Initial Environmental Examination

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India: Rajasthan Urban Sector Development Investment Program— Chittorgarh Urban Transport and Roads Sub Project (Tranch-03)

Prepared by Local Self Government Department

For the Government of Rajasthan
Rajasthan Urban Infrastructure Development Project

The initial environmental examination is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.

ABBREVIATION

ADB	-	Asian Development Bank
DSC	-	Design and Supervision Consultancy
EA	-	Executing Agency
EAC	-	Expert Appraisal Committee
GLSR	-	Ground Level Service Reservoir
GoI	-	Government of India
GoR	-	Government of Rajasthan
GSI	-	Geological Survey of India
IA	-	Implementing Agency
IEE	-	Initial Environmental Examination
IPMC	-	Investment Programme Management Consultancy
IPMU	-	Investment Programme Management Unit
JNNURM	-	Jawaharlal Nehru National Urban Renewal Mission
LSGD	-	Local Self-Government Department
MFF	-	Multitranche Financing Facility
MoEF	-	Ministry of Environment and Forests
NAAQS	-	National Ambient Air Quality Standards
OHSR	-	Over Head Service Reservoir
OM	-	Operations Manual
PHED	-	Public Health Engineering Department
PM	-	Particulate Matter
PMU	-	Project Management Unit
RCC	-	Reinforced Cement Concrete
ROW	-	Right of Way
RPCB	-	Rajasthan State Pollution Control Board
RUIDP	-	Rajasthan Urban Infrastructure Development Project
RUSDIP	-	Rajasthan Urban Sector Development Investment Program
SPM	-	Suspended Particulate Matter
STP	-	Sewerage Treatment Plant
ToR	-	Terms of Reference
UIDSSMT	-	Urban Infrastructure Development Scheme for Small and Medium Towns
USEPA	-	United States Environmental Protection Agency

WEIGHTS AND MEASURES

lakh	–	100 thousand = 100,000
crore	–	100 lakhs = 10,000,000
$\mu g/m^3$	–	micrograms per cubic meter
km	–	kilometer
lpd	–	liters per day
m	–	meter
mg/l	–	milligrams per liter
mm	–	millimeter
ppm	–	parts per million

NOTE{S}

(i) In this report, "$" refers to US dollars.

(ii) “INR” and “Rs” refer to Indian rupees

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EXECUTIVE SUMMARY

1. **Introduction and Regulatory Framework:** Rajasthan Urban Sector Development Investment Program (RUSDIP) is intended to optimize social and economic development in 15 selected towns in the State, particularly district headquarters and towns with significant tourism potential. RUSDIP Phase II to be implemented over a seven year period beginning in 2008, and will be funded by a loan via the Multitranche Financing Facility (MFF) of the ADB. RUSDIP will improve infrastructure through the design and implementation of a series of subprojects, each providing improvements in a particular sector (water supply, sewerage, drainage, road, solid waste etc) in one town.

2. The impacts of subprojects prepared according to ADB Environment Policy (2009) and Indian National Law. Projects are screened for their expected environmental impacts and are assigned to Category A, B, C and F1. RUSDIP has been classified by ADB as environmental assessment category B (some negative impacts but less significant than category A). The only type of infrastructure provided by the RUSDIP that is specified in the EIA Notification (2006) of Govt. of India is solid waste management, where Environmental Clearance (EC) is required for all Common Municipal Solid Waste Management Facilities. EC is thus not required for the Chittorgarh road & transport sector sub-project which is the subject of this Environmental Examination. This is the Initial Environmental Examination (IEE) report for the Chittorgarh road and transport (RUB) sector. It discusses the generic environmental impacts and mitigation measures relating to the location, design, construction and operation of physical works proposed under this subproject.

3. **Project Description:** The sub-project is located in Chittorgarh, the headquarters town of Chittorgarh district, in the southern part of Rajasthan. The main component of the sub-project is construction of Railway Under Bridge (RUB) near railway culvert no. 226 towards Chanderia in Chittorgarh. Type of construction involve the construction of Box Culvert by adopting box-pushing technology beneath the existing surface infra structure (railway line), construction of service road at both sides of RUB approaches, and provision of footpath, provision of drain, utility space, crash barrier, road appurtenances. The box is proposed to be connected to the National Highway 79 on one side and local road to Chanderiya Station on the other side of the track at L.C No.86C.

4. **Description of Environment:** Chittorgarh lies between the East latitude 70^{o}38'and North longitude 24^{o}53'. The average height of the area is 538 m above MSL. The Banas, Bedach, the Wagan, the Gambhir and the Jakham are the main rivers draining the area. Chittorgarh town lies in low damage risk zone II. The area is less prone to earthquakes as it is located on comparatively stable geological plains based on evaluation of the available earthquake zone information. Geomorphologically, the district has divided into eight geomorphic units namely structural plain, structural hills, structural ridge and valley, denudational ridge and valley, plain and plateau on Deccan Trap (DT), highly dissected pediment and undissected pediment. The main sources of drinking water in Chittorgarh are Gambhiri and Bedach Rivers. This place is potentially rich in mineral resources. Limestone deposits are in abundance, which feed several cement industries. Soil of the region falls within low rainfall zone of 500- 900 mm. The soils are lithosolsat foot hills and alluvials in plains. The climate of Chittorgarh is generally dry. The maximum average temperature during summer is 41.5 degree Celsius and during winters it is 25 degree Celsius. Being hilly terrain it is relatively hot and dry and the temperature reaches around 44 degree Celsius, which recedes only after arrival of South West monsoon towards June end. With departure of monsoon in mid September, the temperature gradually rises again and falls steeply from November. Winds blow South West to North East in summer and winter experience northern and North West winds. The average rainfall is 760 mm. 95 percent of the annual rains are experienced during June to September. The nearest airport is located at Udaipur (121 km from Chittorgarh). Traffic and industries are the main sources of air pollution. Ambient air

quality monitoring at different locations of Chittorgarh shows that air quality of Chittorgarh is well within the limits prescribed by GOI. The Chittorgarh district supports mahua, baheda, saded, aam and jhinjha. The endemic taxa or species found in the district are represented by pipal, bad or banyan tree, bael, dhak, kaith, datura, indrokdhav. There is no forest plantation or any other sensitive location nearby the project site.

5. Economic base of a town reflects its prosperity. Chittorgarh being district headquarter, has been functioning as administrative city with sustained growth in tertiary economic activities. The major economic activities are trade and commerce, thus it offers a number of wholesale and retail markets which act as a distribution center for nearby towns and villages. Because of developing Industries now it is equivalent to Byawar, Alwar and Bhilwada. Tourism income is also contributing very much towards economic generation of the town on the contrary major industries play a big role in providing employment and income generation. The raw material found nearby areas of the Chittorgarh town accelerated the growth and development of Commercial and Industrial activities. The first Industrial unit Cotton Jinning Factory was established in 1924 in Chittorgarh. Birla Cement Works was started in 1966 in the form of Birla Jute Manufacturing Company Limited a unit of Birla Industries. Hindustan Zinc Limited is the other large industrial unit in the town. Chittorgarh is highest producer of groundnuts in Rajasthan, second highest producer of maize, alsi and sanai, third in barley and pulses, fourth in sugarcane and gram production fifth in chillies and cotton.

6. The major source of drinking water for Chittorgarh is river Gambhiri, which flows right through the habitation of the town. The intake wells and pump houses are located along 2.5 km of river banks. Except this the water supply is also done through 93 additional tube wells to the different parts of the Chittorgarh town. The water supply network has 7 overhead tanks and 11 ground water reservoirs. Chittorgarh town does not have underground sewerage system. Out of the occupied residential houses about 85% have some kind of latrines. Most of the houses have adopted the practice of providing onsite disposal by constructing water seal / borehole latrines or by providing septic tank with effluent discharge into soak pits or open surface drains which ultimately reaches to Gambhiri River. The existing drainage system in Chittorgarh is piecemeal construction of open *nallah* as per local and temporary requirements without proper designs. There are mainly open drains in the town. The total waste generation in the town is about 22 T/day out of which 15 T/day is collected by Municipal Board. Chittorgarh is connected through meter gauge to Delhi, Jaipur Ajmer and Udaipur and Broad Gauge to Kota and Nimach under the North –West Railway zone .The main Railway yard is in Chanderia from where Railway Siding is provided to Birla Cement Works. At present there are two Bus Stands in Chittorgarh. Rajasthan State Road Transport Corporation bus stand is situated near Collectorate in front of Kotwali where as the Private Bus stand is in Gandhi Nagar Yojana.

7. As per the Census of India Population for the year 2001 was 96,028 with a Municipal Area of 41.76 Sq. km and a population density of 2299.52 person per Sq.km which was rapidly increased in comparison to year 1981 with a Population of 44,994 with Municipal Area of 24.81 Sq.km and a Population density of 1813.54 persons per Sq.km. There are good educational facilities in Chittorgarh town, which serve both towns people and inhabitants of surrounding villages and towns in the hinterland. There is 1 hospital and community center in urban area of Chittorgarh. There are also 6 primary health centers and 39 sub–centers. Chittorgarh has rich heritage sites. The mammoth Chittorgarh Fort is one of its kinds. It stands 150 meters above plain ground and is 5 km long encompassing 690 acres of land. The Historical Fort and other historical places like Nagar Dwar Prasad ,Vijay Stambh Temples are full of Heritage and Architecture and attract inland and foreign Tourist in large numbers.

8. **Potential environmental impacts and mitigation measure:** All pre-construction (design), construction, and operation activities that are likely to cause environmental impacts were identified, and evaluated to assess their magnitude, duration, and potential receptors in consultation with the stakeholders. Most of the individual elements of the subproject are relatively small and involve straightforward construction and operation, so impacts will be mainly localised and not greatly significant during design phase.

9. No protected areas and cultural heritage site will be affected due to construction of RUB. Project area is free from habitation, only industrial, Government and agriculture land require acquisition, which is the sole responsibility of Municipal Corporation, who will hand over the site to RUIDP for proposed works. Therefore no affect on natural resources or wildlife will be anticipated.

10. During project implementation the impacts are considered on physical environment like water, air, soil, noise; on biological environment, like flora and socio-economic environment (which is positive in some extent). All the impacts are temporary and for short duration. In all the cases mitigation measures i.e. control of air, dust pollution, checking of water and noise pollution, protection of biological environment(through compensatory afforestation) and minimize the social impacts are taken care. Safety measures, both occupational and social are considered and those are depicted in IEE. Traffic management plan will be considered as per the requirement. During operation phases, few positive socio-economic impacts will be anticipated.

11. **Institutional responsibility and Environmental management and monitoring plan:** LSGD is the Executing Agency (EA) responsible for management, coordination and execution of all activities funded under the loan. Environmental issues will be coordinated by an Environmental Specialist within the IPMU/ IPMC, who will ensure that all subprojects comply with environmental safeguards. An Environmental Expert, who is part of the DSC team will implement the Environmental Monitoring Plan from each IEE, to ensure that mitigation measures are provided and protect the environment as intended. An Environmental Safeguard Officer, who is nominated in IPIU, shall monitor day to day activities and ensure compliance of EMP during the construction phase.

12. Implementation of Environmental management plan and monitoring frequency will be taken care during construction phase. Most of the mitigation activities are the responsibility of the Construction Contractors (CC) employed to build the infrastructure during the construction stage, or the O&M Contractors employed to conduct maintenance or repair work when the system is operating. Responsibility for the relevant measures will be assigned to the Contractors via the contracts through which they are appointed (prepared by the DSC during the detailed design stage), so they will be legally required to take the necessary action. There are also some actions that need to be taken by LSGD in their role as project proponent, and some actions related to the design that will be implemented by the DSC. Mitigation measures are fairly standard methods of minimising disturbance from construction works in urban areas (maintaining access, planning work to avoid sensitive times, finding uses for waste material, etc), and experienced Contractors should be familiar with most of the requirements. Monitoring of such measures normally involves making observations in the course of site visits, although some require more formal checking of records and other aspects. There will also be some surveys of road users nearby communities, as most of the measures are aimed at preventing impacts on people and the human environment. Environmental management and monitoring cost for the sub-project has been estimated as 0.79 million Rupees i.e. 17,174 US$.

13. **Public consultation, information disclosure and grievance redress mechanism:** Public consultation with primary and secondary stakeholders has been conducted to understanding the local issues and public views regarding the possible impact. The group

discussion meeting was conduct by RUIDP with local administration, local leaders and politician under the Chairmanship of District Collector in City Level Committee. The issues like, awareness and extent of the project and development components, benefits of project for the economic and social upliftment of community, labour availability in the project area or requirement of outside labour involvement, local disturbances due to project construction work, necessity of tree felling etc. at project sites, water logging and drainage problem if any, drinking water problem, forest and sensitive area nearby the project site etc. On the basis of outcome of consultation the action plan has been developed. LSGD will extend and expand the consultation and disclosure process significantly during implementation of RUSDIP. They will appoint an experienced NGO to handle this key aspect of the programme.

14. The project authority has establish a Grievances Redressal Mechanism to receive and facilitate resolution of affected persons' concerns, complaints and grievances about the project's environmental performance.

15. **Recommendation and Conclusion:** There are two straightforward but essential recommendations that need to be followed to ensure that the environmental impacts of the project are successfully mitigated. These are that LSGD should ensure that, all mitigation, compensation and enhancement measures proposed in this IEE report and in the Resettlement Framework for the RUSDIP are implemented in full, as described in this document and the Environmental Monitoring Plan proposed in IEE and the internal and external monitoring proposed in the Resettlement Framework are also implemented in full.

16. This initial environmental examination (IEE) ascertains that the subproject is unlikely to cause any significant environmental impacts. Few impacts were identified attributable to the proposed subproject, all of which are localized and temporary in nature and can be easily mitigated with minor to negligible residual impacts. There are no uncertainties in the analysis, and no further studies are required to comply with ADB procedure or national law

I. INTRODUCTION

A. Purpose of the report

1. Rajasthan Urban Sector Development Investment Program (RUSDIP) is intended to optimize social and economic development in 15 selected towns in the State, particularly district headquarters and towns with significant tourism potential. This will be achieved through investments in urban infrastructure (water supply; sewerage and sanitation; solid waste management; urban drainage; urban transport and roads), urban community upgrading (community infrastructure; livelihood promotion) and civic infrastructure (art, culture, heritage and tourism; medical services and health; fire services; and other services). RUSDIP will also provide policy reforms to strengthen urban governance, management, and support for urban infrastructure and services. The assistance will be based on the State-level framework for urban reforms, and institutional and governance reforms recommended by the Government of India (GoI) through the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) and Urban Infrastructure Development Scheme for Small and Medium Towns (UIDSSMT).

2. RUSDIP Phase II to be implemented over a seven year period beginning in 2008, and will be funded by a loan via the Multi-tranche Financing Facility (MFF) of the ADB. The Executing Agency (EA) is the Local Self-Government Department (LSGD) of the Government of Rajasthan (GoR); and the Implementing Agency (IA) is the Project Management Unit (PMU) of the Rajasthan Urban Infrastructure Development Project (RUIDP), which is currently in the construction stage.

3. RUSDIP will improve infrastructure through the design and implementation of a series of subprojects, each providing improvements in a particular sector (water supply, sewerage, solid waste etc) in one town. RUSDIP has been classified by ADB as environmental assessment category B (some negative impacts but less significant than category A). The impacts of subprojects prepared according to ADB Environment Policy (2009) and Environmental Assessment Guidelines (2003).

B. Extent of the IEE study

4. Indian law and ADB policy (2009) require that the environmental impacts of development projects are identified and assessed as part of the planning and design process, and that action is taken to reduce those impacts to acceptable levels. This is done through the environmental assessment process, which has become an integral part of lending operations and project development and implementation worldwide.

1 ADB Policy

5. ADB's Environment Policy (2009) requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for Environmental Assessment are described in Operations Manual (OM) 20: Section F1/BP (2006) Environmental Considerations in ADB Operations. This states that ADB requires environmental assessment of all project loans, programme loans, sector loans, sector development programme loans, financial intermediation loans and private sector investment operations.

6. The nature of the assessment required for a project depends on the significance of its environmental impacts, which are related to the type and location of the project, the sensitivity, scale, nature and magnitude of its potential impacts, and the availability of cost-effective mitigation measures. Projects are screened for their expected environmental impacts and are assigned to one of the following categories:

Category A: Projects that could have significant environmental impacts. An Environmental Impact Assessment (EIA) is required.

Category B: Projects that could have some adverse environmental impacts, but of less significance than those for category A. An Initial Environmental Examination (IEE) is required to determine whether significant impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report.

Category C: Projects those are unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are reviewed.

Category FI: Projects that involve a credit line through a financial intermediary (FI) or an equity investment in a FI. The FI must apply an environmental management system, unless all subprojects will result in insignificant impacts.

7. The Bank has categorised this program as Category B and following normal procedure for MFF loans has determined that one Environmental Examination will be conducted for each subproject, with a subproject being the infrastructure improvements in a particular sector (water supply, sewerage, etc) in one town.

2 National Law

8. The GoI EIA Notification of 2006 as amended in 2009 (replacing the EIA Notification of 1994), sets out the requirement for Environmental Assessment in India. This states that Environmental Clearance (EC) is required for specified activities/projects, and this must be obtained before any construction work or land preparation (except land acquisition) may commence. Projects are categorised as A or B depending on the scale of the project and the nature of its impacts.

9. Categories A projects require Environmental Clearance from the National Ministry of Environment and Forests (MoEF). The proponent is required to provide preliminary details of the project in the form of a Notification, after which an Expert Appraisal Committee (EAC) of the MoEF prepares comprehensive Terms of Reference (ToR) for the EIA study, which are finalized within 60 days. On completion of the study and review of the report by the EAC, MoEF considers the recommendation of the EAC and provides the EC if appropriate.

10. Category B projects require environmental clearance from the State Environment Impact Assessment Authority (SEIAA). The State level EAC categorizes the project as either B1 (requiring EIA study) or B2 (no EIA study), and prepares TOR for B1 projects within 60 days. On completion of the study and review of the report by the EAC, the SEIAA issues the EC based on the EAC recommendation. The Notification also provides that any project or activity classified as category B will be treated as category A if it is located in whole or in part within 10 km from the boundary of protected areas, notified areas or inter-state or international boundaries.

11. The only type of infrastructure provided by the RUSDIP that is specified in the EIA Notification is solid waste management, where EC is required for all Common[1] Municipal Solid Waste Management Facilities (CMSWMF). EC is thus not required for the road/ bridge sub-project that is the subject of this Environmental Examination.

3 Review and Approval Procedure

12. For Category B projects the Draft Environmental Status report and its summary (SIEE) are reviewed by ADB's Regional Department sector division and Environment and Social Safeguards Division, and by the Executing Agency, and additional comments may be sought from project affected people and other stakeholders. All comments are incorporated in preparing the final documents, which are reviewed by the Executing Agency. The EA then officially submits the IEE and SIEE reports to ADB for consideration by the Board of Directors. Completed reports are made available worldwide by ADB, via the depository library system and the ADB website.

4 Scope of Study

13. This is the IEE for the Chittorgarh road and bridge sector. It discusses the generic environmental impacts and mitigation measures relating to the location, design, construction and operation of physical works proposed under this subproject.

[1] For the purpose of EIA Notification, common municipal solid waste management facilities may be referred as centralized MSW facility for an given town, city, region. It is further to mention a common facility need not have surrounding ULBs included.(Technical EIA Guidance Manual for CMSWMF)

II. DESCRIPTION OF THE PROJECT

A. Type, Category and Need

14. This is a transportation sub-project, and as explained above it has been classified by ADB as Category B, because it is not expected to have major negative environmental impacts. Under ADB procedures such projects require an IEE to identify and mitigate the impacts, and to determine whether further study or a more detailed EIA may be required. The sub-project is needed to help alleviate road congestion in the town, where the capacity of the network has not expanded to cope with increased traffic demand. Railway Level crossing No. 86-C (i.e. Chanderia Level Crossing) lies on city road which connects to Chanderia Housing Board & NH-79 within the municipal area of Chittorgarh. To avoid congestion at level crossing, construction of 2-lane RUB with approach road at both sides near culvert no 226 between Chanderia Level Crossing and Ramdevji Ki Chanderia Level Crossing is proposed. This is one of a series of subprojects designed by the RUSDIP that are intended to raise the standards of the municipal infrastructure and services of Chittorgarh.

B. Location, Size and Implementation Schedule

15. The sub-project is located in Chittorgarh, the headquarters town of Chittorgarh district, in the southern part of Rajasthan **(Figure 2.1).** The infrastructure will consist of Railway Under Bridge (RUB) near culvert no 226 between Chanderia Level Crossing and Ramdevji Ki Chanderia Level Crossing. **Figure 2.2** shows important features near project site.

16. Detailed design started in December 2011 and construction will be started after finalization of proposal and completed within six months after start of construction.

17. This Sub-Project is having two parts (i) one for Approach Road (to be directly executed by RUIDP) and (ii) Construction of RUB by Box Pushing Technology (to be executed by Western Railways directly on Deposit Basis - Railways will design, float tender, and execute). As such, there will be two separate contracts and agencies. As per ADB guidelines, EMP will be included in both the contracts; and RUIDP shall be submitting copies of relevant EMP formats to Railways for including and incorporating the same into their contract documents too.

18. Photographs of the project area are attached as **Annexure- I**

Figure 2.1: Location of RUB subproject in Google Map

C. Existing Road and traffic at Chittorgarh

19. Chittorgarh comprises a road network of 300km, consisting of 150 km bituminous roads, 100 km cement concrete roads and 50 km WMM road. Mostly City roads are maintained by municipal Council, Chittorgarh or PWD. In the recent past, municipal Council has invested substantially in upgrading roads to cement concrete.

20. Chanderia Level Crossing is located on City road (i.e. between Chanderia Housing Board and NH79) which connects to NH-79. NH-79 Connects Bhilwara to Neemach. At present, one level crossing at Chanderia for commercial vehicles and other level crossing at Ramdevji Ki Chanderia for slow moving & light vehicles exit at this location, both 1.5 Kms away from each other.

21. Both the level crossings falls on Ajmer – Udaipur section of broad gauge railway line of Western railway. The Chanderia level crossing being located within municipal area of Chittorgarh causes lot of inconvenience at the time of closed gates before, during and after crossing the trains. Situation becomes worse when two or more consecutive trains (up and/or down) passes one after other and crossing closes for 15-20 minutes.

22. At present average 73 trains are passing through the line and as per traffic survey 7573 fast moving vehicle & 3187 slow moving vehicles are passing through the above road

per day. In peak hours (10.00 pm to 11.00 pm) the traffic congestion at level crossing LC 86 creates chaotic situation due to closer of gates for passing the trains. Besides the above, congestion at above level crossing location are becoming worse day by day due to enormous growth of 2-wheelers and car/jeep/taxi. The subproject, when implemented, will benefit the population of town as well as through traffic of NH-79 with safe travel time & fuel consumption.

D. Sub- project Description including detailed scope

23. **Table 2.1** shows the nature of the subproject. The main elements are: construction of the RUB under the railway tracks near culvert no. 226, and construction of approach roads on both side. The descriptions shown in **Table 2.1** are based on the present proposals, which can be changed in due course of time and are expected to be substantially correct, although certain details may change as development of the subproject progresses.

Table 2.1: Improvements in transportation infrastructure proposed in Chittorgarh

Infrastructure	Function	Description	Location
Road in Chittorgarh	To make ease of traffic movement, especially during prolonged closure of railway crossing	RUB at Chanderia is located on City road (i.e. Chanderia Housing Board and NH 79) NH-79 Connects Bhilwara to Neemach. At present, one level crossing for commercial vehicles and Chanderia and other level crossing at Ramjiki Chanderia exists in the location	Near railway culvert no 226 between Chandaria Railway Station and Ramdevji Ki Chanderia level crossing (LC 87C)

24. Scope and components of the works consist of construction of RUB span, both side approach road, footpath, provision of drain & utility etc. Details of major works are as under;

a. Construction of precast RCC Box of 7.5 mx2.5 m of the length of 30.0 m.
b. Construction of 7.5 m wide cement concrete approach road on either side of RUB.
c. Construction of 7.5 m wide bituminous approach road on either side of RUB with 1.5 m hard shoulder on both sides.
d. Construction of RCC drain on either side of road.
e. Shifting of utilities within ROW.
f. Electrical and other miscellaneous works

Figure 2.3 shows plan and layout of the proposed project components.

25. This Sub-Project is having two parts (i) one for Approach Road (to be directly executed by RUIDP) and (ii) Construction of RUB by Box Pushing Technology (to be executed by Western Railways directly on Deposit Basis - Railways will design, float tender, and execute).

26. Topographical survey was conducted and the site visit was made by the experts. After studying the present Right of Way (ROW), the geometry of RUB along with its approaches is planned in such a way that minimum acquisition of land & structures are involved. Besides the above, both side service roads of minimum 7.5m wide along with 1.5m footpath are also planned to facilitate the existing road users. The following design criteria are adopted for planning the geometry of RUB.

i) Safe bearing pressure: 20 T/sqm at foundation level 95.929m.

ii) Angle of internal friction of soil: 30^0

iii) Dead load including the self-weight of the structure including all components/attachments: $24kN/m^3$.

iv) Superimposed deal load: thickness of ballast below rails: 600mm.

v) Earth pressure: Weight density=$18kN/m^3$ and effective friction angle=30^0, friction angle between fill & wall=20^o.

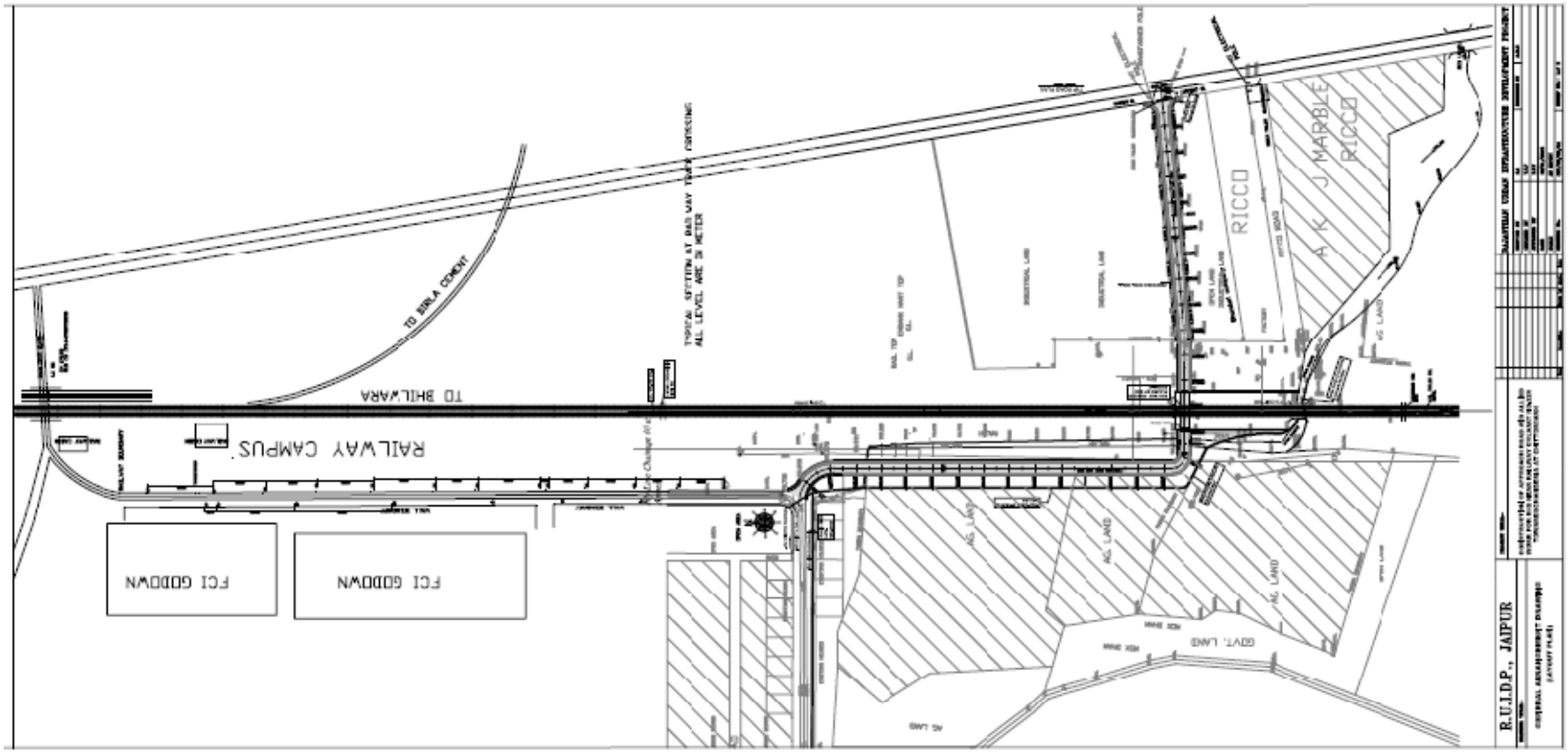
27. *Salient Details of proposed RUB works:* it is proposed to construct a Reinforced Concrete Box-type structure with clear vertical clearance of 2.5m and horizontal clearance of 7.5m. The Road Top Level inside the box has been kept 0.55m above the railway culvert bed level to ensure proper drainage of surface water towards the culvert (about 95m meters away from the RUB), during rainy season. The horizontal clearance provides for a 2 lane carriageway to pass through the box. In view of the running tracks above the box, it was proposed that the box shall be cast in segments of 3.0m each and pushed into the soil below tracks by hydraulic jacks acting against a thrust block & reaction frame. With this type of construction, it can be ensured that the train services on the track are not disrupted. The hydraulic pushing shall be done during block hours. The box is proposed to be connected to the National Highway 79 on one side and local road to Chanderiya Station on the other side of the track at L.C No.86C. The salient details of RUB, viaducts, embankment with RE walls, service roads etc. are presented in **Table 2.2** below:-

Table 2.2: Salient Details of RUB & Viaduct

S. No.	Items	Quantity
1.	Precast RCC box of 7.5mx2.5m and length is 30.0m	1
2.	7.5 m wide cement concrete approach road on either side of RUB	200 m
3.	7.5 m wide bituminous approach road on either side of RUB with 1.5 m hard shoulder on both side	700 m
4.	RCC drain on either side of road	1440 m
5.	Shifting of utilities within ROW	As per site conditions
6.	Electrical arrangement	As per site conditions
7.	Other miscellaneous works	As per site conditions

Figure 2.2: Google Map showing the location of the RUB project in relation to nearby important locations

Figure 2.3: Plan and cross section of Chittorgarh RUB



III. DESCRIPTION OF THE ENVIRONMENT

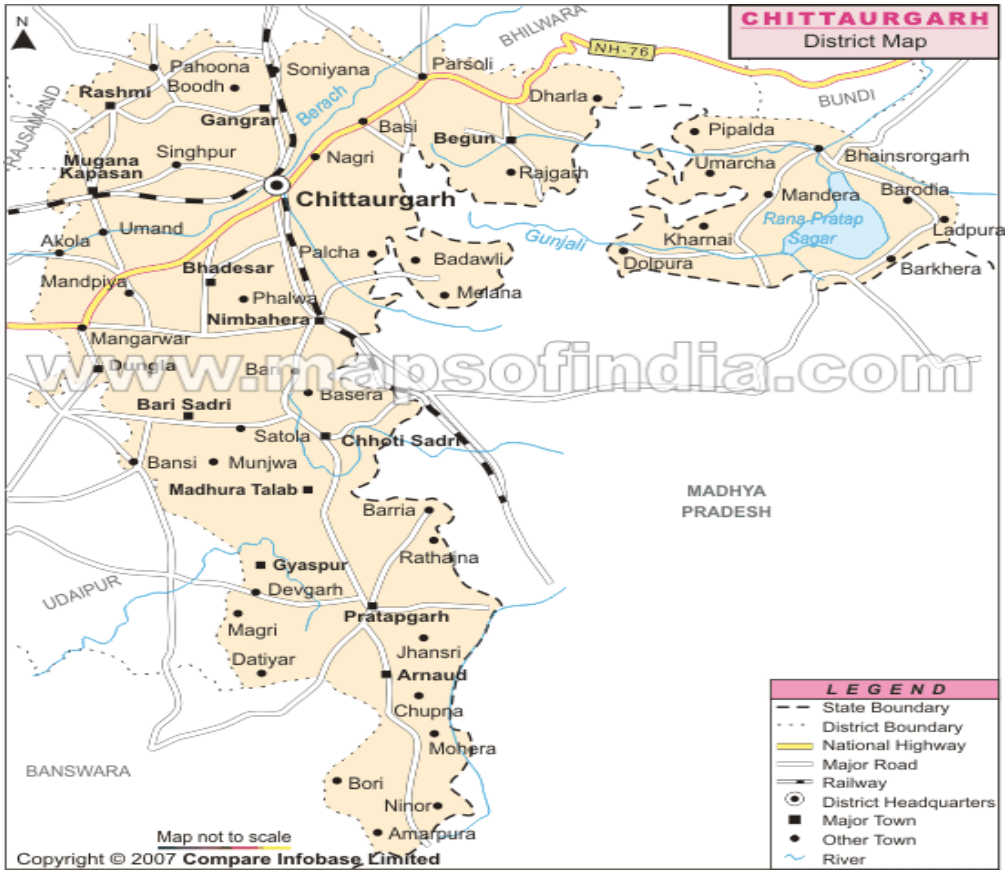
A. Physical Resources

1 Location

28. The Chittorgarh town is situated in the North –West of Aravali Mountains which is in the western part of Malwa Plains. The southern part of the land of Chittorgarh is very rich from the point of view of Agriculture and mineral resources. Located on confluence of Malwa and Mewar region, Chittorgarh is well connected from all sides, through rail and road. The mammoth Chittorgarh fort is one of its kind. It stands 150 m above plain ground and is 5 km long encompassing 690 acres of land. Chittorgarh has hilly character and soil is dark coloured soil having silt. The area of the District is 10,856 square km, which is 3.17 percent of physical area of Rajasthan State.

29. Chittorgarh is situated at the Ajmer –Khandwa meter gauge. It is directly linked to Delhi, Ajmer, Jaipur, Bhilwara, Udaipur and further Chittorgarh is well linked with national network as it is located on Kota –Neemach broad gauge Rail line. National Highway No.76 and 79 & State Highway No.9 pass through Chittorgarh and it is well linked with neighbouring cities like Bhilwara, Banswara, Kota, Udaipur and Neemach (MP) and in future Chittorgarh will be connected to Ratlam also by broad gauge Railway Line. **Figure 3.1** shows district map of Chittorgarh.

Figure 3.1: District map of Chittorgarh



2 Topography, Drainage, Natural hazard and Drought

30. **Topography** Chittorgarh lies between the East latitude 70° 38'and North longitude 24° 53'. The average height of the area is 538 m above m.s.l.

31. **Drainage:** The Banas, Berach, the Wagan, the Gambhir and the Jakham are the main rivers draining the area.

32. **Natural Hazards-** Earthquake: Chittorgarh town lies in low damage risk zone II. The area is less prone to earthquakes as it is located on comparatively stable geological plains based on evaluation of the available earthquake zone information. **Figure 3.2** depicts the earthquake zones of Rajasthan. **Figure 3.3** shows natural hazard zones of the Chittorgarh district.

33. **Drought:** Low rainfall coupled with erratic behavior of the monsoon in the State makes Rajasthan the most vulnerable to drought. Based upon the discussion with PHED officials the water table in the city continuously decreases by 1-2 meter on an annual basis combined with significant drawdown conditions.

Figure 3.2: Earthquake zones of Rajasthan

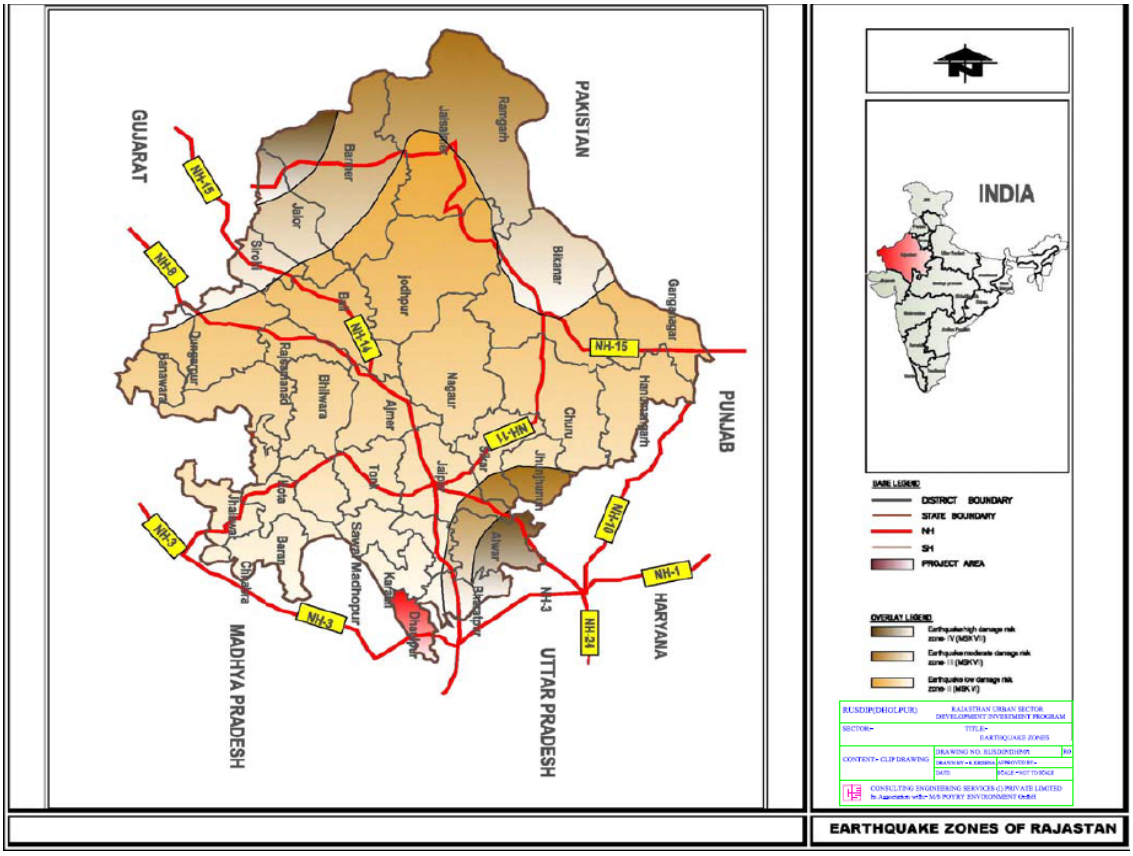
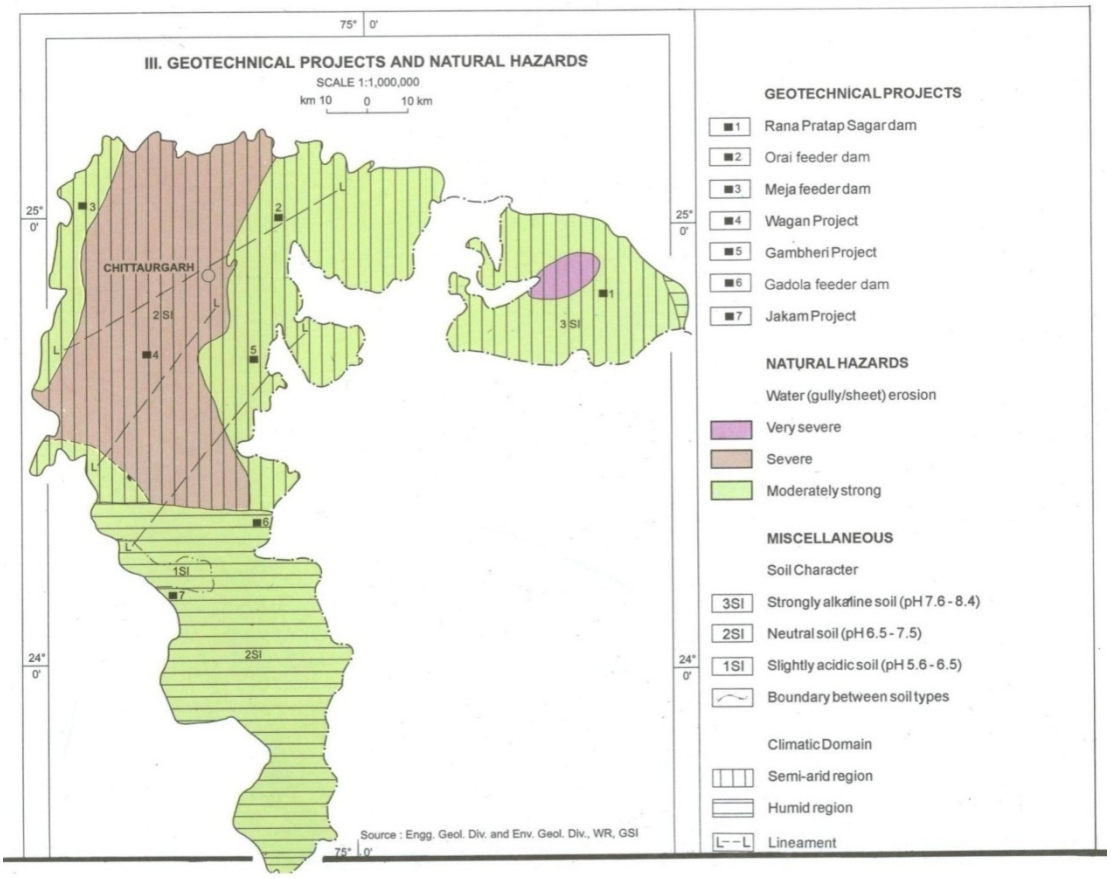


Figure 3.3: Natural Hazard map of Chittorgarh (GSI Resource map)



3 Geology, geomorphology, mineral resources and soil

34. Chittorgarh district in southern Rajasthan, Bordering Madhya Pradesh, covers an area of 10,856km2 The district has twelve tehsils namely Rashmi, Gangrar, Begun, Kapasan, Chittorgarh, Bhadesar, Dungla, Nimbahera, Bari Sadri, Choti Sadri, Pratapgarh and Arnaud. The area is well connected by metalled road and meter gauge railway line. The various rock types of the area belong to the Bhilwara Supergroup (Archean to Lower Proterozoic) and the Deccan Traps (Cretaceous to Eocene). The oldest comprise schite, gneiss, migmatite, quartizete dolomitic marble of the Mangalwar Complex and shale, slate, phyllite, tuff and greywacke of the Hindoli group, Both Belonging to Archaean age. These early Proterozoic cover sequences of the Rajpura – Dariba and Pur – Banera Groups occurs in isolated patches over the basement rocks of the Mangalwar Complex. The Rajpura – Dariba and Pur – banera Group comprise an assemblage of quartzite, dolomite marble, calc – gneiss, graphite mica schist. The Vidhyan supergroup overlies the basement rocks with a sharp angular unconformity referred to as a Great Eparchaean Unconformity. The Vidhyan supergroup includes an alternating sequence of sandstone, Shale limestone with andesitic flows at the base. These are classified into the Satola, the Sand, the Lasrawan, the Khorip and Kaimur Groups (Lower Vindhyans of Middle Proteozoic age). The lime stone of these assemblages, at places, show algal structures, known as stromatolites. In the southern part of the district, the basement rocks and the Vidhyan rocks are covered by basaltic flows, geological known as the Deccan Traps (65 to 62 m.y.old) which form flat topped hills. A total of nine flow have been recognized in recognized in Chittorgarh – Partapgarh Sector between 308 –350 m. in the north central part between (SW of) Chittorgarh and (west of) Parasoli, the Vidhyan rocks are truncated against Archaean rocks by the Great Boundary Fault

35. Geomorphologically, the district has divided into eight geomorphic units namely structural plain, structural hills, structural ridge and valley, denudational ridge and valley, plain and plateau on Deccan Trap (DT), highly dissected pediment and undissected pediment. The pediment area are seen in the western part where as structural plain (on the Vidhyans) are present in the eastern part, Two hydrological domain (of fissured formation on hilly area) with ground water potential ranging from <1 to 5LPS. Natural Hazard includes mainly water erosion which is moderate, severe and very severe in the district.

36. **Mineral Resources:** Clay deposit of the good quality occurs near Eral (24°52':74°37') and Sava (24°46':74°32') where the clay is plastic, fine grained with water of plasticity being 18.04%. The estimated reserve at Eral is 6.1 Million tonne (Mt). Montmorillonite – rich clay is reported from intertrappean beds of Barwara Gujar (24°25':74°40'). Limestone deposits are located near Chittaurgarh (24°53':74°37'), Nimbahera (24°37':74°40') and Parsoli (25°07':74°54') which cater to the needs of the cement plants at Chanderiya (24°56':75°38') and Nimbahera. Lead – Zinc and copper occurrences are found in Rewara (25°06':74°22') area. The sulphide dissiminations include galena chalcopyrite, sphalerite and pyrite. Reserve of 1.2 Mt with 0.7% Cu, 5.4% Pb and 0.4% Zn have been estimated. Minor occurrences of rock phosphate at Javada (24°36':74°26'), Barytes at Javra, near Rawat Bhata (24°56':75°35') and iron ore, NNW of Praptapgarh, are also reported from the district.

37. The main sources of drinking water in Chittorgarh are Gambhiri and Bedach Rivers. This place is potentially rich in mineral resources. Limestone deposits are in abundance, which feed several cement industries .The flooring stone and stone slabs used for roofing and covering are of good quality and are absorbed throughout the state. The Zinc deposits have facilitated establishment of Hindustan Zinc Smelter in Chittorgarh.

38. *Soil characteristics:* Soil of the region falls within low rainfall zone of 500- 900 mm. The soils are lithosolsat foot hills and alluvials in plains. **Table 3.1** shows nutrient level in the Chittorgarh soil including area coverage of saline and sodic soil. The nutrient status of the Chittargarh soil is graded as medium to high level.

Table 3.1: Fertility status – major nutrients and problematic soils of Chittorgarh district

Item	Nutrient			Saline Soil(Ha)	Sodic or Alkali(Ha)
	N	P	K		
Status	L	M	H	17720	11397

(Source: Vital Agricultural Statistics 2004-05, Directorate of Agriculture, Rajasthan)

4 Climate

39. The climate of Chittorgarh is generally dry. The maximum average temperature during summer is 41.5 degree Celsius and during winters it is 25 degree Celsius. Being hilly terrain it is relatively hot and dry and the temperature reaches around 44 degree Celsius, which recedes only after arrival of South West monsoon towards June end. With departure of monsoon in mid September, the temperature gradually rises again and falls steeply from November. The climate being dry generally the humidity in air remains at 20 percent or low. It is only during South West monsoon that the humidity goes upto 70 percent or even more. It remains dark cloudy during rains and otherwise the sky remains clear. The wind blows at

low except during summer and monsoon when hard and turbulent winds are experienced. Winds blow South West to North East in summer and winter experience northern and North West winds. The average rainfall is 760 mm. 95 percent of the annual rains are experienced during June to September. The maximum rainfall was experienced in 1917 when it rained 211% over the average rainfall.

40. The rainfall over Chittorgarh is scanty and is concentrated over four month i.e. from June to September. The rains are erratic and so is the distribution of the rainfall. However agriculture and the animal wealth are dependent on rains to large extent. Seasonal Rainfall data for the recent year (2011) is shown in **Table 3.2.**

Table 3.2: Rainfall at Chittorgarh in the year 2011

S. No.	Months	Rainfall (mm)
1	January	0.0
2	February	0.0
3	March	0.0
4	April	0.0
5	May	0.0
6	June	158
7	July	223
8	August	267.5
9	September	169
10	October	0.0
11	November	0.0
12	December	0.0
13	**Monsoon Rainfall**	**817.5**
14	**Non monsoon rainfall**	**0**
15	**Annual Rainfall**	**817.5**

5 Air Quality

41. In the month of November 2011 air quality monitoring was done in various locations of Chittorgarh for different projects of RUSDIP. These includes village Bhoikhera, near Sangam of River Gambhiri and Bedach, Berda Mines and at Sengwa Housing Board. The major sources of air pollution in Chittorgarh are some big industries like Birla Cement Factory, Hindustan Zinc Limited, various medium and small scale industries, mining and crushers, vehicular pollution etc. The ambient air quality data is depicted in **Table 3.3.** Data shows that ambient air quality in Chittorgarh is well within the limits prescribed by GOI.

Table 3.3: Ambient Air Quality in Chittorgarh during November 2011

Monitoring Station	Aerial Distance from RUB site (approx)	Sulphur Dioxide as SO2 (μg/m3)	Oxides of Nitrogen as NO_2 ($\mu g/m^3$)	Carbon Monoxide as CO ($\mu g/m^3$)	PM10 ($\mu g/m^3$)	PM 2.5 ($\mu g/m^3$)
Bherda Mines	1750 m	7.96	12.93	146	62.72	39.31
Village Bhoikhera	2150 m	8.07	15.5	159	75.35	43.47
Sengwa Housing Board	7000 m	8.12	13.46	173	96.14	16.0

Permissible limits as per CPCB Notification, New Delhi, 18th November, 2009 (24 Hours)	80	80	2000*, 4000#	100	60

NOTE: Sampling and Analysis done according to IS 5182(Pt- 2, 4, 5, 6, 10, 23)
Where: *= Maximum limits for 8 hourly monitoring, #= Maximum limits for 1 hourly monitoring

6 Surface Water

42. The surface water quality monitoring has been carried out in River Gambhiri and Sangam point and water reservoir of Bherda Mines for RUSDIP projects in the month of November 2011. The data on DO, pH, BOD, COD and TSS is given in **Table 3.4.**

Table 3.4: Surface Water Quality of Gambhiri, Sangam point and Bherda Mines Reservoir

Surface Water Sources	Approx Aerial distance from RUB site	Dissolved Oxygen (mg/lt)	pH	BOD (mg/lt) (3 days at 27o C)	Chemical Oxygen Demand (COD) (mg/lt)	Total Suspended Solids (TSS) (mg/lt)
Sangam Point	2200 m	4.99	7.5	5.44	47.36	19
Gambhiri River	2300 m	4.90	7.69	4.08	23.04	24
Bherda Mines	2200 m	4.83	7.75	1.19	10.42	6.0

Data shows that surface water quality of Gambhiri, Sangam and Bherda Mines are good enough and these sources are being used for drinking water supply for the town by PHED.

7 Geohydrology and Groundwater

43. There are number of National Hydrographic monitoring stations of Central Ground Water Board in and around Chittorgarh. In most of the cases ground water table ranged between 10 - 20 m bgl.

44. The Central Ground Water Board carried out chemical testing of tube well water seasonally. The average concentrations of major constituents are shown in **Table 3.5**.

Table 3.5: Ground Water Quality in and around Chittorgarh

Parameters	Maximum Level	Minimum Level	Standard of Drinking water (IS: 10500: 1991)	
			Desirable limit (mg/l)	Maximum Permissible limit (mg/l)
pH	8.85	7.25		
EC (micro-mhos/cm at 25 °C)	3680	485		
Cl (mg/l)	753	28	250	1000
SO_4(mg/l)	311	10	200	400 (if Mg does not exceeds 30 ppm)
NO_3(mg/l)	345	0.41	-	100
PO_4(mg/l)	1.5	0.03		

Parameters	Maximum Level	Minimum Level	Standard of Drinking water (IS: 10500: 1991)	
			Desirable limit (mg/l)	Maximum Permissible limit (mg/l)
Total Hardness(mg/l)	950	120	300	600
Ca(mg/l)	256	12	75	200
Mg(mg/l)	119	15	30	100
Na(mg/l)	632	12	-	-
K(mg/l)	226	0.78	-	-
F(mg/l)	2	0.34	1.0	1.5
Fe(mg/l)	19.7	0.15	0.3	1.0
SiO_2(mg/l)	24	8		
TDS (mg/l)	2392	315	500	2000

Note: Total – 17 nos. samples
Source: Ground water year book 2005-06 Rajasthan, Central Ground Water Board, Jaipur (2008-09)

B. Ecological Resources

45. FLORA: The Chittorgarh district supports mahua, baheda, saded, aam and jhinjha. The endemic taxa or species found in the district are represented by pipal, bad or banyan tree, bael, dhak, kaith, datura, indrokdhav.

46. FAUNA: Chittorgarh falls in Paleotropical –Oriental Region .It is needless to mention that India as a whole also falls in Oriental Region. Of the typical fauna of the Oriental region, the district harbours Mor, Bandar, Langur, Baghera and Kala hiran these days. No endangered flora and fauna are noted near proposed site.

47. There is no forest plantation exist nearby the project site

C Economic Development

48. Economic base of a town reflects its prosperity. Chittorgarh being district headquarter, has been functioning as administrative city with sustained growth in tertiary economic activities. The major economic activities are trade and commerce, thus it offers a number of wholesale and retail markets which act as a distribution center for near by towns and villages. Because of developing Industries now it is equivalent to Byabar, Alwar and Bhilwada. Tourism income is also contributing very much towards economic generation of the town on the contrary major industries play a big role in providing employment and income generation. As per the master plan major industries of the Chittorgarh are Bidla Cement works and Zinc Smelter in which a major part of Industrial workers is engaged. Housing facilities for these workers is provided by these Industries. Occupational Structure of Chittorgarh town in year 2001-2005 is given Below **(Table 3.6)**

Table 3.6: Occupational Structure of the Chittorgarh

Sl.No.	Occupation	Year 2001		Year 2005	
		No. of Persons Engaged	% of Total Workers	No. of Persons Engaged	% of Total Workers
1	Agriculture & its associated work	3,620	12.16	2,016	3.00

Sl.No.	Occupation	Year 2001		Year 2005	
		No. of Persons Engaged	% of Total Workers	No. of Persons Engaged	% of Total Workers
2	Industry	7,538	25.32	20,832	31.00
3	Constructional work	1,530	5.14	2,688	4.00
4	Trade & Commerce	5,864	19.30	14,112	21.00
5	Transport	3,501	11.76	7,392	11.00
6	Other Services	7,716	25.92	20,160	30.00
Total		**29,769**	**100.00**	**67,200**	**100.00**

Source: Master Plan 2001-2005

1 Land use

49. Chittorgarh town spreads over an area of 41.76 sq.km. i.e. 10,319 acres out of which 6,345 acres are urbanization area while rest is hillock, water bodies, agriculture land etc. Out of 6,345 acres urbanization area only developed area is 3,665 acres rest of the part is for Water Bodies, Fort, Agriculture Research and Mining. The Percentage of residential area is quite less in old Chittorgarh due to slow development of dense residential units. This is only 35.61% of total developed area. Being the District Headquarter Percentage land use of Government and Semi Government is 3.14% and for Recreation is 10.78%. Railway is having sufficient land under their use and the Regional Roads are crossing through this town,16.78% of total developed area is under the use of Circulation. For Commercial and Industrial purposes, land use is respectively 2.86 % & 29.19% .Following table shows the Existing land use pattern of year 2001 and proposed land use pattern of year 2025 (**Table 3.7**).

Table 3.7: Existing and proposed Land Use Chittorgarh

SN.	Land use	Year 2001			Year2025		
		Area (Acre)	% of developed area	% of total urbanization area	Area (Acre)	% of developed area	% of total urbanization area
1	Residential	1,305	35.61	20.57	4,455	48.82	36.91
2	Commercial	105	2.86	1.65	390	4.27	3.23
3	Industrial	1,070	29.19	16.86	1,300	14.25	10.77
4	Govt.& Semi Govt.	115	3.14	1.81	160	1.75	1.33
5	Recreation	395	10.78	6.23	640	7.01	5.30
6	Public facilities	60	1.64	0.95	915	10.03	7.58
7	Circulation	615	16.78	9.69	1,265	13.87	10.48
Total developed area		**3,665**	**100.00**	**57.76**	**9,125**	**100.00**	**75.60**
8	Water bodies	934	-	14.72	595	-	4.93

SN.	Land use	Year 2001			Year2025		
		Area (Acre)	% of developed area	% of total urbanization area	Area (Acre)	% of developed area	% of total urbanization area
9	Fort	690	-	10.87	690	-	5.72
10	Plantation	95	-	1.50	1,300	-	10.77
11	Agriculture research & nursery	835	-	13.16	360	-	2.98
12	Mining	126	-	1.99	-	-	-
Total urbanization area		**6,345**	**-**	**100.00**	**12,070**	**-**	**100.00**

Source – Master Plan 2001-2025 Chittorgarh

2 Commerce, Industry and Agriculture

50. The raw material found nearby areas of the Chittorgarh town accelerated the growth and development of Commercial and Industrial activities .After 1950 new markets developed nearby Railway Station and Collectorate. Talkies of the town are located at Rana Sanga Bazar and Fort Road .The Godowns of Rajasthan State Storage Corporation are located near Gurukul and Sainti villages. Godowns of F.C.I. are located near Chanderia Railway Station.

51. The first Industrial unit Cotton Jinning Factory was established in 1924 in Chittorgarh. Birla Cement Works was started in 1966 in the form of Birla Jute Manufacturing Company Limited a unit of Birla Group. Other notable large industry is Hindustan Zinc Limited. The Industrial Area of 80 acres is 4 km away from Chittorgarh at Bhilwara Road. Two units are working in this area. In Chanderia at Bhilwara Road one Industrial area is developed by Ricoh of 105 acres which is having 200 Industrial Plots. Also in Ajoliya ka Kheda at Bhilwara Road Ricoh has developed 155 acres Industrial area consisting of 200 Industrial Plots. 71 nos. Plots are kept in 40 acres area by Ricoh at Bundi Road in Maanpura village. Cutting and Polishing work of Granites and Stones is done by Ricoh in these industries. Fast Industrialization of Chittorgarh is reported in last two decades.

52. House Hold Industries of Chittorgarh like floor mill, jewellery work and repair workshop are also included in major Industries. Riico small scale units of stone cutting and polishing are established being the availability of good and sufficient building stones. Recently many units of Marble cutting, polishing and Diamond cutting are installed in Riico Industrial area. The large scale Industries of this town are Bidla Cement Works and Hindustan Zink Limited's smelter plant. Two units of Bidla Cement Works are in the production stage having 1962 workers.

53. A large Industrial unit named Super Zinc Smelter is established near Putholi by Hindustan Zinc Limited. Approval was given by the Government in 1988 for this project. Commercial production of Zinc is started in September 1991 and commercial production of Copper in September 1997. Main water source of this project is Ghosunda Dam. This Industrial boundary is spread in 825 acres between Bhilwara Road and Broad Gauge Railway Line.

54. In and around the Chittorgarh town area there are about 70-80% of lands used for agricultural purpose. Crop production statistics as depicted in **Table 3.8** indicates more crop production in Kharif season in compared to Rabi season.

55. Chittorgarh district is highest producer of groundnuts in Rajasthan, second highest producer of maize, alsi and sanai, third is barley and pulses, fourth in sugarcane and gram production fifth in chillies and cotton. Major production of opium in Rajasthan comes from Chittorgarh.

Table 3.8: Crop production (Ton) in and around Chittorgarh

Type of Crops	Under Rabi Crops	Under Kharif Crops
Cereals	319834	472764
Pulses	8002	601
Food Grains	**327836**	**473365**
Oilseeds	93018	84200
Others	60348	57444
Total	**841222**	**615009**

(Rajasthan Agriculture Statics at a Glance, 2009-10)

3 Infrastructure

56. *Water supply*: The major source of drinking water for Chittorgarh is river Gambhiri, which flows right through the habitation of the town. The intake wells and pump houses are located along 2.5 kms of river banks. Except this the water supply is also done through 93 additional tube wells to the different parts of the Chittorgarh town. The water supply network has 7 overhead tanks and 11 ground water reservoirs. The capacity of total water supply to Chittorgarh is 72.00 lacks liters per day out of which 66.82 lacks liters per day is used for residential purpose and 5.18 lacks liters per day is used for other purposes. Per capita day supply being made is 95 liters as against the standards of range from 115-135 liters per capita per day. Two new Water Treatment Plants at Bherda Mines and Sengwa Housing Board and five new OHSRs are proposed under RUSDIP works to strengthen the water supply of the town.

57. *Sewerage System:* Chittorgarh town does not have underground sewerage system. Out of the occupied residential houses about 85% have some kind of latrines. Most of the houses have adopted the practice of providing onsite disposal by constructing water seal / borehole latrines or by providing septic tank with effluent discharge into soak pits or open surface drains which ultimately reaches to Gambhiri River. Economically weaker section generally defecates into the open field. No sewerage treatment facility is there in the town and the drains having combined drainage and sewage are having outfall discharge in open fields or Gambhiri River of the town. In the absence of any sewerage facility, the major mode of disposal is through individual septic tanks and low cost sanitation. There is no sewerage connection in the Chittorgarh town. Total no. of toilets as per Census 2001 is 1200. Currently there is no any facility of waste water treatment. For the treatment and disposal of sewerage and waste water the Sewage Treatment Plant is proposed in village Bhoikhera, near Gambhiri river. This treated water may be used for the development of agricultural fields near the place of Gambhiri river.

58. *Sanitation:* Only 70-80 % of the households reportedly has septic tanks and soaks well as the system of sewerage disposal. The remaining accounted for cases of open defecation which is an unacceptable and unhygienic practice. The raw settled sewage from septic tank is periodically flushed out by sanitary workers of the Municipal Board and

discharge to open spaces, agricultural lands in an indiscriminate manner. Slum areas were also not equipped with requisite sanitation (LCS etc.) resulting in open defecation.

59. *Drainage*: The existing drainage system in Chittorgarh is piecemeal construction of open *Nallah* as per local and temporary requirements without proper designs. The town has mainly open drains. The waste water along with sewage is discharged into the fields and Gambhiri River through open drains. Storm water drainage is expressed in terms of its coverage with respect to the total road length. Ideally length of the storm water drain should be twice that of the total road length.

60. The open drain system in the town is irregular and mismanaged. The improper construction and maintenance of open drains cause spillage of rain water mixed with sewage and gets collected in local depressions at following core places of the town and requires pumping for several days.

61. *Industrial Effluents.* Industries exists, which is out-side the city area and small amount of effluent disposed scattered in local nallahs. As reported by the local MC, the responsibility of effluent disposal is under industry's own and could not be connected to the proposed sewer network. The individual industry should treat their effluent to bring it to the required standard before final disposal.

62. *Solid Waste:* Chittorgarh town spreads over 41.76 square km. The total waste generation in the town is about 22 T/day out of which 15 T/day is collected by Municipal Board considering a population of 96,219 persons in year 2001 census. It is important to note that no initiatives has been taken till now in terms of door to door collection of solid waste in Chittorgarh. Presently most of the city wastes are simply dumped without any treatment in depressions, ditches or by the sides of the road flank in an unscientific manner. This practice may lead to air and water pollution, releases foul smell and this situation may cause major threat to the public health. Primarily, the sweeping is done by municipal staffs and collection and disposal is performed by the contractor. The garbage is collected and stored in a common point in every ward and the transportation is done by the tractor and wheel barrows. There are some open points within the town demarcated by Chittorgarh municipal Board for garbage disposal in the wards. The disposal site of Solid Waste is Chatka ji at Bundi Road .The average distance is 12 km per trip. The total distance is 6 km from collection to the disposal point. Improved Solid Waste Management System is proposed with collection, treatment (through Composting) and disposal (Land Filling) is also proposed under RUSDIP works, but land for land fill site is still not finalised by Municipal Corporation.

4 Transportation

63. This section covers the scenario of transportation sector and related problems and issues. Chittorgarh is well connected with all the important towns of the state. It is situated on the junction of National Highway No.76 running from Pindwada to Kota via Udaipur ,Mangalwad, Chittorgarh Bengu, Bijaulia and Bundi, while National Highway No.79 goes upto Indore via Ajmer, Bhilwada, Chittorgarh, Nimbaheda Neemach and Ratlam. State Highway No.9 running from Udaipur to Bundi via Dabok Mavli, Kapasan, Chittorgarh and Ladpura .All these three Highways are very busy due to heavy traffic. Chittorgarh is important being the main junction of all Highways mentioned above.

64. At present there are two Bus Stands in Chittorgarh .Rajasthan State Road Transport Corporation bus stand is situated near Collectorate in front of Kotwali where as the Private Bus stand is in Gandhi Nagar Yojana. Private Bus stand is at Ghatiavali Road in the South East part of Chittorgarh from where the buses to all the important cities passes through

Madhya Setu Road, Collectorate Circle, Maharana Pratap Circle. This bus stand is very congested. In the centre towards North of the city another bus stand is proposed near Kapasan Circle, so that load of traffic can be distributed. As there is no truck stand in the city so all the trucks are parked on the main roads. There is no proper arrangement of traffic in the old city .In the old city width of road is approximately 10-20 ft. On the right side of National Highway No.78 Transport Nagar will be developed in the North of city at Bilwara Road .Its area will be 42 acres .In this Transport Nagar Godowns, Private Transport Offices, Repair market ,Automobile Market ,Parking place, Banks, Petrol pumps, Service station and Fire Station.

65. Chittorgarh is connected through meter gauge to Delhi, Jaipur Ajmer and Udaipur and Broad Gauge to Kota and Nimach under the North –West Railway zone .The main Railway yard is in Chanderia from where Railway Siding is provided to Birla Cement Works .The Broad Gauge Railway Line will be extended up to Ratlam. Both the Railway Stations Meter Gauge and Broad Gauge are constructed nearby. Broad Gauge Line is proved beneficial for Marble Industry along with Hindustan Zinc and Birla Cement. There is no Airport in the Chittorgarh at present, arrangement is made in the Boundary of Birla Cement Works.

66. **Table 3.9** provides a breakdown of road network within Chittorgarh municipal areas. Physical growth of the city has resulted in a corresponding increase in vehicular traffic greater than that of the city's population growth due to improving economic status of the city.

Table 3.9: Details of Road Surface

Surface Type	Length (Km.)
Concrete	100
Black Topped	150
Water Bound Macadam	50
Total	**300**

Source –Municipal Council Chittorgarh

67. *Traffic Study and Traffic Assessment:* The 7 days (17.05.2010 to 24.05.2010) traffic survey was conducted at level crossing LC 86 location to determine the ADT (Average Daily Traffic) in terms of Nos. & PCUs. The peak hour is observed from 10.00 PM to 11.00 PM. The traffic figures for various passenger and goods units are collected and provided with the survey. The traffic mainly comprised of 2 wheelers, cars, jeeps, taxi and cycles. Although, the vehicle registration data is indicating sale of commercial vehicles between 13 to 15%, for calculation prupose the commercial vehicles are considered as 25 %. Obviously, the vehicles below 3T of laiden weight are not considered for calculations as per IRC-37 2001. The traffic composition for light and heavy vehicles is as following (reference PFR for traffic survey enclosed in DPR). This shows that about 60 to 65 % of daily traffic wil pass through this RUB. From **Table 3.10** it is also observed that 2-Wheelers, Car, Jeep, Taxi and Cycles are more dominating in this section of road. PCU Values for different vehicles are taken from IRC-86:1983

Table 3.10: Traffic Survey details for proposed RUB

Type	Two Wheelers (motor cycles, scooters)	Three Wheelers/ Auto rickshaw	Car/Jeep/ Van	LCV	Tractor/ Tractor Trailer	Cycle	Cycle rickshaw	Animal drawn

Type	Two Wheelers (motor cycles, scooters)	Three Wheelers/ Auto rickshaw	Car/Jeep/ Van	LCV	Tractor/ Tractor Trailer	Cycle	Cycle rickshaw	Animal drawn
Nos.	4834	1081	1143	515	1145	1837	205	315
% comp.	39.02	8.73	9.23	4.16	9.24	14.8	1.65	2.54

68. *Traffic Projection & Justification:* As already discussed, the traffic survey is carried out at LC no 86 to determine daily traffic. The following parameters are considered for the purpose of traffic calculations (in terms of million standard axles)

i. Growth Rate - 7.50%
ii. Lane Distribution Factor - 0.75
iii. Vehicle Damage Factor - 3.50
iv. Direction Distribution Factor - 1.0

69. The non peak traffic is considered as 5% of the peak hour traffic and is taken for 17 hours (i.e. from 6 AM to 12 PM excluding peak hour). The peak hour traffic is assumed for 1 hour (i.e. 10.00 PM to 11.00 PM). The heaviest traffic is considered for the pavement design for both carriageways. Hence, 2-lane RUB is justified only as per the projected peck hour traffic.

D. Social and Cultural Resources

1 Demography

70. The first Census of Chittorgarh was done in 1881, but it was not reliable because the Bhil Community did not support due to the fear developed due to Census. The Population of year 1901 was 7,593 which was the authenticated data by the Census. The main cause of low Population growth in the decades 1911-1931 was unfavourable climate and diseases like Enfluenza, Plague and Diarrhoea. The main reason of Population growth in the decade 1951-1961 is the arrival of displaced families from outside to Chittorgarh and shifting of District Headquarter from Nimbaheda to Chittorgarh. As per the Census of India Population for the year 2001 was 96,028 with a Municipal Area of 41.76 Sq. km and a population density of 2299.52 person per Sq.km which was rapidly increased in comparison to year 1981 with a Population of 44,994 with Municipal Area of 24.81 Sq.km and a Population density of 1813.54 persons per Sq.km. (**Table 3.11**).

Table 3.11: Population Growth in Chittorgarh town

Year	Population	Variation	Growth Rate
	Chittorgarh town		*(%)*
1901	7,593	-	-
1911	7,332	-261	-3.44
1921	8,015	683	9.32
1931	8,041	26	0.32
1941	9,300	1,259	15.66
1951	11,863	2,563	27.56

Year	Population	Variation	Growth Rate
	Chittorgarh town		*(%)*
1961	16,888	5,025	42.36
1971	25,917	9,029	53.46
1981	44,990	19,073	73.60
1991	71,569	26,579	59.08
2001	96,219	24,650	34.44
2011	139,537	43,318	45.02
2021	193,863	54,326	38.93
2031	269,043	75,180	38.78
2041	376,169	107,126	39.82

Source: Census of India, 2001.

2 Health and educational facilities

71. There are good educational facilities in Chittorgarh district, which serve both townspeople and inhabitants of surrounding villages and towns in the hinterland. There are 1863 primary schools, 184 secondary and higher secondary schools, plus 5 general degree colleges, 1 polytechnic college and 4 industrial training institutes (ITI). **Table 3.12** shows education facility in the district.

Table 3.12: Educational facility of Chittorgarh District

Educational Facilities	No.
Primary Schools	1,863
Middle Schools	524
Higher Secondary and Secondary Schools	184
Colleges	5
Professional and Special Education Schools	5
Polytechnic	1
ITI	4

Source: Official website of Rajasthan

72. There is 1 hospital and community center in urban area of Chittorgarh. There are also 6 primary health centers and 39 sub–centers. **Table 3.13** shows detail of medical facility of Chittorgarh.

Table 3.13: Medical facility at Chittorgarh urban area

S.N.	Facilities	Number
1	Hospital & community center	1
2	Primary Health Center and Maternity Center	6
3	Mother and Child Care Center	2

S.N.	Facilities	Number
4	Sub-center	39
	Total	48

Source: District statistical handbook

3 History, culture and tourism

73. Today it is the most important city of Rajasthan. Chittorgarh city being the capital of the district, functions as the administrative city and hub of the tertiary economic activities like services, trade and commerce.

74. Chittorgarh has rich heritage sites. The mammoth Chittorgarh Fort is one of its kind .It stands 150 meters above plain ground and is 5 km. long encompassing 690 acres of land. The Historical Fort and other historical places like Nagar Dwar, Prasad ,Vijay Stambh, Temples are full of Heritage and Architecture and attract inland and foreign Tourist in large numbers. The Tourist inflow in Chittorgarh is constantly increasing, which is evident from the data of Tourism Department as follows in **Table 3.14**.

Table 3.14: Tourist Inflow of Chittorgarh

Sl No.	Year	Inland Tourist	Foreign Tourist	Total Tourist
1	1983	111,416	2,122	113,538
2	1984	116,109	2,215	118,324
3	1985	117,560	2,252	119,812
4	1986	118,424	2,492	120,916
5	1987	122,691	3,472	126,163
6	1988	138,393	2,857	141,250
7	1989	142,749	3,678	146,427
8	1990	154,443	5,105	159,548
9	1991	155,326	6,153	161,479
10	1992	173,940	6,355	180,295
11	1993	200,170	9,087	209,257
12	1994	153,839	12,700	166,539
13	1995	152,164	17,153	169,317
14	1996	182,400	18,240	200,640
15	1997	240,872	13,357	254,229
16	1998	327,874	10,433	338,307
17	1999	150,108	5,886	155,994
18	2000	120,145	8,164	128,309
19	2001	120,390	7,552	127,942

Source -Tourism Department Chittorgarh

75. There are 16 developed and 8 undeveloped gardens in Chittorgarh .Nehru Garden near Government Guest House, Pratap Garden near Udaipur Road and Municipality Garden

are the main gardens in the city whose care is satisfactory. Mragvan Garden is developed at Fort in 102 acres area. One Stadium is also developed at Bhilwada Road in the North of Collectorate having 17 acre area.

76. Within the Fort, two mega religious fairs are organized in every year namely Kalika ji fair and Johar Jyoti fair which attract over 20,000 tourists and 10,000 tourists. These festivals are of great importance for local people and tourists.

77. Although Chittorgarh is a very small town but due to inflow of tourists Hotels and Dharmshalas for lodging and boarding are also available in addition to Circuit Houses and Dak Bunglows

IV. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

78. ADB Environmental Assessment Guidelines require that an IEE should evaluate impacts due to the location, design, construction and operation of the project. Construction and operation are the two activities in which the project interacts physically with the environment, so they are the two activities during which the environmental impacts occur. In assessing the effects of these processes therefore, all potential impacts of the project are identified, and mitigation is devised for any negative impacts. This has been done in Sections V and VI below and no other impacts are expected.

79. This section of the IEE reviews possible subproject-related impacts, in order to identify issues requiring further attention and screen out issues of no relevance. ADB SPS (2009) require that impacts and risks will be analyzed during pre-construction, construction, and operational stages in the context of the subproject's area of influence. As defined previously, the primary impact areas are (i) within the 50-m zone from both sides and 100-m length from both approaches of the existing bridges; (ii) main routes/intersections which will be traversed by construction vehicles; and (iii) quarries and borrow pits as sources of construction materials. The secondary impact areas are: (i) entire Chilttorgarh town outside of the delineated primary impact area; and (ii) entire Chilttorgarh district in terms of over-all environmental improvement.

80. The ADB REA Checklist for Roads and Highways found in http://www.adb.org/documents/guidelines/environmental_assessment/eaguidelines002.asp was used to screen the subproject for environmental impacts and to determine the scope of the IEE. The completed checklist is found in **Annexure 2**. Results of the rapid assessment show all the subproject components will interact physically with the environment.

81. As the project involve some land acquisition (agricultural and industrial land) for the approach road, there may some significant impact, but it is sole responsibility of Municipal Corporation to acquire the land and hand it over to RUIDP for this project, therefore it may be considered as there is no impact regarding land acquisition.

82. However in the case of this subproject it is not considered that there are any impacts that can clearly be said to result from either the design or location. This is because:

- Most of the individual elements of the subproject are relatively small and involve straightforward construction and operation, so impacts will be mainly localized and not greatly significant;

- Most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving digging and other small excavation. However the routine nature of the impacts means that most can be easily mitigated;

- In one of the major fields in which there could be significant impacts (archaeology), those impacts are clearly a result of the construction process rather than the project design or location, as they would not occur if this did not involve trenching or other ground disturbance.

- Disturbance in railway operation on this route during construction of RUB section, for which mitigation shall be sole responsibility of Railways, who will execute the RUB section itself.

A. Pre-construction

83. **Screening out areas of no significant impact** From the descriptions given in Section II.C, it is clear that implementation of the subproject should not have major negative impacts because it will affect only one site, at which all construction will be conducted within a relatively small area.

84. Because of this there are several aspects of the environment that are not expected to be affected by the construction process and these can be screened out of the assessment at this stage as required by ADB procedure. These are shown in **Table 5.1**, with an explanation of the reasoning in each case.

Table 5.1: Fields in which construction is not expected to have significant impacts

Field	Rationale
Climate	Short-term production of dust is the only effect on atmosphere
Geology and seismology	Excavation will not be large enough to affect these features
Fisheries & aquatic biology	No rivers or lakes will be affected by the construction work
Wildlife and rare or endangered species	No wildlife and endangered species nearby the RUB
Coastal resources	Chittorgarh is not located in a coastal area
Development of minerals and tourism	There are none of these developments near the site
Population and communities	Construction will not affect population numbers,

85. These environmental factors have thus been screened out presently but will be assessed again before starting of the work.

86. **Environmentally-sensitive Areas.** Location impacts are not significant as there are no environmentally sensitive areas within the subproject area. A few trees will be cut and vegetation (mostly shrubs and grasses) will be cleared during the project execution. Prior to construction, the Design and Supervision Consultants (DSC) in close coordination with the Chittorgarh Investment Project Implementation Unit (IPIU) will (i) inventory the trees to be cut; (ii) obtain tree-cutting permit from Municipal Corporatin and/or District Collector; and (iii) include in the bid documents provisions on replacement of 3 trees for every one tree cut during construction.

87. **Utilities**. Telephone lines (railway), electric lines (HT and LT) with poles and wires, within the existing bridge right-of-way (ROW) may be affected and may need to be shifted or preserved. To mitigate the adverse impacts due to relocation of the utilities, DSC will (i) integrate utility ducts to the proposed bridge designs; (ii) identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase; and (iii) require construction contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services. Although the construction within the railway ROW will be done by western railway and the necessary measures as required will be taken by them.

88. **Access Roads.** Access roads on both sides of RUB needs land acquisition, which shall be done my Municipal Corporation as per applicable rules and regulations.

89. **Social and Cultural Resources.** Rajasthan is an area of rich and varied cultural heritage which includes many forts and palaces from the Rajput and Mughal periods, and large numbers of temples and other religious sites, so there is a risk that any work involving ground disturbance can uncover and damage archaeological and historical remains. For this subproject, there is least possibility to affect these features as there are no any historical and archaeological monuments present within 500 mtrs area. Nevertheless the Contractor during conducting any excavation work, have to ensure that when any chance finds are recognized, immediate measures are taken to ensure they are protected and conserved.

90. **Site selection of construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas.** Priority is to locate these within or nearest possible vacant space in the vicinity of subproject sites to avoid disturbance to pedestrians and vehicular traffic. The nearest suitable land will be selected for this purpose. However, if it is deemed necessary to locate elsewhere, sites to be considered will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems. Residential areas will not be considered to protect the human environment (i.e., to curb accident risks, health risks due to air and water pollution and dust, and noise, and to prevent social conflicts, shortages of amenities, and crime). Extreme care will be taken to avoid direct disposal to nearby nallah or in areas which will inconvenience the community. All locations will be determined by IPIU and DSC prior to award of construction contracts.

91. **Site selection of sources of materials.** Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution. To mitigate the potential environmental impacts, priority will be sites already permitted by the Mining Department. If other sites are necessary, it will be the construction contractor's responsibility to verify the suitability of all material sources and to obtain the approval of IPIU. If additional quarries will be required after construction is started, then the construction contractor shall obtain a written approval from PMU.

B. Construction

1. Screening of No Significant Impacts

92. The construction work is expected not to cause major negative environmental impacts, mainly because:

- Major activities of RUB will be on the existing rail ROW and approach roads in agricultural and industrial land allotted by Municipal Corporation of the town thus could be constructed without causing major environmental impacts;

- The site will be located on an government-owned land which will not be occupied or used for any other purpose;

- Overall construction program will be relatively short and is expected to be completed in 6 months, with activities to conducted by small teams working on short lengths at a time so most impacts will be localized and short in duration; and

- Environmental impacts during construction are generic construction-related impacts associated with (i) road construction and (ii) removal and relocation of utility lines. These impacts are not expected to be significant, and can be managed through adoption of good engineering practices and undertaking specific mitigation measures.

93. As a result, there are several aspects of the environment which are not expected to be affected by the construction process and these can be screened out of the assessment at this stage as required by ADB procedures. These are shown in **Table 5.2**. These environmental factors are screened out presently but will be assessed again before starting of the construction activities.

Table 5.2: Fields in which Construction is not expected to have Significant Impacts

Field	Rationale
Topography, Drainage, and Natural Hazards	Activities are not large enough to affect these features.
Geology, Geomorphology, Mineral Resources, and Soils	Activities are not large enough to affect these features. No mineral resources in the subproject sites.
Climate	Activities are not large enough to affect this feature.
Air Quality	Short-term production of dust is the only effect on atmosphere
Protected Areas	There are no protected areas within 5 kms radius of the proposed site
Flora and Fauna	No rare or endangered species are found in the project area.
Economic Development	Activities are not large enough to permanently affect this feature.
Commerce and Industry	Activities are not large enough to affect these features, the access road on NH 79 side shall be beneficial for nearby industries
Population	Activities are not large enough to affect this feature.
Health and education facilities	No any health and education facilities exist near the proposed site
Religious, historical or archaeological sites	No religious sites near the subproject sites.

- **Construction method**

94. As explained above, this subproject will involve construction of a RUB of 2.5m x 7.5 m x 7.5 m and approach roads on both sides.

95. Construction will begin with the earthwork in excavation for thrust bed and box pushing, including the Scooping out of earth and including shoring or any other arrangement to the satisfaction of Engineer is required to protect the adjoining structures, earth slopes from sides or Road embankment and stack the suitable materials for backfilling and disposal of the unsuitable excavated earth in the nearby available ROW land with all leads to fill borrow pits/widen Road embankment as directed by the Engineer.

96. Other construction steps will include- Casting of thrust bed including casting of foundations, if required and as per design duly approved by the Engineer, Manufacturing and fabrication of the front end frame/cutting shield and intermediate jacking stations, Fixing of front-end frame/cutting shield, with all fabricated enabling work remaining the property of contractor after completion of the work, Jacking of precast boxes to form the openings under the roadway without obstructing traffic and without any sinkage or heaving of pavement. Box pushing work will be done only in day light hours and in the presence of Engineer's representative.

97. The contractor will further ensure such rate of box pushing as will not disturb the Roadway above and will be personally responsible for the safety of traffic. However if box pushing is to be done in nights, special permission is necessary from the Engineer and as per that to be executed in the presence of Engineer's representative.

98. Construction equipments used shall be- A. Excavator B. Sheet piling equipment. C. Pumps D. Generator. E. Welding set F. Equipment for Concrete production, transportation, placing and compaction. G. Hydraulic Jacks for pushing the boxes H. Hydraulic pumps I. Cutting edge/shield plates and J. General road forming equipments like compactor, pavement machine etc.

99. RCC box will be cast on thrust bed, with front shield projecting 0.75m on top and 0.5 m on sides and bottom. Front shield has a lap of 0.5m on RCC box on all four sides. Similarly, rear shield of MS plates of 1.2 m width, having 0.6 m over lap on RCC box on all four sides is provided. The front shield is for carrying out excavation work up to 0.5m length before jacking operation of box is started. Rear shield is provided for keeping gap between two boxes of maximum 0.6 m and preventing collapse of soil from all sides.

100. The operation will be conducted by a team of around 25 men, roughly 50% unskilled labour and 50% with various skills including truck drivers, vehicle and machine operators, surveyors, foremen and supervisors, etc. The operation should be completed in around 6 months.

3 Anticipated Environmental Impacts and Mitigation Measures

101. All works will be conducted at relatively small sites but will involve a moderate deal of excavation and earth-moving over a period of approximately six months. However these physical environmental impacts are generic construction-related impacts associated with (i) road/bridge construction and (ii) removal and relocation of utility lines. These impacts are not expected to be significant and permanent, and can be managed through adoption of good engineering practices and undertaking specific mitigation measures.

102. **Sources of Materials.** Significant amount of gravel, sand, and cement will be required for this subproject. Extraction of rocks and material from nearby quarries may cause continuous degradation of the regime. The construction contractor will be required to:

(i) Use quarry sites and sources permitted by government;

(ii) Verify suitability of all material sources and obtain approval of Investment Program Implementation Unit (IPIU);

(iii) If additional quarries will be required after construction has started, obtain written approval from PMU; and

(iv) Submit to DSC on a monthly basis documentation of sources of materials.

103. **Air Quality.** Emissions from construction vehicles, equipment, and machinery used for excavation and construction will induce impacts on the air quality in the construction sites as well on the road users (pedestrians and vehicles). Anticipated impacts include dusts and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons) but temporary and during construction activities only. To mitigate the impacts, construction contractors will be required to:

(i) Consult with IPIU/DSC on the designated areas for stockpiling of clay, soils, gravel, and other construction materials;

(i) Excavate the area at the same time as the access roads are built so that dug material is used immediately, avoiding the need to stockpile on site;

(ii) Damp down exposed soil and any stockpiled on site by spraying with water when necessary during dry weather;

(iii) Use tarpaulins to cover sand and other loose material when transported by trucks; and

(iv) Fit all heavy equipment and machinery with air pollution control devices which are operating correctly.

104. **Surface Water Quality.** There are no surface water sources near the project site. There is only one municipal nallah under rail culvert no. 226, which may be affected due to mobilization of settled silt materials, run-off from stockpiled materials during construction activities. These potential impacts are temporary and short-term duration only and to ensure these are mitigated, construction contractor will be required to:

(ii) Avoid stockpiling of earth fill especially during the monsoon season unless

covered by tarpaulins or plastic sheets;

(iii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with IPIU/DSC on designated disposal areas;

(iv) Install temporary silt traps or sedimentation basins along the drainage leading to the nallah to protect from silting;

(v) Dispose any wastes generated by construction activities in designated sites; and

105. **Noise Levels.** There are no adjacent settlements, health facilities, religious sites (temples and churches), scheduled or unscheduled historical, archaeological, paleontological, or architectural sites near the construction sites. The project area is in the industrial area in one side and agricultural land in other side, therefore no sensitive receptors present near the site. But increased noise may affect the workers engaged in the construction. Increase in noise level may be caused by earth-moving and excavation equipment, and the transportation of equipment, materials, and people. Impact is negative, short-term, and reversible by mitigation measures. The construction contractor will be required to:

(i) Plan activities in consultation with IPIU/DSC so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance;

(ii) Require horns not be used unless it is necessary to warn other road users or animals of the vehicle's approach;

(iii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor; and

(iv) Maintain maximum sound levels not exceeding 80 decibels (dbA) when measured at a distance of 10 m or more from the vehicle/s.

106. **Existing Infrastructure and Facilities.** There may be few utilities which may be affected during construction due to unavoidable circumstances. To mitigate disturbance it is therefore required to finalize the list of affected utilities and their service providers by survey and prepare a mitigation plan to least disturb the utilities. Telephone lines and OFC cables are lying on one side of railway track and belong to the Railways. The construction within the railway right-of-way (ROW) will be done by Western Railways as per the understanding between W/R and RUIDP thus the necessary mitigation measures as required for safely execution of works, will be taken by them. There is only an over head power line, passing through the access road and which is to stay unaffected.

107. **Flora and Fauna.** There are no protected areas in or within of the subproject sites. A few trees, shrubs, and grasses are vegetation noted in the area. There are some trees at the site that need to be removed. During survey it was found that there are 2 neem trees to be removed on NH-79 site and 2-3 trees of other species to be removed on Station side. Therefore mitigation measures are to be taken care of. As per applicable RUIDP policy contractor needs to obtain tree-cutting permit from the Municipal Board or District Collector and plant 3 new trees for each 1 cut trees to compensate the ecological loss. Potential impacts are negative but reversible by mitigation measures

108. **Landscape and Aesthetics.** The construction activities will produce solid wastes as well as excess construction materials. Such waste could include removed concrete, wood, trees and plants, packaging material, empty containers, spoiled soil, sludge, oils, lubricants, paints, chemicals, worn-out spares, remnants of construction materials, and other similar items. These impacts are negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

(i) Prepare and implement Waste Management Plan;

(ii) Recover used oil and lubricants and reuse or remove from the sites;

(iii) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;

(iv) Remove all wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; and

(v) Request IPIU/DSC to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.

109. **Transportation – Accessibility.** Hauling of construction materials and operation of equipment on-site can cause traffic problems and conflicts in ROW. Potential impact is negative but short term and reversible by mitigation measures. The construction contractor will be required to:

(i) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites;

(ii) Schedule transport and hauling activities during non-peak hours;

(iii) Locate entry and exit points in areas where there is low potential for traffic congestion;

(iv) Keep the site free from all unnecessary obstructions;

(v) Drive vehicles in a considerate manner;

(vi) Notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.

110. **Railway operation during construction period.** As stated earlier, construction of the portion of RUB under the existing and running railway line shall be executed by Western Railway by their Engineers and contractors. Therefore the problem of safety and minimum disturbance to operation of trains in this section shall be sole responsibility of Railway itself. It is understood that Railway is well versed in such types of works and can handle the situation as per their requirements. The EMP prepared for this sub project shall be given to Railway by RUIDP and shall be made a part of the contract agreement. Supervision of the implementation of these EMP shall be done by DSC during the time of execution.

111. **Socio-Economic** Although much of main RUB work will be conducted within the ROW of the railway and available lands (to be acquired by Municipal Corporation), there may be a need to acquire some land for the construction of access roads. This will be

obtained through the legal mechanism of the Land Acquisition Act (1894) through which the government purchases the land compulsorily from the owners at a rate that is established on the basis of recent transactions. ADB policy on Involuntary Resettlement requires that no-one should be worse-off as a result of the project, so a Resettlement Plan and Resettlement Framework have been prepared to examine these issues. However, the land acquisition shall be done by Municipal Corporation and land cleared by all the legal formalities shall be handed over to RUIDP for construction works. Therefore no resettlement issue may arise for this project but Short Resettlement Plan (SRP) shall be prepared for the project.

112. One roadside shop (Tyre puncture repairing shop), which is located on the side of NH-79 near the entry point, may still lose income because this shop has to be removed from the present place. These issues are also dealt with by the Short Resettlement Plan and Framework, which indicate that these impacts will be mitigated within the applicable policy and framework. However, during survey it was found that the owner is not the title holder and has established this shop on Govt. land and is ready to relocate the shop away from the site.

113. Transportation is the other principal economic activity that will be impeded by this work, as the trains will have to travel slowly in the vicinity of the site, and when work is conducted close to the line, the train service may need to be interrupted temporarily. These impacts could be significant given the amount of traffic using this crossing and the frequency of the train service. These impacts will need to be mitigated by careful planning of the construction program, in conjunction with the road, rail and municipal authorities, in order to:

- Maintain safe passage for vehicles and pedestrians throughout the construction period;
- Provide effective, well signposted diversions and alternative routes when required;
- Conduct work that requires the closure/diversion of roads at times of low traffic volume;
- Conduct work on or close to the railway line at times when there are fewer trains;
- Schedule truck deliveries of soil to the site for periods of low traffic volume.

114. Finally, there could be some short-term socio-economic benefits from the construction work if local people are able to gain employment in the construction workforce. To direct these benefits to the communities directly affected by the work, the Contractor should be required to employ at least 50% of his labour force from communities in the vicinity of the site. This will have the added benefit of avoiding social problems that sometimes occur when workers are imported into host communities, and avoiding environmental and social problems from workers housed in poorly serviced camp accommodation.

115. **Occupational Health and Safety.** Workers need to be mindful of the occupational hazards which can arise from working in infrastructures like roads and bridges. Potential impacts are negative and long-term but reversible by mitigation measures. The construction contractor will be required to:

(i) Develop and implement site-specific Health and Safety (H&S) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all

workers are provided with and use Personal Protective Equipment; (c) H&S Training[2] for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents;

(ii) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;

(iii) Provide medical insurance coverage for workers;

(iv) Secure all installations from unauthorized intrusion and accident risks;

(v) Provide supplies of potable drinking water;

(vi) Provide clean eating areas where workers are not exposed to hazardous or noxious substances;

(vii) Provide H&S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;

(viii) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted;

(ix) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;

(x) Ensure moving equipment is outfitted with audible back-up alarms;

(xi) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; and

(xii) Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.

116. **Community Health and Safety.** Hazards posed to the public; specifically in high-pedestrian areas (such as near the Chanderia Railway Station) may include traffic accidents and vehicle collision with pedestrians. Potential impact is negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

[2] Some of the key areas that may be covered during training as they relate to the primary causes of accidents include (i) slips, trips and falls; (ii) personal protective equipment; (iii) ergonomics, repetitive motion, and manual handling; (iv) workplace transport; and (v) legislation and responsibilities. Training can provide the foundations of competence but it does not necessarily result in a competent worker. Therefore, it is essential to assess staff competence to ensure that the training provided is relevant and effective. Supervision and monitoring arrangements shall be in place to ensure that training has been effective and the worker is competent at their job. The level of supervision and monitoring required is a management decision that shall be based on the risks associated with the job, the level of competence required, the experience of the individual and whether the worker works as part of a team or is a lone worker.

(i) Plan routes to avoid times of peak-pedestrian activities.

(ii) Liaise with IPIU/DSC in identifying high-risk areas on route cards/maps.

(iii) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.

(iv) Provide road signs and flag persons to warn of dangerous conditions.

117. **Work Camps.** Operation of work camps can cause temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants. Potential impacts are negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

(i) Consult with IPIU/DSC before locating project offices, sheds, and construction plants;

(ii) Minimize removal of vegetation and disallow cutting of trees;

(iii) Provide water and sanitation facilities for employees;

(iv) Train employees in the storage and handling of materials which can potentially cause soil contamination;

(v) Recover used oil and lubricants and reuse or remove from the site;

(vi) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;

(vii) Remove all wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; and

(viii) Request IPIU/DSC to report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.

118. **Social and Cultural Resources.** Rajasthan is an area with a rich and varied cultural heritage that includes many forts and palaces from the Rajput and Mughal periods, and large numbers of temples and other religious sites, so there is a risk that any work involving ground disturbance could uncover and damage archaeological and historical remains. In this case the excavation will occur in and around an existing railway track, agriculture and industrial land and existing road so there is a minimum risk of such impacts. There is no any historical or archaeological site within or near the project site. Nevertheless the Contractor during conducting any excavation work, have to ensure that when any chance finds are recognized, immediate measures are taken to ensure they are protected and conserved. This should involve:

- Having excavation observed by a person with archaeological field training;
- Stopping work immediately to allow further investigation if any finds are suspected;
- Calling in the state archaeological authority if a find is suspected, and taking any action they require ensuring its removal or protection in situ.

119. There are no modern-day social and cultural resources (such as schools and hospitals) near the site, and no areas that are used for religious or other purposes, so there is no risk of other impacts on such community assets.

120. There is invariably a safety risk when substantial construction such as this is conducted in an urban area, and precautions will thus be needed to ensure the safety of both workers and citizens. The Contractor will be required to produce and implement a site Health and Safety Plan, and this should include such measures as:

- Excluding the public from the site;
- Ensuring that all workers are provided with and use appropriate Personal Protective Equipment;
- Health and Safety Training for all site personnel;
- Documented procedures to be followed for all site activities;
- Accident reports and records; etc.

C. Operation and Maintenance

121. O&M of the bridge will be the responsibility of the Municipal Corporation. The bridge have a design life of 30 years, during which shall not require major repairs or refurbishments. The stability and integrity of the bridge will be monitored periodically to detect any problems and allow remedial action if required. Routine maintenance will include:

- Small scale *ad hoc* repairs of surface damage caused by traffic use or accidents;
- Repairs and replacement of damaged safety barriers and signs; and
- Regular unblocking of drains to prevent damage from flooding in the monsoon.

1. Screening out areas of no significant impact

122. Because roads and bridges generally operate without the need for major repair and maintenance, there are several environmental factors that should be unaffected once the new RUB begins to function. These are identified in **Table 5.3** below, with an explanation of the reasoning in each case. These factors are thus screened out of the impact assessment and will not be mentioned further.

Table 5.3: Fields in which operation and maintenance of the RUB and roads not expected to have significant impacts

Field	Rationale
Climate	Exhaust gases affect air quality but a new road does not alter climate
Fisheries & aquatic biology	There are no rivers or lakes close to the RUB site
Wildlife, forests, rare species, protected areas	No wildlife and forest near location of RUB
Coastal resources	Chittorgarh is not located in a coastal area

2. Environmental impacts and mitigation measures

123. **Air Quality.** Once the bridges are completed and operating it will improve the physical environment by removing the current severe traffic congestion in the areas. This will indirectly result to less air pollution in the area. The potential impact is positive and long-term.

124. **Noise Level.** As expected of any road/bridge infrastructures, noise levels tend to increase with vehicular traffic. To mitigate this impact, Municipal Corporation will put signage and caution boards

125. **Accessibility.** Portions of the roads and bridge may be affected during routine repairs. However, the works will be very small in scale, and will be conducted manually by small teams of men with simple equipment (shovels, wheelbarrows, tarmac blender, etc.). Even if larger vehicles will be used to refurbish larger portions of the roads, the work will be very short in duration. The potential impacts are negative although will not cause significant physical impacts.

126. **Ecological Resources.** This is to be noted that there are no any important ecological resources near the project site. Therefore the operation of the bridge and the routine maintenance and repair of the roads and surroundings will have no ecological impacts. There would be some small ecological gain from the planting of replacement trees. It shall be responsibility of the Municipal Council for the continuous care of the planted trees.

127. **Economic Development.** The RUB will improve the infrastructure of the town by providing a more efficient and effective transportation route, and this should have positive impacts on the overall economy by reducing time spent idle in stationary traffic by delivery vehicles, employees and customers. It may also make further positive contributions to the development of particular sectors, for example allowing the more efficient transportation of agricultural produce and other goods to and from the town.

128. Traffic may be interrupted temporarily if the road or bridge is repaired and maintained, but this work will be very small in scale, infrequent, and short in duration, so there should be no economic or other implications. To maintain the safety of workers and road-users, such work should be coordinated with the local police department so that adequate warning signs and traffic diversions can be set up when necessary.

129. **Social and Cultural Resources**. Effects of the operating RUB on social and cultural resources in the town will be relatively small in scale and intangible in nature, and are thus difficult to assess and quantify.

130. The citizens of the town will benefit from a more effective transportation route as they will spend less time in stationary traffic exposed to noise, pollution and the associated physical and psychological stresses. Social and cultural resources may also benefit in a small way as it will be easier for people to reach schools, hospitals, temples, museums. People may also benefit from an improvement in the economy of the town, although it would require much larger improvements in transportation and other infrastructure for this to be recordable.

131. Repairs to the road and bridge will not be physically invasive so there will be no risk to historical remains, and as there are no areas or resources of social or cultural importance in the vicinity there will be any risk to such features.

V. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Project Stakeholders

132. The primary stakeholders are:

(i) Residents, shopkeepers and businesspeople who live and work alongside the roads in which improvements will be provided and near sites where facilities will be built

(ii) Railway Department

(iii) State and local authorities responsible for the protection and conservation of archaeological relics, historical sites and artifacts; and

(iv) State and local tourism authorities.

133. The secondary stakeholders are:

(i) LSGD as the Executing Agency;

(ii) Other government institutions whose remit includes areas or issues affected by the subproject (state and local planning authorities such as Public Health Engineering Department, Local Government Department, Ministry of Environment and Forests, Roads and Highways Division);

(iii) Non-government organizations (NGOs) and community-based organizations (CBOs) working in the affected communities;

(iv) Other community representatives (prominent citizens, religious leaders, elders, women's groups);

(v) The beneficiary community in general; and

(vi) ADB, GoI, and Ministry of Finance.

B. Consultations and Disclosures Conducted

134. Public consultations and group discussion meeting was conducted by RUIDP on 07 December 2011 in City Level Committee (CLC) meeting under the chairmanship of District Collector. Members present were- Hon. MLA, Chairman of Municipal Council, Executive Engineers and Assistant Engineer of various government departments and municipal body, RUIDP and representatives of NGOs and CAPP. The objectives were to appraise the stakeholders about the program's environmental and social impacts and present safeguards to mitigate any potential significant impacts. Public Consultation was also done by DSC Environmental Expert during preliminary survey with the nearby people. Records of public consultations are attached as **Annexure 3**. The major issues raised are related to traffic interferences and possible dust and noise problems during construction phase. Other comments include construction vehicles creating some disturbances to the local people daily activities, necessity of proper safety arrangements, and widening of roads prior to construction activities. The issues and comments have been considered and incorporated in the design of the bridges and mitigation measures for the potential environmental impacts raised during the public consultations.

135. Informal discussions were held with the local people during site visits for the preparation of this IEE. Issues discussed were:

(i) Awareness and extent of the subproject and its components;

(ii) Benefits of the subproject for the economic and social upliftment of the community;

(iii) Labour availability in the subproject sites or requirement of outside labour involvement;

(iv) Local disturbances due to the construction activities;

(v) Necessity of tree felling and vegetation clearing at the subproject sites;

(vi) Water logging and drainage problems, if any;

(vii) Drinking water problem; and

(viii) Forest and sensitive area within or nearby the subproject site.

136. Hindi versions of the Environmental Framework were provided during workshops to ensure stakeholders understood the objectives, policy, principles, and procedures. Likewise, English and Hindi versions of the Environmental Framework have been placed in Urban Local Body (ULB) offices, Investment Program Project Management Unit (IPMU) and IPIU offices, and the town library.

C. Future Consultation and Disclosure

137. LSGD extended and expanded the consultation and disclosure process significantly during implementation of RUSDIP. They have appointed an experienced NGO (Community Action and Participation Program; CAPP) to handle this key aspect of the program. The CAPP continuously (i) conducts a wide range of activities in relation to all subprojects in each town; and (ii) ensures the needs and concerns of stakeholders are registered and are addressed in subproject design. For this subproject, the CAPP will develop, in close coordination with IPIU and DSC, a public consultation and disclosure program which is likely to include the following:

(i) Consultation during detailed design:

- Focus-group discussions with affected persons and other stakeholders (including women's groups, NGOs and CBOs) to hear their views and concerns, so that these can be addressed in subproject design where necessary; and
- Structured consultation meetings with the institutional stakeholders (government bodies and NGOs) to discuss and approve key aspects of the project.

(ii) Consultation during construction:

- Public meetings with affected communities to discuss and plan work programs and allow issues to be raised and addressed once construction has started; and

- Smaller-scale meetings to discuss and plan construction work with individual communities to reduce disturbance and other impacts, and provide a mechanism through which stakeholders can participate in subproject monitoring and evaluation;

(iii) Project disclosure:

(a) Public information campaigns (via newspaper, TV and radio) to explain the project to the wider town population and prepare them for disruption they may experience once the construction program is underway;

(b) Public disclosure meetings at key project stages to inform the public of progress and future plans, and to provide copies of summary documents in Hindi; and

(c) Formal disclosure of completed project reports by making copies available at convenient locations in the study town, informing the public of their availability, and providing a mechanism through which comments can be made.

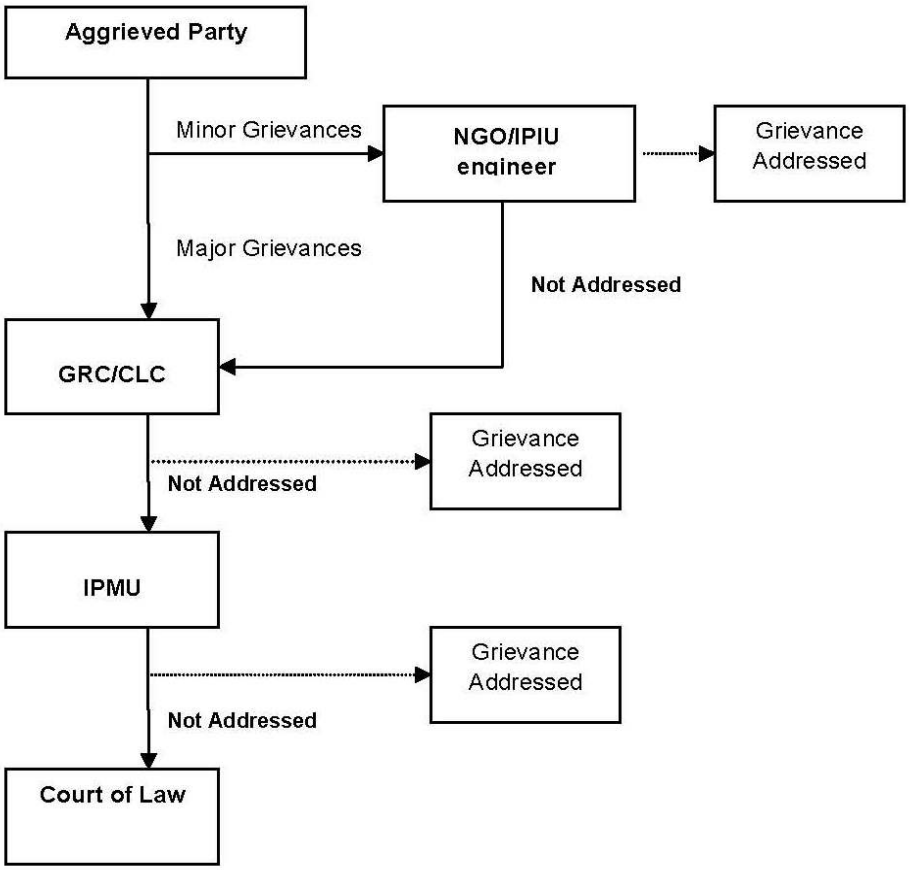
138. Based on ADB requirements, the following will be posted on ADB website: (i) final or updated IEE, (ii) corrective action plan prepared during project implementation, and (iii) environmental monitoring reports, upon receipt.

VI. GRIEVANCE REDRESS MECHANISM

139. Grievances of affected persons will first be brought to the attention of the implementing NGO or IPIU engineer. Grievances not redressed by the NGO or IPIU will be brought to the City Level Committees (CLC) set up to monitor project implementation in each town. The CLC, acting as a grievance redress committee (GRC) is chaired by the District Collector with representatives from the ULB, state government agencies, IPIU, community-based organizations (CBOs) and non-government organizations (NGOs). As GRC, the CLC will meet every month. The GRC will determine the merit of each grievance, and resolve grievances within a month of receiving the complaint, failing which the grievance will be addressed by the inter-ministerial Empowered Committee. The Committee will be chaired by the Minister of Urban Development and LSGD, and members will include Ministers, Directors and/or representatives of other relevant Government Ministries and Departments. Grievance not redressed by the GRC will be referred to the IPMU for action, failure at this level will be referred to the appropriate courts of law. The IPIU will keep records of all grievances received including: contact details of complainant, date that the complaint was received, nature of grievance, agreed corrective actions and the date these were effected, and final outcome. The grievance redress process is shown in **Figure 6.1**.

140. All costs involved in resolving the complaints will be borne by the IPMU. The GRCs will continue to function throughout the project duration.

Figure 6.1: Grievance Redress Mechanism – RUSDIP



CLC = City Level Committee, GRC = Grievance Redress Committee, IPIU=Investment Program Implementation Unit, IPMU = Investment Progarm Management Unit, NGO = nongovernmental organization,

VII. ENVIRONMENTAL MANAGEMENT PLAN

A. Institutional Arrangements

141. The main agencies involved in managing and implementing the subproject are:

(i) LSGD is responsible for management, coordination, and execution of all activities funded under the loan;

(ii) IPMU is responsible for coordinating construction of subprojects across all towns, and for ensuring consistency of approach and performance;

(iii) IPMC assists IPMU in managing the program and assures technical quality of design and construction;

(iv) DSCs design the infrastructure, manage tendering of Contractors (for approach roads only) and supervise the construction process (both RUB portion as well as approach roads);

(v) Western Railway will design, float tender execute the works of RUB portion under the railway line. RUB portion by Box Pushing Technology will be executed by Railways directly which also has full-fledged and stringent systems and policies for safety, environment, and construction. IPIUs appoint and manage Construction Contractors to build elements of the infrastructure in a particular town.

(vi) An inter-ministerial Empowered Committee[3] (EC) assists LSGD in providing policy guidance and coordination across all towns and subprojects.; and

(vii) City Level Committees[4] (CLCs) have also been established in each town to monitor project implementation in the town and provide recommendations to the IPIU where necessary.

142. **Figure 7.1** shows institutional responsibility for implementation of environmental safeguard at different level.

1. Responsible for carrying out mitigation measures

143. During construction stage, implementation of mitigation measures is the construction contractor's responsibility while during operation stage, Municipal Corporation and Railway will be responsible for the conduct of maintenance or repair works.

144. To ensure implementation of mitigation measures during the construction period, contract clauses (**Annexure 4**) for environmental provisions will be part of the civil works contracts. Contractors' conformity with contract procedures and specifications during construction will be carefully monitored by Investment Program Management Unit (IPIU).

[3] The EC is chaired by the Minister of Urban Development and LSG, and members include Ministers, Directors and/or representatives of other relevant Government Ministries and Departments.

4 CLCs are chaired by District Collectors, with members including officials of the ULB, local representatives of state government agencies, the IPIU, and local NGOs and CBOs.

2. Responsible for carrying out monitoring measures

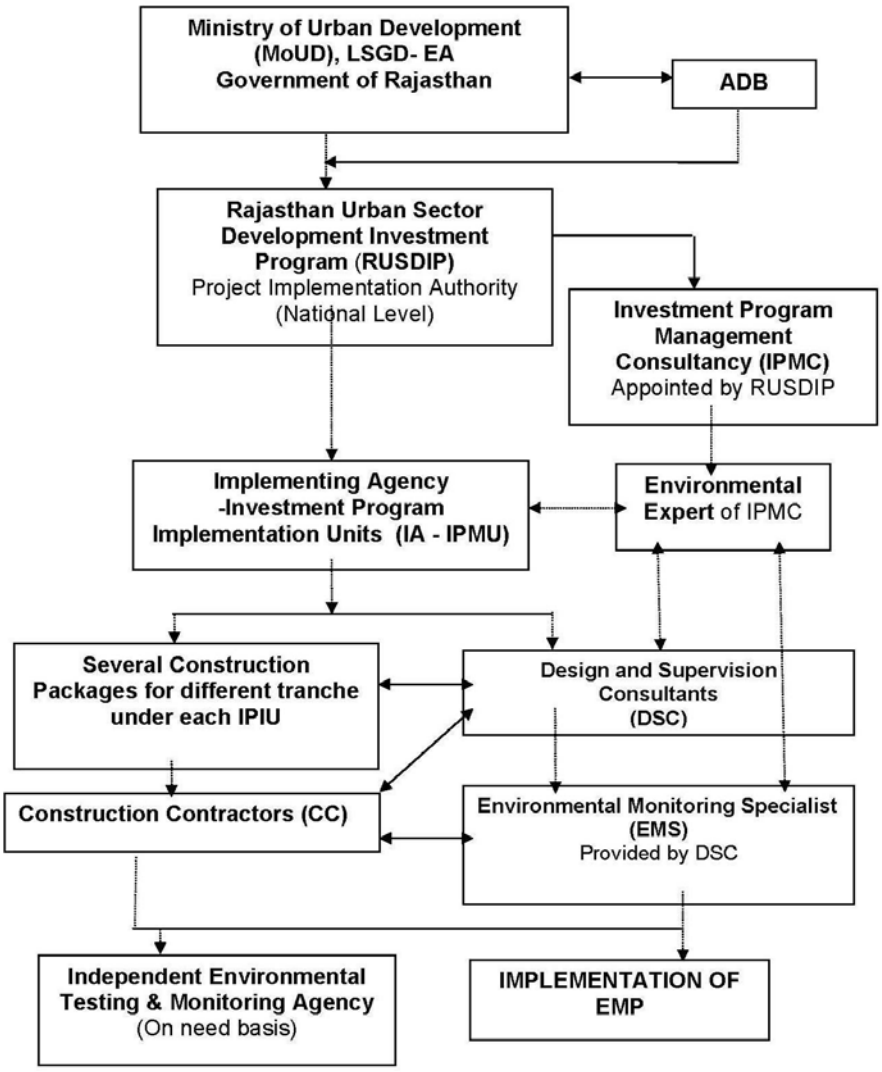
145. During construction, DSC's Environmental Expert and the designated representative (Environment Safeguards Officer) of IPIU will monitor the construction contractor's environmental performance.

146. During the operation stage, monitoring will be the responsibility of Municipal Corporation.

3. Responsible for reporting

147. LGSD will submit to ADB quarterly reports on implementation of the EMP and will permit ADB to field annual environmental review missions which will review in detail the environmental aspects of the Project. Any major accidents having serious environmental consequences will be reported immediately.

Figure 7.1: Institutional Responsibility- RUSDIP



B. Environmental Mitigation Plan

148. **Tables 7.1 to 7.3** show the potential adverse environmental impacts, proposed mitigation measures, responsible parties, and estimated cost of implementation. This EMP will be included in both of the bid documents (approach road and RUB portion) and will be further reviewed and updated during implementation.

C. Environmental Monitoring Program

149. **Tables 7.4 to 7.6** show the proposed environmental monitoring program for this subproject. It includes all relevant environmental parameters, description of sampling stations, frequency of monitoring, applicable standards, responsible parties, and estimated cost. Monitoring activities during the detailed engineering design stage will from part of the baseline conditions of the subproject sites and will be used as the reference for acceptance of restoration works by the construction contractors.

Table 7.1: Anticipated Impacts and Mitigation Measures – Pre-construction Environmental Mitigation Plan

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
Environmentally-sensitive Areas	Some trees will be cut and vegetation (mostly shrubs and grasses) will be cleared in the sub-project area	Avoid to cut any tree and if necessary obtain permission from town authority and plant 3 trees for each cut tree	Design and Supervision Consultants (DSC) in close coordination with the Municipal Board/ Council Investment Program Implementation Unit (IPIU)	(i) Inventory of trees; (ii) Tree-cutting permit; (iii) Location and number of trees replaced for every one tree cut
Utilities	Telephone lines, electric poles and wires, OFC cable within the existing bridge right-of-way (ROW) will be removed.	(i) Integrate utility ducts to the proposed bridge designs; (ii) Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase; and (iii) Require construction contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services.	DSC, in close coordination with the Railways and Investment Program Implementation Unit (IPIU)	(i) design specification showing utility ducts if necessary; (ii) list of affected utilities and operators; (iii) bid document to include requirement for a contingency plan for service interruptions
Railway operation	Disturbance/disruption of railway operation	(i) Consult Railways in advance and prepare a work plan to avoid disturbance to railway operations (ii) plan work in the hours when there is minimum or no railway traffic (iii) Prepare railway safety plan as per discussions and guidelines by Railway to avoid any accident during execution of work of RUB portion	DSC, in close coordination with the Railways and Investment Program Implementation Unit (IPIU)	(i) Railway Safety Plan (ii) Train time table available at work site for contractors (iii) Permissions of Railway for works of RUB
Access Roads	Disruption to traffic flow and sensitive receptors	(i) Include entry and exit points in plan drawings; and (ii) Consult affected communities prior to finalizing subproject lay-out and design.	DSC and Non-government Organization in charge of public consultation and disclosure	(i) plan drawings showing entry and exit points; (ii) records of public consultations
Social and Cultural Resources	Ground disturbance can uncover and damage archaeological and historical	(i) Consult Archaeological Survey of India (ASI) to obtain an expert assessment of the archaeological	IPIU and DSC	Chance Finds Protocol

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
	remains	potential of the site; (ii) Consider alternatives if the site is found to be of medium or high risk; (iii) Include state and local archaeological, cultural and historical authorities, and interest groups in consultation forums as project stakeholders so that their expertise can be made available; and (iv) Develop a protocol for use by the construction contractors in conducting any excavation work, to ensure that any chance finds are recognised and measures are taken to ensure they are protected and conserved.		
Construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas.	Disruption to traffic flow and sensitive receptors	(i) Prioritize areas within or nearest possible vacant space in the subproject sites; (ii) If it is deemed necessary to locate elsewhere, consider sites that will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems; (iii) Do not consider residential areas; (iv) Take extreme care in selecting sites to avoid direct disposal to nallah/water body or in areas which will inconvenience the community.	IPIU and DSC to determine locations prior to award of construction contracts.	List of selected sites for construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas.
Sources of Materials	Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion,	(i) Prioritize sites already permitted by the Mining Department; (ii) If other sites are necessary, inform construction contractor that it	IPIU and DSC to prepare list of approved quarry sites and sources of materials	(i) list of approved quarry sites and sources of materials; (ii) bid document to include

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
	disturbance in natural drainage patterns, ponding and water logging, and water pollution.	is their responsibility to verify the suitability of all material sources and to obtain the approval of IPIU; and (iii) If additional quarries will be required after construction is started, inform construction contractor to obtain a written approval from IPMU.		requirement for verification of suitability of sources and permit for additional quarry sites if necessary.

Table 7.2: Anticipated Impacts and Mitigation Measures – Construction Environmental Mitigation Plan

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
Sources of Materials	Extraction of rocks and material from quarry sites may cause degradation of the regime	(i) Use quarry sites and sources permitted by government; (ii) Verify suitability of all material sources and obtain approval of investment Program Implementation Unit (IPIU); (iii) If additional quarries will be required after construction has started, obtain written approval from PMU; and; (iv) Submit to DSC on a monthly basis documentation of sources of materials.	Construction Contractor	Construction Contractor documentation
Air Quality	Emissions from construction vehicles, equipment, and machinery used for excavation and construction resulting to dusts and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons)	(i) Consult with IPIU/DSC on the designated areas for stockpiling of clay, soils, gravel, and other construction materials; (ii) Excavate the required area at the same time as the access roads are built so that dug material is used immediately, avoiding the need to stockpile on site; (iii) Damp down exposed soil and any stockpiled on site by spraying with water when necessary during dry weather; (iv) Use tarpaulins to cover sand and other loose material when transported by trucks;	Construction Contractor	(i) Location of stockpiles; (ii) complaints from sensitive receptors; (iii) heavy equipment and machinery with air pollution control devices (iii) ambient air for particulate matters- PM 10 PM 2.5 and other pollutants; (iv) vehicular emissions such as sulphur dioxide (SO2), nitrous oxides (NOx), carbon monoxide (CO), and

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		and (v) Fit all heavy equipment and machinery with air pollution control devices which are operating correctly.		hydrocarbons
Surface water quality	Mobilization of settled silt materials, run-off from stockpiled materials, and chemical contamination from fuels and lubricants during construction works can contaminate downstream surface water quality.	(i) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets; (ii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with IPIU/DSC on designated disposal areas; (iii) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies; (iv) Place storage areas for fuels and lubricants away from any drainage leading to water bodies; (v) Dispose any wastes generated by construction activities in designated sites; and (vi) Conduct surface quality inspection according to the Environmental Management Plan (EMP).	Construction Contractor	(i) Areas for stockpiles, storage of fuels and lubricants and waste materials; (ii) number of silt traps installed along drainages leading to water bodies; (iii) records of surface water quality inspection; (iv) effectiveness of water management measures; (v) for inland water: suspended solids, oil and grease, biological oxygen demand (BOD), and coliforms.
Noise Levels	Increase in noise level due to earth-moving and excavation equipment, and the transportation of equipment, materials, and people	(i) Plan activities in consultation with IPIU/DSC so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance; (ii) Require horns not be used unless it is necessary to warn other road users or animals of the vehicle's approach; (iii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers,	Construction Contractor	(i) Complaints from sensitive receptors; (ii) use of silencers in noise-producing equipment and sound barriers; (iii) equivalent day and night time levels

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		and portable street barriers the sound impact to surrounding sensitive receptor; and (iv) Maintain maximum sound levels not exceeding 80 decibels (dbA) when measured at a distance of 10 m or more from the vehicle/s.		
Existing Infrastructure and Facilities	Disruption of service and damage to existing infrastructure located alongside roads, in particular water supply pipes and sewer lines.	(i) Obtain from IPIU and/or DSC the list of affected utilities and operators; (ii) Prepare a contingency plan to include actions to be done in case of unintentional interruption of services; and	Construction Contractor	(i) Existing Utilities Contingency Plan; (ii) Asbestos Cement Pipes Management Plan
Flora and Fauna	Land-clearing activities and presence of workers in the sites can damage or cause loss of existing flora	(i) Minimize removal of vegetation and disallow cutting of trees if not required for the construction activities; (ii) If tree-removal will be required, obtain tree-cutting permit from the Municipal Council or District Collector; (iii) Require to plant three native trees for every one that is removed; and (v) Prohibit employees from cutting of trees for firewood.	Construction Contractor	(i) tree-cutting permit for affected trees; (ii) number of replanted trees
Landscape and Aesthetics	solid wastes as well as excess construction materials may change landscape and aesthetic appearance of the area	(i) Prepare and implement Waste Management Plan; (ii) Recover used oil and lubricants and reuse or remove from the sites; (iii) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; (iv) Remove all wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; and (v) Request IPIU/DSC to report in writing that the necessary environmental restoration	Construction Contractor	(i) Waste Management Plan; (ii) complaints from sensitive receptors; (iii) IPIU/DSC to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		work has been adequately performed before acceptance of work.		
Transportation – Accessibility	traffic problems and conflicts in right-of-way (ROW)	(i) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites; (ii) Schedule transport and hauling activities during non-peak hours; (iii) Locate entry and exit points in areas where there is low potential for traffic congestion; (iv) Keep the site free from all unnecessary obstructions; (v) Drive vehicles in a considerate manner; (vi) Coordinate with Municipal Traffic Office for temporary road diversions and for provision of traffic aids if transportation activities cannot be avoided during peak hours; and (vii) Notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.	Construction Contractor	(i) Traffic Management Plan; (ii) complaints from sensitive receptors; (iii) number of signages placed at subproject sites.
Railway operation (safety)	Hindrances/delay in railway operation, risks of accidents and workers safety while working near railway line	((i) Prepare and discuss the detail work plan with the railway authority before start of work (ii) Discuss with the railway official for the possibilities of detouring the trains to avoid the stretch (iii) Avail written permission of Railways before start of work	Construction Contractor	(i) Traffic Management Plan; (ii) complaints from sensitive receptors; (iii) number of signages placed at subproject sites (iv) Railway Safety Plan (v) Railway time table (vi) permissions from railway (vii) List of utilities (viii) workers training records(ix) records of track inspections

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		(iv) Regular inspection and maintenance of the rail lines and facilities to ensure track stability in close coordination with railway staff (v) Discuss the schedule of railway traffic with concerned railway officials and in charge of nearest railway stations to find out the suitable breaks for construction work near track (vi) If necessary work when railway traffic is light or nil to avoid any disturbance to train operation, keep away to workers and instruments from railway tracks during passing of trains (vii) Request railways authority for blocking railway traffic during major works within railways ROW (viii) Strictly follow-up the work plan agreed with railway authority (ix) Display traffic signage and display boards in local language at work site to make the workers aware of the nature of hazards while working near railway track (x) Prepare list of utilities near railway track and keep close observation during any excavation near railway tracks to avoid any disturbance to railway utilities (xi) Prepare contingency plan to cope up with any unwanted incidents/accidents (xii) Display emergency contact numbers including medical, railway, police and important emergency personnel at		

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		work site (xiii) Provide training to contractor's staff and workers about hazards and risks in working on railway tracks and mitigation measures		
Socio-Economic	generation of contractual employment and increase in local revenue	(i) Employ at least 50% of the labour force, or to the maximum extent, local persons within the 2-km immediate area if manpower is available; and (ii) Secure construction materials from local market.	Construction Contractor	(i) employment records; (ii) records of sources of materials
Occupational Health and Safety	occupational hazards which can arise from working in infrastructures like roads and bridges	(i) Develop and implement site-specific Health and Safety (H&S) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use Personal Protective Equipment; (c) H&S Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents; (ii) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site; (iii) Provide medical insurance coverage for workers; (iv) Secure all installations from unauthorized intrusion and accident risks; (v) Provide supplies of potable drinking water;	Construction Contractor	(i) site-specific Health and Safety (H&S) Plan; (ii) Equipped first-aid stations; (iii) Medical insurance coverage for workers; (iv) Number of accidents; (v) Supplies of potable drinking water; (vi) Clean eating areas where workers are not exposed to hazardous or noxious substances; (vii) record of H&S orientation trainings (viii) personal protective equipments; (ix) % of moving equipment outfitted with audible back-up alarms;

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		(vi) Provide clean eating areas where workers are not exposed to hazardous or noxious substances; (vii) Provide H&S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers; (viii) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted; (ix) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas; (x) Ensure moving equipment is outfitted with audible back-up alarms; (xi) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; and (xii) Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.		(xi) sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal.
Community Health and Safety.	traffic accidents and vehicle collision with pedestrians	(i) Plan routes to avoid times of peak-pedestrian activities.	Construction Contractor	(i) Traffic Management Plan; (ii) complaints from sensitive

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		(ii) Liaise with IPIU/DSC in identifying high-risk areas on route cards/maps. (iii) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure. (iv) Provide road signs and flag persons to warn of dangerous conditions.		receptors
Work Camps	temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants	(i) Consult with IPIU/DSC before locating project offices, sheds, and construction plants; (ii) Minimize removal of vegetation and disallow cutting of trees; (iii) Provide water and sanitation facilities for employees; (iv) Prohibit employees from poaching wildlife and cutting of trees for firewood; (v) Train employees in the storage and handling of materials which can potentially cause soil contamination; (vi) Recover used oil and lubricants and reuse or remove from the site; (vii) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; (viii) Remove all wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; and (ix) Request IPIU/DSC to report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.	Construction Contractor	(i) complaints from sensitive receptors; (ii) water and sanitation facilities for employees; and (iii) IPIU/DSC report in writing that the camp has been vacated and restored to pre-project conditions
Social and Cultural	risk of archaeological chance	(i) Strictly follow the protocol for chance	Construction	(i) records of chance finds

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
Resources	finds	finds in any excavation work; (ii) Request IPIU/DSC or any authorized person with archaeological field training to observe excavation; (iii) Stop work immediately to allow further investigation if any finds are suspected; and (iv) Inform IPIU/DSC if a find is suspected, and take any action they require ensuring its removal or protection in situ.	Contractor	

Table 7.3: Anticipated Impacts and Mitigation Measures – Operation and Maintenance Environmental Mitigation Plan

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
Noise Level	noise levels tend to increase with vehicular traffic	Put signage and implement “no blowing of horns” zones where there are sensitive receptors	Municipal Council	complaints from sensitive receptors
Accessibility	Portions of the roads and bridges may be affected during routine repairs	Coordinate with the Municipal Police Department so that warning signs and traffic diversions can be set up when necessary	Municipal Council	complaints from sensitive receptors
Ecological Resources	ecological gain from the planting of replacement trees	Coordinate with the Municipal Council for the continuous care of the planted trees.	Municipal Council	% survival of planted trees
Railway Safety		(i) Avail written permission of Railways before start of work (ii) Avail assistance of Railway Engineers to keep watch on works and railway safety (iii) Engage qualified contractor having experience of works on/near the railway lines (iv) Give training to contractors and workers about hazards and risks in working on railway tracks and mitigation measures for it (v) Prepare work plan with mitigation	O&M Contractors	i) Traffic Management Plan; (ii) complaints from sensitive receptors; (iii) Railway Safety Plan (v) Railway time table (vi) permissions from railway (vii) workers training records

		measures (vi) Keep in close consultation with nearest railway station on up and down side to remain updated on upcoming trains and keep away to workers and instruments from railway tracks during passing of trains (vii) Work when railway traffic is light or nil to avoid any disturbance to train operation (viii) Prepare contingency plan to cope up with any unwanted incidents/accidents		

Table 7.4: Pre-construction Environmental Monitoring Program

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
Permits – Trees and Vegetation	Access roads	Design and Supervision Consultants (DSC) in close coordination with the town Investment Project Implementation Unit (IPIU)	(i) Inventory of trees; (ii) Tree-cutting permit; (iii) Location and number of trees replaced for every one tree cut	checking of records	(i) Inventory of trees prepared; (ii) Tree-cutting permit obtained from Municipal Council or District Collector; (iii) Location identified and number of trees estimated	once	IPMU
Utilities	ROW of RUB site	DSC	(i) design specification showing utility ducts if necessary; (ii) list of affected utilities and operators; (iii) bid document to include requirement for a contingency plan for service interruptions	checking of records	(i) utility ducts included in the design; (ii) list of affected utilities and operators prepared; (iii) requirement for a contingency plan for service interruptions included in bid documents	once	IPMU
Railway Operation	RUB site	Design and Supervision Consultants (DSC) in close coordination with the town	) Advance work plan to avoid disturbance to railway operations (ii) plan work in	checking of records	(i) Work plan (ii) list of affected utilities (iii) railway safety plan	once	IPMU

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
		Investment Project Implementation Unit (IPIU)	the hours when there is minimum or no railway traffic (iii) Prepare railway safety plan as per discussions and guidelines by Railway to avoid any accident during execution of work of RUB portion (iv) list of affected utilities and operators				
Access Roads	ROW of site	DSC and Non-government Organization in charge of public consultation and disclosure	(i) plan drawings showing entry and exit points; (ii) records of public consultations	checking of records	(i) plan drawings include entry and exit points; (ii) stakeholders consulted; (iii) updated IEE and EMP disclosed	once	IPMU
Social and Cultural Resources	ROW of site	IPIU and DSC	Chance Finds Protocol	checking of records	Chance Finds Protocol provided to construction contractors prior to commencement of activities	once	IPMU
Construction work camps, hot mix plants, stockpile areas, storage	Construction work camps, hot mix plants, stockpile areas,	IPIU and DSC to determine locations prior to award of	List of selected sites for construction work camps, hot mix	checking of records	List of selected sites for construction work camps, hot mix	once	IPMU

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
areas, and disposal areas.	storage areas, and disposal areas.	construction contracts.	plants, stockpile areas, storage areas, and disposal areas.		plants, stockpile areas, storage areas, and disposal areas provided to construction contractors prior to commencement of works.		
Sources of Materials	Quarry sites	IPIU and DSC to prepare list of approved quarry sites and sources of materials	(i) list of approved quarry sites and sources of materials; (ii) bid document to include requirement for verification of suitability of sources and permit for additional quarry sites if necessary.	checking of records	(i) list of approved quarry sites and sources of materials provided to construction contractors (ii) bid document included requirement for verification of suitability of sources and permit for additional quarry sites if necessary.	once	IPMU
Baseline Environmental Condition – Ambient Air Quality	Subproject sites	DSC	Establish baseline values of particulate matters (PM 10 and PM 2.5) and other pollutants	Air sample collection and analyses by accredited 3rd party laboratory	GOI Ambient Air Quality Standards	Once prior to start of construction	IPMU
Baseline Environmental Condition - Water Quality	Subproject sites	DSC	Establish baseline values of suspended solids (TSS),	Air sample collection and analyses by accredited 3rd	GOI Water Quality Standards	Once prior to start of construction	IPMU

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
			(iii) pH (iv) biological oxygen demand (BOD), (v) fecal coliform	party laboratory			

Table 7.5: Construction Environmental Monitoring Program

Mitigation Measures	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
Sources of Materials	quarries and sources of materials	Construction Contractor	Construction Contractor documentation	(i) checking of records; (ii) visual inspection of sites	(i) sites are permitted; (ii) report submitted by construction contractor monthly (until such time there is excavation work)	Monthly submission for construction contractor as needed for DSC	DSC
Air Quality	construction sites and areas designated for stockpiling of materials	Construction Contractor	(i) Location of stockpiles; (ii) complaints from sensitive receptors; (iii) heavy equipment and machinery with air pollution control devices (iii) particulate matters (PM 10 and PM 2.5) and other pollutants (iv) vehicular emissions such as sulphur dioxide (SO2), nitrous oxides (NOx), carbon monoxide (CO), and	(i) checking of records; (ii) visual inspection of sites	(i) stockpiles on designated areas only; (ii) complaints from sensitive receptors satisfactorily addressed; (iii) air pollution control devices working properly; (iv) GOI Ambient Quality Standards for ambient air quality; (iv) GOI Vehicular Emission Standards for SO2, NOx, CO and HC.	monthly for checking records	DSC

Mitigation Measures	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
			hydrocarbons (HC)				
Water Quality	(i) construction sites; (ii) areas for stockpiles, storage of fuels and lubricants and waste materials;	Construction Contractor	(i) Areas for stockpiles, storage of fuels and lubricants and waste materials; (ii) number of silt traps installed along drainages leading to water bodies; (iii) records of surface water quality inspection; (iv) effectiveness of water management measures; (v) for inland water: suspended solids, oil and grease, biological oxygen demand (BOD), and coliforms.	visual inspection	(i) designated areas only; (ii) silt traps installed and functioning; (iii) no noticeable increase in suspended solids and silt from construction activities (iv) GOI Standards for Water Discharges to Inland Waters and Land for Irrigation	monthly	DSC
Noise Levels	(i) construction sites; (ii) areas for stockpiles, storage of fuels and lubricants and waste materials; (iii) work camps	Construction Contractor	(i) Complaints from sensitive receptors; (ii) use of silencers in noise-producing equipment and sound barriers; (iii) equivalent day and night time levels	(i) checking of records; (ii) visual inspection	(i) complaints from sensitive receptors satisfactorily addressed; and (ii) silencers in noise-producing equipment functioning as design; and (iii) sound barriers installed where necessary	Monthly	DSC
Existing Infrastructure and Facilities	(i) construction sites; (ii) alignment of affected utilities	Construction Contractor	Existing Utilities Contingency Plan	(i) checking of records; (ii) visual inspection	implementation according to Utilities Contingency Plan	as needed	DSC
Flora and Fauna	(i) construction	Construction	(i) tree-cutting permit	(i) checking of	number of trees cut,	as needed	DSC

Mitigation Measures	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
	sites; (ii) location where replacement trees will be planted	Contractor	for affected trees; (ii) number of replanted trees	records; (ii) visual inspection	replanted and location according to the tree-cutting permit		
Landscape and Aesthetics	(i) construction sites; (ii) areas for stockpiles, storage of fuels and lubricants and waste materials; (iii) work camps	Construction Contractor	(i) Waste Management Plan; (ii) complaints from sensitive receptors; (iii) IPIU/DSC to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.	(i) checking of records; (ii) visual inspection	(i) no accumulation of solid wastes on-site; (ii) implementation of Waste Management Plan; (iii) Complaints from sensitive receptors satisfactorily addressed.	Monthly	DSC
Transportation – Accessibility	(i) construction sites; (ii) traffic routes	Construction Contractor	(i) Traffic Management Plan; (ii) complaints from sensitive receptors; (iii) number of signage placed at subproject sites.	visual inspection	(i) implementation of Traffic Management Plan; (ii) complaints from sensitive receptors satisfactorily addressed; (iii) signage visible and located in designated areas	Monthly	DSC
Railway Operation	construction sites;	Construction Contractor	i) Railway traffic Management; (ii) number of signages placed at subproject sites (iii) Railway Safety Plan (iv)	visual inspection	(i)signage visible and located in designated areas (ii) implementation of Railway Safety Plan (iii)track inspection	as needed	DSC

Mitigation Measures	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
			Railway time table (v) permissions from railway (vi) List of utilities (vii) workers training records(viii) records of track inspections		records(iv) various permissions from railway		
Socio-Economic	construction sites	Construction Contractor	(i) employment records; (ii) records of sources of materials	checking of records	number of employees from town equal or greater than 50% of total workforce	Quarterly	DSC
Occupational Health and Safety	construction sites	Construction Contractor	(i) site-specific Health and Safety (H&S) Plan; (ii) Equipped first-aid stations; (iii) Medical insurance coverage for workers; (iv) Number of accidents; (v) Supplies of potable drinking water; (vi) Clean eating areas where workers are not exposed to hazardous or noxious substances; (vii) record of H&S orientation trainings (viii) personal protective equipments; (ix) % of moving equipment outfitted with audible back-up alarms; (xi) sign boards for	(i) checking of records; (ii) visual inspection	(i) implementation of H & S plan; (ii) number of work-related accidents; (iii) % usage of personal protective equipment; (iv) number of first-aid stations, frequency of potable water delivery, provision of clean eating area, and number of sign boards are according to approved plan; (v) % of moving equipment outfitted with audible back-up alarms	Quarterly	DSC

Mitigation Measures	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
			hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal.				
Community Health and Safety.	construction sites	Construction Contractor	(i) Traffic Management Plan; (ii) complaints from sensitive receptors	visual inspection	(i) implementation of Traffic Management Plan; (ii) complaints from sensitive receptors satisfactorily addressed	Quarterly	DSC
Work Camps	work camps	Construction Contractor	(i) complaints from sensitive receptors; (ii) water and sanitation facilities for employees; and (iii) IPIU/DSC report in writing that the camp has been vacated and restored to pre-project conditions	visual inspection	(i) designated areas only; (ii) complaints from sensitive receptors satisfactorily addressed	Quarterly	DSC
Social and Cultural Resources	construction sites	Construction Contractor	records of chance finds	checking of records	Implementation of Chance Finds Protocol	as needed	DSC

Table 7.6: Operation and Maintenance Environmental Monitoring Program

Mitigation Measures	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
Noise Levels	subproject sites	Municipal Highway Department (MHD)	complaints from sensitive receptors	checking of records	complaints from sensitive receptors satisfactorily addressed	as needed	PMU
Accessibility	subproject sites	MHD	complaints from sensitive receptors	checking of records	complaints from sensitive receptors satisfactorily addressed	as needed	PMU
Ecological Resources	subproject sites	MHD	% survival of planted trees	checking of records	at least 80% survival rate	quarterly	PMU

D. Environmental Management Costs

150. 150. **Most** of the mitigation measures require the Construction Contractors to adopt good site practice, which should be part of their normal procedures already, so there are unlikely to be major costs associated with compliance. Regardless of this, any cost of mitigation by the construction contractors or DSC are included in the budgets for the civil works and do not need to be estimated separately here. Mitigation that is the responsibility of LSGD will be provided as part of their management of the project, so this also does not need to be duplicated here.

151. 151. The remaining actions in the Environmental Management Plan are the various environmental monitoring activities. These have not been budgeted elsewhere, and their costs are shown in **Table 7.7**. The figures show that the total cost of environmental management and monitoring for this subproject as a whole (covering design and construction) is INR 0.72 million, ie US$ 15652.

Table 7.7: Estimated Environmental management and monitoring costs (INR)

Item	Quantity	Unit Cost	Total Cost	Sub-total	Source of Funds
1. Implementation of EMP (2 years)					
Environmental Monitoring Specialist of DSC	1 x 3 month	140,000[5]	420,000		DSC
Survey and monitoring expenses - air and noise quality	Lump Sum	100,000	100,000	520,000	DSC
2. Improvement of aesthetics along the bridge including plantation	Lump Sum	200,000	200,000	200,000	Contractor
TOTAL				720,000	

(Air Quality- Once in a week for 2 weeks 2 locations , semi-annually for the parameters like PM 10, PM 2.5, SO_2 NOx, CO, H_2S; Noise level- Once (6 times in a day in 6 working hours for 2 days at 2 locations, measurement semi-annually)

[5] Unit costs of domestic consultants include fee, travel, accommodation and subsistence

VIII. FINDINGS AND RECOMMENDATIONS

152. The process described in this document has assessed the environmental impacts of the infrastructure proposed under the Chilttorgarh Urban Transport and Roads Subproject. Potential negative impacts were identified in relation to construction and operation of the improved infrastructures. No impacts were identified as being due to either the project design or location.

153. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects and as a result some measures have already been included in the designs of the bridges. This means that the number of impacts and their significance has already been reduced by amending the design.

154. Regardless of these and various other actions taken during the IEE process and in developing the project, there will be some residual impacts on the environment when the RUB will built and when it is operating. This is mainly because of the sizes of the structures, location at busy roads (NH 79), and the fact that the work involves some excavation so there could be a risk of uncovering historical remains from the rich cultural history of Rajasthan. Because of these factors the most impacts are on the physical environment, the human environment, and the cultural heritage. One field in which impacts are much less routine is archaeology, and here a series of specific measures have been developed to avoid damaging important remains.

155. It is proposed that the subproject will employ in the workforce people who live in the vicinity of the construction sites to provide them with a short-term economic gain.

156. There will be some ecological gain when three trees shall be planted *in lieu of* each tree that will be required to cut.

157. Once the bridges are completed, it will operate with routine maintenance (such as occasional repairs of the road, safety barriers and signs), which will be small-scale, infrequent and short in duration and should not affect the environment. The only mitigation required in this period is to plan any maintenance work with the municipal authorities and police to ensure precautions are taken to maintain the safety of workers and road users.

158. The main impacts of the operating bridges will be beneficial in improving the infrastructure of the town by providing a more efficient and effective transport route, which should improve the overall economy by reducing time spent idle in traffic by delivery vehicles, employees and customers. The general environment will also be improved at this location as the daily concentration of vehicular noise and pollution from exhaust gases will be removed.

159. Mitigation will be assured by a program of environmental monitoring conducted during construction and operation to ensure that all measures in the EMP are implemented and to determine whether the environment is protected as intended. This will include observations on and off site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported to the IPMU.

160. The stakeholders were involved in developing the IEE through face-to-face discussions on site and a large public meeting held in the town, after which views expressed were incorporated into the IEE and the planning and development of the project. The IEE will be made available at public locations in the town and will be disclosed to a wider audience

via the ADB website. The consultation process will be continued and expanded during project implementation, when a nationally-recognized NGO will be appointed to handle this key element to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation.

IX. CONCLUSIONS

161. The subproject is unlikely to cause significant adverse impacts. The potential adverse impacts that are associated with design, construction, and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures.

162. Based on the findings of the IEE, the classification of the Project as Category “B” is confirmed, and no further special study or detailed EIA needs to be undertaken to comply with ADB SPS (2009) or GoI EIA Notification (2006).

Annexure – 1

Photograph of Project Area

Photo 1: Access road to RUB site toward NH 79 belongs to M/s Pungaliya Marble Industries in RICCO area

Photo 2: Transformer and Tyre repairing shop coming on access road towards NH 79 side

Photo 3: Access road to RUB site toward NH 79 belongs to M/s Pungaliya Marble Industries in RICCO area

Photo 4: M/s Pungaliya Marble Industries in RICCO area beside proposed access road

Photo 5: Electrical utilities coming on access road needs to be shifted

Photo 6: Neem Trees coming on Access road to RUB site toward NH 79 needs to be cut

Photo 7: Site of RUB construction from NH 79 side

Photo 8: Chanderia Railway station (about 250 mtrs) as seen from proposed RUB site

Photo 9: Railway culvert no 226 about 25 mtrs away from proposed RUB site

Photo 10: Access road to RUB site toward Chanderia Housing Board belongs to private land owners (agricultural fields)

Photo 11: Access road to RUB site toward NH 79 as seen from railway line at proposed RUB site

Photo 12: Birla Cement Factory gate on other side of NH 79 in front of proposed access road

Annexure 2

Rapid Environmental Assessment (REA) Checklist

Instructions:

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES), for endorsement by Director, RSES and for approval by the Chief Compliance Officer.

(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

(iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: India/Rajasthan Urban Infrastructure Development Project

Sector Division: Road/Bridge (RUB), Chittorgarh

SCREENING QUESTIONS	Yes	No	REMARKS
A. PROJECT SITING Is the project area adjacent to or within any of the following Environmentally sensitive areas?			
▪ Cultural heritage site		√	No any cultural heritage site is present near Project site
▪ Protected area		√	
▪ Wetland		√	
▪ Mangrove		√	
▪ Estuarine		√	
▪ Buffer zone of protected area		√	
▪ Special area for protecting biodiversity ▪		√	

SCREENING QUESTIONS	Yes	No	REMARKS
B. POTENTIAL ENVIRONMENTAL IMPACTS Will the project cause…			
▪ encroachment on historical/cultural areas; disfiguration of landscape by road embankments, cuts, fills, and quarries?		√	
▪ encroachment on precious ecology (e.g. sensitive or protected areas)?		√	
▪ alteration of surface water hydrology of waterways crossed by roads, resulting in increased sediment in streams affected by increased soil erosion at construction site?		√	No waterway is crossed by proposed road, only one municipal nallah exists about 25 mts from proposed site
▪ deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?		√	
▪ increased local air pollution due to rock crushing, cutting and filling works, and chemicals from asphalt processing?		√	No rock crushing or cutting and filling work is proposed
▪ risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	√		Workers engaged shall be in occupational health and safety risks during construction and operation phase due to physical and chemical hazards
▪ noise and vibration due to blasting and other civil works?	√		Blasting is not proposed but noise may be created during construction phase
▪ dislocation or involuntary resettlement of people?	√		There is private land acquisition proposed for approach road, the land is to be acquired by Municipal Corporation and to be handed over to RUIDP for construction works
▪ dislocation and compulsory resettlement of people living in right-of-way?	√		There is private land acquisition proposed for approach road, the land is to be acquired by Municipal Corporation and to be handed over to RUIDP for construction works, also one temporary shop of tyre repairing to be dislocated at NH 79 end

SCREENING QUESTIONS	Yes	No	REMARKS
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		√	
▪ other social concerns relating to inconveniences in living conditions in the project areas that may trigger cases of upper respiratory problems and stress?		√	
▪ hazardous driving conditions where construction interferes with pre-existing roads?		√	The new access road is to be developed, therefore no interference with pre-existing roads
▪ poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases (such as STI's and HIV/AIDS) from workers to local populations?	√		Poor sanitation and solid waste disposal in construction camps and work sites may create health hazards to workers and local communities, transmission of communicable diseases is also possible due to outside workers will be engaged
▪ creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents?		√	
▪ accident risks associated with increased vehicular traffic, leading to accidental spills of toxic materials?		√	No toxic materials are proposed to be used in proposed project
▪ increased noise and air pollution resulting from traffic volume?	√		Operation of transportation vehicles and construction equipments may increase noise and air pollution in the locality
▪ increased risk of water pollution from oil, grease and fuel spills, and other materials from vehicles using the road?	√		Accidental leakage of oil and grease from construction vehicles and equipments or leakages due to poor maintenance may cause risk of water pollution
▪ social conflicts if workers from other regions or countries are hired?		√	Most of the workers shall be hired locally as per guidelines
▪ large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		√	Improvement in the existing road will not result in large population influx

SCREENING QUESTIONS	Yes	No	REMARKS
▪ risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?		√	There are no major use, transportation or disposal of materials such as explosives, fuel and other chemicals during construction and operation
▪ community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning.		√	No community safety risks, due to accidental and natural causes during project execution is expected.

Annexure – 3

PUBLIC CONSULTATION- ENVIRONMENT

RUB Chittorgarh

Location: RUB at Chanderia, Chittorgarh

Issues discussed

- Awareness and extent of the project and development components
- Benefits of Project for the economic and social Upliftment of Community
- Labour availability in the Project area or requirement of outside labour involvement
- Local disturbances due to Project Construction Work
- Necessity of tree felling etc. at project sites
- Water logging and drainage problem if any
- Drinking water problem
- Forest and sensitive area nearby the project site

1. **Date and time of Consultation: 01.03.2012, 02.30 p.m.**
2. **Location: near RUB site, access road and nearby locations**

A. Table: Issues of the Public Consultation- Design phase

Sr. No.	Key Issues/Demands	Perception of community	Action to be taken
1	Awareness of the project – including coverage area	Mostly people are unaware of the project	Before start of the project public consultations in nearby areas to be done and caution boards indicating the nature or work to be displayed
2	In what way they may associate with the project	They will be benefitted by overcoming the problem of traffic jam at the time of closed railway crossing	
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the	No such issue except Some trees may be required to cut, during construction	Compensatory plantation to be done against the felling trees

Sr. No.	Key Issues/Demands	Perception of community	Action to be taken
	project area		
4	Presence of historical/ cultural/ religious sites nearby	No any	
5	Un favorable climatic condition	Very hot during summer (upto 48 degree celcius) and very cold during winter	
6	Occurrence of flood	No flood occurred during last 20 years	
7	Drainage and sewerage problem facing	Yes, nallah passing under railway culvert becomes filled with water during heavy rains	Drainage system to be improved
8	Present drinking water problem – quantity and quality	No any	
9	Present solid waste collection and disposal problem	No any, SW is collected by municipal authority regularly	
10	Availability of labour during construction time	Yes, labors are easily available	
11	Access road to project site	No, lands for access on both sides to be acquired, there is one kaccha path beside railway line from LC 87c	
12	Perception of villagers on tree felling and afforestation	Trees are coming on RICCO land and agricultural land	Tree cutting permit to be taken and compensatory plantation to be done for the cut trees
13	Dust and noise pollution and disturbances during construction work	These may affect for a short period	Proper mitigation measures to be consider
14	Setting up worker camp site within the village/ project locality	Project will be located in the Govt. land so setting of worker camp will not cause any problem to local habitants	
15	Safety of residents during	Yes during construction phase	Plan should be made to

Sr. No.	Key Issues/Demands	Perception of community	Action to be taken
	construction phase and plying of vehicle for construction activities	road traffic and safety of road users should be taken care	maintain the safety of people and safe traffic flow
16	Conflict among beneficiaries downstream users – water supply project using of river water	No such issue	
17	Requirement of enhancement of other facilities	Road lighting, signage and demarcation	These are taken in DPR
18	Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation	4 private land and one industrial land (RICCO) is being affected, one shop will also be affected, land acquisition shall be done by Municipal Corporation therefore private land owners are to be approached by themselves and affected shopkeeper is agree to shift his shop	

NAME AND TITLES OF PERSONS CONSULTED

1. Rasul Khan, Shopkeeper, R.K. tyre Service, NH 79, RICCO industrial area, Chanderia
2. Hari Ram, title holder of agricultural land to be acquired, Chanderia
3. Shankar Singh, Resident, Chanderia
4. Jeevan Singh, Resident, Chanderia
5. Mani Lal, Gang Man, Railway LC no 87

Summary of outcome:

People are very much interested for construction of RUB at Chanderia, because they are suffering greatly due to traffic jam during closure of railway crossing. Some private lands, one industrial land, some trees and one shop is being affected. Shopkeeper is ready to shift his shop away from the site. These should be rehabilitated as per norms of loan agency.

B. Photographs of Public Consultations

Photo 1: Consultation with Mr. Hari Ram, owner of one of the agricultural land to be acquired

Photo 2: Consultation with nearby habitants of Chanderia

Photo 3: Consultation with Mr. Mani Lal, Gangman, railway crossing no LC 87, Ramjiki Chanderia

Photo 4: Consultation with Mr. Rasul Khan, owner of tyre repairing shop, whose shop needs to be shifted for construction of the access road

Annexure 4

Recommended Contract Clauses for Contractors

A. Sources of Materials

- Use quarry sites and sources permitted by government;
- Verify suitability of all material sources and obtain approval of Investment Program Implementation Unit (IPIU);
- If additional quarries will be required after construction has started, obtain written approval from IPMU; and;
- Submit to DSC on a monthly basis documentation of sources of materials.

B. Air Quality

- Consult with IPIU/DSC on the designated areas for stockpiling of clay, soils, gravel, and other construction materials;
- Damp down exposed soil and any stockpiled on site by spraying with water when necessary during dry weather;
- Use tarpaulins to cover sand and other loose material when transported by trucks; and
- Fit all heavy equipment and machinery with air pollution control devices which are operating correctly and have PUC of all the construction vehicles updated.

C. Surface Water Quality

- Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets;
- Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with IPIU/DSC on designated disposal areas;
- Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;
- Place storage areas for fuels and lubricants away from any drainage leading to water bodies;
- Dispose any wastes generated by construction activities in designated sites; and
- Conduct surface quality inspection according to the Environmental Management Plan (EMP).

D. Noise Levels

- Plan activities in consultation with IPIU/DSC so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance;

- Require horns not be used unless it is necessary to warn other road users or animals of the vehicle's approach;
- Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor; and
- Maintain maximum sound levels not exceeding 80 decibels (dbA) when measured at a distance of 10 m or more from the vehicle/s.

E. Existing Infrastructure and Facilities

- Obtain from IPIU and/or DSC the list of affected utilities and operators;
- Prepare a contingency plan to include actions to be done in case of unintentional interruption of services

F. Accessibility

- Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites;
- Schedule transport and hauling activities during non-peak hours;
- Locate entry and exit points in areas where there is low potential for traffic congestion;
- Keep the site free from all unnecessary obstructions;
- Drive vehicles in a considerate manner;
- Coordinate with Chittorgarh Municipal Traffic Office for temporary road diversions and with for provision of traffic aids if transportation activities cannot be avoided during peak hours; and
- Notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.

G. Landscape and Aesthetics

- Prepare and implement Waste Management Plan;
- Recover used oil and lubricants and reuse or remove from the sites; (iii) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;
- Remove all wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; and
- Request IPIU/DSC to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.

H. Socio-Economic – Income

- Leave spaces for access between mounds of soil;
- Provide walkways and metal sheets where required to maintain access across trenches for people and vehicles;
- Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools;
- Consult businesses and institutions regarding operating hours and factoring this in work schedules; and
- Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.

I. Socio-Economic – Employment

- Employ at least 50% of the labor force, or to the maximum extent, local persons within the 2-km immediate area if manpower is available; and
- Secure construction materials from local market.

J. Occupational Health and Safety

- Develop and implement site-specific Health and Safety (H&S) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use Personal Protective Equipment; (c) H&S Training for all site personnel; (d) documented Procedures to be followed for all site activities; and (e) documentation of work-related accidents;
- Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be
- easily accessible throughout the site;
- Provide medical insurance coverage for workers;
- Secure all installations from unauthorized intrusion and accident risks;
- Provide supplies of potable drinking water;
- Provide clean eating areas where workers are not exposed to hazardous or noxious substances;
- Provide H&S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;
- Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted;
- Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;
- Ensure moving equipment is outfitted with audible back-up alarms;
- Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal.

Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; and

- Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.

K. Community Health and Safety.

- Plan routes to avoid times of peak-pedestrian activities.
- Liaise with IPIU/DSC in identifying high-risk areas on route cards/maps.
- Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.
- Provide road signs and flag persons to warn of dangerous conditions.

L. Work Camps

- Consult with IPIU/DSC before locating project offices, sheds, and construction plants;
- Minimize removal of vegetation and disallow cutting of trees;
- Provide water and sanitation facilities for employees;
- Prohibit employees from poaching wildlife and cutting of trees for firewood;
- Train employees in the storage and handling of materials which can potentially cause soil
- contamination;
- Recover used oil and lubricants and reuse or remove from the site;
- Manage solid waste according to the following preference hierarchy: reuse, recycling and
- disposal to designated areas;
- Remove all wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; and
- Request IPIU/DSC to report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.

M. Social and Cultural Resources

- Strictly follow the protocol for chance finds in any excavation work;
- Request IPIU/DSC or any authorized person with archaeological field training to observe excavation;
- Stop work immediately to allow further investigation if any finds are suspected; and
- Inform IPIU/DSC if a find is suspected, and take any action they require ensuring its removal or protection in situ.