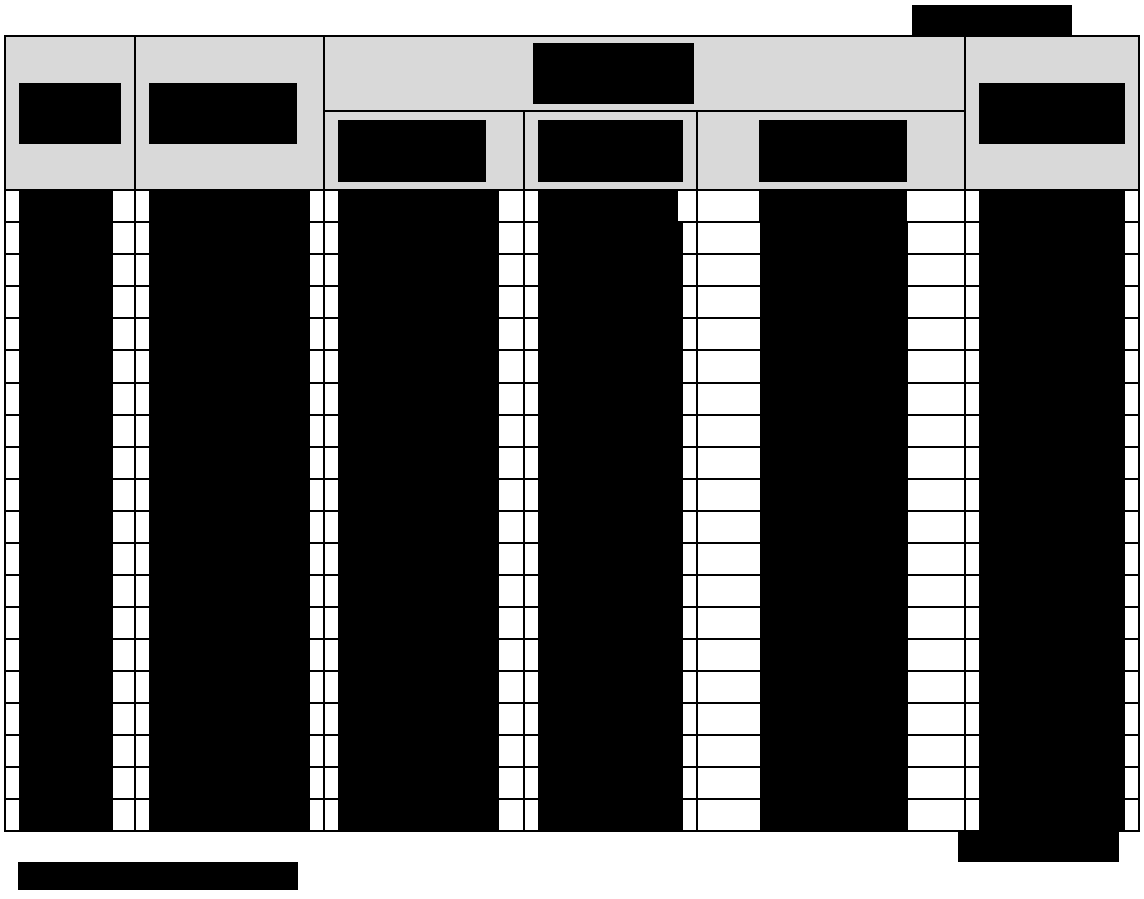
Vehicle Type	Vehicle Operating Speed 2020	Vehicle Operating Speed 2025[1]
Motorcycle	38	70
Small Car	38	70
Mini Bus	38	70
Heavy Bus	33	52
LCV	33	53
2-Axle truck	33	54
3 Axle truck	33	54
Multi Axle	33	54
Tractors with Trailors	33	53

Note 1: 2 years after estimated road improvement
Source: JICA Survey Team

9.4 Result of EIRR Estimation

Based on the above assumptions, economic costs and benefits were estimated for NH127B (Assam), and an EIRR computed. Table 9-4 shows the calculation and results of the economic analysis. The EIRR is estimated at 12.45%, which exceeds the opportunity cost of capital that has often been assumed at 12% in India. This result indicates that the investment in the improvement of this Project section is economically viable and will benefit the national economy of India.

Table 9-4: Benefit and Cost Streams and EIRR for NH127B Assam



9.5 Sensitivity Analysis

The economic analysis involves the inevitable uncertainty concerning the precise values of key variables. Therefore, to examine the impact of changes in cost and benefit on the EIRR estimate, a sensitivity analysis was conducted.

Table 9-5 shows the sensitivity of the EIRR for NH127B Assam with respect to changes in the Project cost and benefit.

Table 9-5: Sensitivity of EIRR

Case	EIRR
(a) Base Case	**12.45%**
(b) Project Cost: 10% up	11.31%
(c) Benefit: 10% down	11.20%
(d) Combination of (b) and (c)	10.14%

Source: JICA Survey Team

Chapter 10. Project Evaluation

10.1 Project Description

National Highway 127B (NH127B) in Assam traverses in plain terrain passing through rural areas as well as few intermittent semi-urban and urban settlements. In rural areas the land use on both sides is agricultural land/open spaces with dispersed small structures. The abutting land use in the built-up areas is predominantly residential and semi-commercial. Few schools and worship places exist along the roads in some of the villages and semi-urban sections. It is observed that the vertical alignment of the road is quite flat except at few bridge and culvert locations. The existing formation height of the project road varies from 2m to 5 m and even more at approaches to bridges, where it is higher. The existing Right of Way (ROW) width along the Survey Road has been observed to be around 20m to 30m. The existing ROW does not cater for the provision of 60m ROW for plain road and hence land is required to be acquired.

The horizontal alignment of the existing road has some sub-standard and sharp curves including reverse S-curves. Also, there is no proper transition length for most of the horizontal curves including the reverse ones to provide for required super elevation reversal for riding safety and comfort. These deficiencies shall be corrected in fixing the horizontal alignment for the entire survey road to conform to MoRTH standards.

The main features of the project relate to the most suitable alignment for 4-laning of road sections and for optimum upgrading of existing road based on field data and detail study involving traffic, geo-technical, topographic, pavement and road condition and socio-economic aspects. Special attention has been given for increase of capacity for intended level of service in design period. A few appropriate design applications have been considered for operational efficiency and road safety. Horizontal alignment has been upgraded based on the design speed of 80-100 km/h except for few stretches where the design speed has been reduced to 65kmph with proper road safety measures.

This road project of 54km is to provide up-grade of the newly declared NH-127 B (Assam portion) starting from Srirampur on NH-27 (old NH-31 C) which is partially the East-West Corridors that connects Northeast area and the other areas of India. The Project road is a connection between two National Highways (NH31C and NH-31) and Connecting with Meghalaya state with proposed bridge over river Brahmaputra, near Dhubri in Assam. NH127B also runs from Bhutan to northeast as an international corridor. Improving the international network and system leads to improvement of connectivity between inner and outer northeast area, in line with the with wide open India-Pacific vision.

10.2 Project Evaluation

10.2.1 Relevance of the Design

The DPR used IRC:SP 84-2014[1] for geometric design of alignment for 4-laning road to be applied to the Survey Road. The DPR design should be modified incorporating IRC:SP 84-2019. The main differences between IRC:SP 84-2014 and IRC:SP 84-2019 are (1) the width of shoulders and (2) vertical and horizontal clearances. These changes shall be applied to the design of road cross-sectional parameters and underpass structures. NH127B is currently a single lane /intermediate road. The horizontal alignment of the existing road has some sub-standard sections which are less safe and comfortable. The entire road stretch passes through plain terrain which is mostly rural in nature.

[1] IRC:SP 84-2014 Manual of Specifications & Standards for Four Laning of Highways Through Public Private Partnership

The most influential factor for the road design is design speed. IRC:73-1980, Section 5 states "Choice of design speed depends on the function of the road as also terrain conditions. It is the basic parameter which determines all other geometric design features. The design speed should be preferably uniform along a given highway. The design speed of 100km/h where (ruling) and 80km/h (minimum) for NH127B Assam is applied due to the flat terrain along the road. Second important factor for the design is horizontal alignment as well as vertical alignment (profile) when the design speed is determined.

There are 16 curves in the DPR design that are smaller than Desirable Minimum Radius and JICA Survey Team created the list and requested the DPR consultant to acknowledge it. The following criteria are used for selecting the preferred alignment.

- Design Speed: The proposed alignment should maintain design speed between 80-100 kmph.
- Riding Comfort: The proposed alignment is such that passengers of the vehicle feel comfort while traveling through the proposed Road.
- Land Acquisition: Minimum land to be acquired. Try to acquire Govt. land as much as possible and minimum acquisition of existing structures.
- Social Impact & Severance: The proposed alignment has minimized effect upon the existing structures and R&R impact of that locality.
- Cost Effectiveness: The Project cost consisting of Civil construction Cost, LA & R&R, Utility Shifting cost of the proposed alignment has been kept minimal.
- Safety: The proposed alignment has been prepared in such a way that it requires minimum safety hazards along its entire length.

Measure features of NH127B Assam design have summarized as the followings;

- Geometric design of the project road has followed the required design standard. Some curves use minimum radius with safety facilities along the road. For the design standard, NHIDCL approved the use of IRC:SP 84-2014 in principle.
- There are 9 existing bridges along the project road. Among 9 bridges one bridge is not used because of alignment change, 3 bridges are reconstructed, 5 bridges are widened. In addition to the existing bridges 4 new bridges and 7 small bridges and underpass will be added.
- Drainage system has been evaluated in consideration of catchment area, estimated flow at each point by hydraulic calculation. Existing pipe culverts will be replaced due to lack of capacity and widening. -The culvert-box has been selected after examination of the capacity, current technology, future maintenance and availability of materials.
- Five bypasses detouring built up areas have been planned, the best alternative is selected for each bypass considering environment and social impact, design speed, land acquisition and cost.
- There is no difficult construction mainly with earthworks. Dumping yard of soil are easy to find and easy access.
- Construction period should be average with seasonal consideration of rainy conditions.
- Naturally the cost would be average compared to other cases with standard devices for safety precaution during construction.

- No major adverse impact has been found out for both environment and social impact. It can be solved in case some impact would be found at site during construction measures could be taken, which are planned as Environmental Management Plan.
- Based on the various assumptions, economic costs and benefits were estimated for NH127B (Assam), and an EIRR computed. The EIRR is estimated at above12% in India. This result indicates that the investment in the improvement of this Project section is economically viable and will benefit the national economy of India.

As a result, mentioned above the design of NH127B has been properly conducted and viable in India.

10.2.2 Relevance of the Project

The North Eastern India of Assam, Meghalaya, Mizoram, Nagaland, Tripura, Manipur and Arunachal Pradesh, surrounding Bangladesh connects to the mainland by a narrow strip of land called the Chicken's Neck. The cargo through these countries is not able to pass through the borders without time consuming customs procedures because transit agreement with Bangladesh or with Myanmar is not yet enacted. This import/export and transloading processes make the North Eastern Region an isolated area with a high transportation cost. Improvement of the road network is critical for the economic development of the region as well as to social development and community services.

Among these states, Assam is a land located south of the eastern Himalayas with an area of 78,440 km2. of about 31[2] million people situated in the northeast corner of India. While the development of arterial road network in mainland India has been progressing, in the case for North-East states, it has been stagnant due to insufficient budget and technical difficulty. In these states, only 28.5% of the roads are paved while the national average is 63.4%, and only 53% of the national highways have more than two lanes compared to the national average of 77.9%.[3]

The road network in Assam is extensive in terms of road density, that is, road length per thousand sq km, of all roads. However, in terms of density of surfaced road Assam is way behind India and the gap is increasing. In response to this the state government has invested on extending the road network rather than on improving the quality of roads. Recent improvement and initiation of new projects will add even more national highways. This project road of 54km (Srirampur to Dhubri) is to provide up-grade of the NH-127 B (Assam portion) starting from Srirampur on NH-27 (old NH-31 C) . The Project road is a connection between two National Highways (NH31C and NH-31) and Connecting with Meghalaya state via proposed bridge over river Brahmaputra, near Dhubri in Assam.

10.2.3 Effectiveness of the Project

Assam's economy is based on agriculture and oil. Assam produces a significant part of the total tea production of the world. State is rich in natural resources like oil and natural gas, coal, rubber, tea and some minerals like granite, limestone and kaolin. It's produces more than half of India's petroleum.

The National Highways not only provide connectivity between the cities but also serve as a connecting link between proposed townships and the cities. They also help in serving the traffic expected to be generated by the exploring activities in the outer municipalities. The NH with its service roads connected to the cities by National Highway network is expected to direct the

[2] Population Census in 2011, Office of the Registrar General & Census Commissioner, India
[3] Source: MORTH. 2013. Road Statistics of India 2011-12.

development of Project Influence Area and will be a position to cater the travel demand patterns generated by these developments

Increase in industrial development can be viewed as boosting economic growth and poverty reduction which will bring substantial social and economic development in the region. The social benefits arising from the project will be triggered off due to improved accessibility to various services such as easy access to markets, health facilities, schools, workplace etc which in turn increases the income of the locals, and ultimately elevating their standard of living. The possible direct and indirect positive impacts of the project are listed below. Improvement of road network will not only link the village communities to better markets, but also open up wider work opportunities in distant communities. People can shuttle to distant worksites and engage in construction, mining factories, business as well as domestic works.

- The immediate benefits of road construction and improvement will come in the form of direct employment opportunities for the construction industries and suppliers of raw materials.
- Effective drainage system to ensure that there will be no pooling of water
- Safety measures for Highway signs, Pavement marking, Traffic signals, Truck lay-byes, Bus stops and Bus bays
- Improvement of geometric deficiencies (both Horizontal & Vertical).
- Provision of Pedestrian passes.
- Provision of ROBs to fly over the traffic and minimize the traffic congestion.
- Provision of ROBs over railway crossings.
- Provision of crash barrier at Bridge approaches.
- Improvement of all Major and Minor Intersections.
- Facilities for public amenities such as Restrooms, Telephone booths, Toilets, shops and etc,

10.3 Project Performance Indicators

(1) Quantitative Indicators

Keeping in view the indicators used up to Phase 4, the table below summarizes the performance indicators for this Project. Based on the traffic analysis and economic analysis, the performance parameters were estimated for the current year (2020) and the target year 2025, two years after the estimated completion of the improvement works.

Table 10-1: Project Evaluation Indicators

Performance Indicators	Baseline Value (2020)	Target Year Value (2025)
Average Travel Time (min)	86	46
Traffic Volume* (PCU/Day)		
Ch. 0+000 km to Ch. 38+990 km	3900	5000
Ch. 38+990 km to Ch. 54+154 km	2900	14000*
*[*Motorized Vehicles only]*		(*incl. diverted traffic)
Average Travel Cost (Rs./vehicle/km)		
Passenger Car	13.52	9.91
2-Axle Truck	31.37	25.30
No. of Passengers (000 Pax/year)		
Ch. 0+000 km to Ch. 38+990 km	5000	6400
Ch. 38+990 km to Ch. 54+154 km	2600	8900
Freight Volume (000 tonne/year)		
Ch. 0+000 km to Ch. 38+990 km	640	810
Ch. 38+990 km to Ch. 54+154 km	80	9200*
		(*incl. diverted traffic)

Source: JICA Study Team

Chapter 11. Risk Analysis

11.1 Overview of Risk Management

The project includes internal and external risks as the followings. Although they are uncertain factors, the risk management is needed with prior preparation.

Internal risk: Risk that can control in the process of project e.g., cost estimate, schedule planning, communication with counterparts, etc.

External risk: Risk that cannot control in the process of project e.g., government policy change, regime change, market trend, weather, etc.

After clarifying various risks, with "probability of risk occurrence" or "degree of influence" in mind, risks need to be considered as an observation target for huge influence against the project. Moreover, "preventive measure" and "action at risk occurrence" need to be reviewed and organized as countermeasures.

Preventive measure: Measure to prevent risks before they occur. It requires to analyze causes for risk occurrence and take action to prevent the causes from occurring.

Action at risk occurrence: Action to minimize the influence after risk occurrence. It is to take action to avert or mitigate damage at risk occurrence.

11.2 Proposed Risk Management Sheet

Below table shows the proposed risk management sheet for the project which describes basic risk analysis results, which are likely to bring huge influences in the target project effects or duration, and proposes specific countermeasures through the recognition and analysis of the current state. This sheet can be used in the future at the time of monitoring and evaluation by recording countermeasure results on the sheet.

Table 11-1: Proposed Risk Management Sheet

No.	Risk Item	Description	Mitigation/Counter Measures
Planning and Design			
1	Traffic volume projection	• The construction of Dhubri bridge which the Project road will connect to has not started. • After construction of this bridge, it is assumed that traffic will be diverted from alternate routes, such as NH31 (Assam), that currently use the existing Goalpara Bridge to cross over between Assam and Meghalaya.	• It has been analyzed and noted in the report by JST that the viability of the traffic forecast presented for the Project also depend on successful completion of the Dhubri bridge. • Since Dhubri bridge construction will be financed by JICA, its progress to be monitored.
2	Road safety risk due to Horizontal curves with smaller radius	• There are 16 curves that has smaller radius than the desirable minimum • Reasons (restrictions) for these. location has been verified by the DPR consultant.	• It was agreed to be indicated as deviation in the Schedule D of the Concession Agreement. • Additional safety measures such as road signs, delineators to be installed.

No.	Risk Item	Description	Mitigation/Counter Measures
3	Bridge Design	• DPR design does not include detail drawings and other details such as bearing capacity. • Such details are to be designed and analyzed by the EPC contractor.	• Supervision consultant (Authority's Engineer) will review the detailed design and other analysis by the EPC contractors.
4	Construction Planning	• Progress of construction work could be slow and piling/foundation works for bridges in the river will be difficult during the raining season (May to September).	• Construction planning of the EPC contractors should take climate conditions and workable days into considerations, which will be reviewed by the supervision consultant (Authority's Engineer).
5	Traffic Management during construction	• Existing public traffic will be disturbed by the construction work	• Traffic management plan will be submitted by the EPC contractors including temporary road diversion, which will be reviewed by the supervision consultant (Authority's Engineer).
Implementation			
1	Delay of land acquisition, compensation, etc.	• Acquisition of 142 ha of private land will be delayed • Compensation for 1,081 nos. of affected private property will be affected • Delay in other mitigation measures planned in the Environmental Management Plan and the Resettlement Action Plan (RAP).	• NHIDCL, Assam state government and NGO for RAP are to implement the process as per the regulations in a timely manner. • The supervision consultant (Authority's Engineer) will assist/monitor, as necessary.
2	Insufficient Capacity of the executing agency	• Although NHIDCL is financially stable and already implementing many projects including JICA financed ones, risks such as insufficient budget, insufficient human resources, delay in payment to Consultant/Contractor could be foreseen.	• Monitor budget allocation and payment schedule to the consultant/contractor. • Monitor manpower of PIU • Consultant to assist NHIDCL in timely payment.
3	Procurement/ Management related to execution	• The risk is low with the experiences of many similar projects including donor funded ones. • The entire schedule needs to be coordinated including procurement of EPC contractors and consultant	• NHIDCL to follow the project implementation schedule as planned and agreed.
Others			
1	Delay by COVID-19	• COVID-19 pandemic situation has not improved in India and not sure how much more time will be required, which may affect the overall project implementation schedule especially at the procurement stage.	• To observe the situation and try to avoid the delay as much as possible with proper measures against COVID-19

No.	Risk Item	Description	Mitigation/Counter Measures
2	Protective measures against COVID-19	• EPC contractors, supervision consultant and other staff are at a risk of being infected with COVID-19	• Complying with the rules and regulations applied by the state and central government for prevention of COVID-19. • Appropriate protective measures, such as those in IFC's "Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19" should be implemented in office and work site by all the parties concerned and such budget should be considered.
3	Security issues	• Some political protest activities could affect the project schedule and work on site	• Closely monitor the security situation and collect the latest information
4	Natural Disaster (flood)	• Flood caused by the heavy rain could affect the project schedule and work on site	• Discuss the contingency plan in case of such emergency among the stakeholders such as NHIDCL, EPC contractors, supervision consultants.

Source: JICA Study Team

Chapter 12. Conclusions and Recommendations

12.1 NH127B in Assam

The road network in Assam is extensive in terms of road density, which imply that the road stretch is long with barrow roadways of all roads. However, the density of national highways is higher in Assam and more have been added in recent years. This would imply that the state government has invested on extending the road network rather than on improving the quality of roads. The Project Road is a connection between two National Highways (NH31C and NH-31) and Connecting with Meghalaya state via proposed bridge over river Brahmaputra in Assam.

The land use of the road stretch is mainly roadside plantation, agricultural area, small villages and scattered houses and light jungle area along the project corridor. The existing ROW width along the project road has been observed to be around 20m to 30m. However, the existing ROW does not cater to the provision of 60m ROW for plain road and hence land is required to be acquired. Thus, the scope of land acquisition is quite significant in the project because of availability of limited ROW and construction of four Bypasses.

12.2 Detailed Project Report

The upgrading of the NH127B gives an immense scope of development of the region in regards of easy accessibility between the state of Assam and other states like West Bengal. Other than the development of the industrial sector there would be easy accessibility of the agricultural surplus of the region and the finished industrial products with the rest the country. The socio – economic status of the region is been changing drastically with inflow venture and human capital. Infrastructural investment such as the NH would remove the bottle necks of development and help in taking a huge positive leap of sustainable socio- economic growth of the region.

The most influential factor for the road design is design speed. It is the basic parameter which determines all other geometric design features. The design speed should be preferably uniform along a given highway. The design speed of 100km/h where (ruling) and 80km/h (minimum) for NH127B Assam is applied due to the flat terrain along the road. There are 16 curves in the DPR design that are smaller than Desirable Minimum Radius and JICA Survey Team created the list and requested the DPR consultant to acknowledge it. The criteria are used for selecting the preferred alignment, such as Design Speed, Riding Comfort. Land Acquisition, Social Impact & Severance, Cost Effectiveness, and Safety.

Major features of NH127B Assam design have summarized as the followings.

- Geometric design of the project road has followed the required design standard. Some curves use minimum radius with safety facilities along the road.
- There are 9 existing bridges along the project road. Among 9 bridges one bridge is not used because of alignment change, 3 bridges are reconstructed, 5 bridges are widened. In addition to the existing bridges 4 new bridges and 7 small bridges and underpass will be added.
- Drainage system has been evaluated in consideration of catchment area, estimated flow at each point by hydraulic calculation. Existing pipe culverts will be replaced due to lack of capacity and widening.
- Five bypasses detouring built up areas have been planned, the best alternative is selected for each bypass considering environment and social impact, design speed, land acquisition and cost.

- There is no difficult construction mainly with earthworks. Dumping yard of soil are easy to find and easy access.
- No major adverse impact has been found out for both environment and social impact. It can be solved in case some impact would be found at site during construction measures could be taken.
- The EIRR is estimated at above12% in India. This result indicates that the investment in the improvement of this Project section is economically viable and will benefit the national economy of India.

12.3 Conclusions and Recommendations

Assam's economy is based on agriculture and oil. Assam produces a significant part of the total tea production of the world. State is rich in natural resources like oil and natural gas, coal, rubber, tea and some minerals like granite, limestone and kaolin. It's produces more than half of India's petroleum. The National Highways not only provide connectivity between the cities but also serve as a connecting link between proposed townships and the cities. They also help in serving the traffic expected to be generated by the exploring activities in the outer municipalities.

The public consultation on the focus groups and the stakeholders give the opportunity to address development schemes and issues, which were already resolved after making appropriate changes in design and alternative finalization. Community consultations also help to avoid opposition to the project, which is otherwise likely to occur. There is very little impact of resettlement and rehabilitation programs as there is no major impact in their livelihood and their socio economic as well as cultural way of life of construction & up-gradation of the newly declared NH-127 B.

The social benefits arising from the upgrading of the NH127B project will be triggered off due to improved accessibility to various services such as easy access to markets, health facilities, schools, workplace etc which in turn increases the income of the locals, and ultimately elevating their standard of living. Improvement of road network will not only link the village communities to better markets, but also open up wider work opportunities in distant communities. These benefits are;

- The immediate benefits of road construction and improvement will come in the form of direct employment opportunities for the construction industries and suppliers of raw materials.
- Effective drainage system to ensure that there will be no pooling of water
- Safety measures for Highway signs, Pavement marking, Traffic signals, Truck lay-byes, Bus stops and Bus bays
- Improvement of geometric deficiencies (both Horizontal & Vertical).
- Provision of Pedestrian passes.
- Provision of ROBs to fly over the traffic and minimize the traffic congestion.
- Provision of ROBs over railway crossings.
- Provision of crash barrier at Bridge approaches.
- Improvement of all Major and Minor Intersections.
- Facilities for public amenities such as Restrooms, Telephone booths, Toilets, shops and etc,

The NH127B is designed along the flat terrain with mainly agriculture industry. The construction involves upgrading of existing roadway and new construction as bypasses. Management of traffic of both residents and construction vehicles and protection of natural and social environment is crucial during construction to proceed smooth road construction work. Special attention should be paid to drainage of road surface and construction site. Construction period should be carefully examined due to rainy season where the earth work is difficult or impossible.