Environmental Assessment Document

Initial Environmental Examination: Churu Water Supply Sub - Project
Project Number: 40031
September 2008

India: Rajasthan Urban Sector Development Investment Program

Prepared by Local Self Government Department

For the Government of Rajasthan
Rajasthan Urban Infrastructure Development Project

ABBREVIATION

ADB	-	Asian Development Bank
CWR	-	Clear Water Reservoir
DSC	-	Design and Supervision Consultancy
EA	-	Executing Agency
EAC	-	Expert Appraisal Committee
FI	-	Financial Intermediary
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
LPCD	-	Litre Per Capita per Day
LPS	-	Litre Per Second
LSGD	-	Local Self-Government Department
MFF	-	Multitranche Financing Facility
MLD	-	Million litre Per day
MoEF	-	Ministry of Environment and Forests
NAAQS	-	National Ambient Air Quality Standards

OD	-	Outer Diameter
OHSR	-	Over Head Service Reservoir
OM	-	Operations Manual
PHED	-	Public Health Engineering Department
PMU	-	Project Management Unit
RCC	-	Reinforced Cement Concrete
ROW	-	Right of Way
RPCB	-	Rajasthan State Pollution Control Board
RSPM	-	Respirable Suspended Particulate Matter
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
UA	-	Urban Agglomeration
UIDSSMT	-	Urban Infrastructure Development Scheme for Small and Medium Towns
uPVC	-	Unplasitized Poly Venyl Chloride
USEPA	-	United States Environmental Protection Agency
WC	-	Water Closets
WTP	-	Water Treatment Plant

WEIGHTS AND MEASURES

lakh	–	100 thousand = 100,000
crore	–	100 lakhs = 10,000,000
µg/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

CONTENTS

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 Multitranche 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 (2002) and Environmental Assessment Guidelines (2003).

B. Extent of the IEE study

4. Indian law and ADB policy 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 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: 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 categorized 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 (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 categorises 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 Municipal Solid

Waste Management Facilities (facilities that are shared by more than one town)1. EC is thus not required for the water supply 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 and the national environmental protection agency (MoEF in this case). 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 report for the Churu water supply 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.

II. DESCRIPTION OF THE PROJECT

A. Type, Category and Need

14. This is a water supply 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 because the present water supply infrastructure in Churu is inadequate for the needs of the growing population. The distribution system supplies less than 80% of the population, but water is available for only few hours per day, mainly because of system losses and low and unequal network pressure.

15. The provision is also unequal, with un-served areas being mainly the slums and newly-developed areas. 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 Churu and the other urban centres to those expected of modern Asian towns.

B. Location, Size and Implementation Schedule

16. The sub-project is located in Churu, the headquarters town of Churu District. It is located in the eastern part of the "Thar" Desert and in the middle portion of the north–east Rajasthan in the Western part of Rajasthan (**Figure 2.1**). Improvements in the raising mains, distribution system will affect only certain parts of the town, such as slums and developing areas where a new network will be provided, and certain other locations where 7 overhead storage reservoirs, and 2 pump houses will be built. Zone wise proposed water supply system is shown in **Figures 2.2 and 2.3.** Proposed rising mains and water distribution of Churu is shown in **figure 2.4.** Photographs of the project area are attached as **Appendix 1**

[1] According to the Rajasthan State Pollution Control Board, the MoEF intends to issue a clarification to the EIA Notification in due course, which will add all landfill facilities and Sewage Treatment Plants to the list of projects specified as requiring EC under the Notification. This has not yet been issued, so the text above indicates the correct legal position at the time of writing

C. Description of the Sub-project

1 Service Delivery, existing water supply arrangement

17. Water supply of Churu town is based on the blending of tube well water and surface water from IGNP scheme. At present there are 8 water supply zones viz. Industrial Area, FCI Godown, Van Vihar, Collectorate, Main SR, Gandhi Nagar, Kolinda and Goyenka zone. Most part of all the zones are supplied water through CWRs and OHSRs constructed in the individual zone. CWRs. Some tube wells are also directly connected to the distribution system. The main PMC pump house for pumping water from CBP was constructed in between the Bhaleri road and Sardar Sahar road, from where; water is being pumped to the existing CWRs through two feeder mains. One feeder main of 300 mm diameter AC pipe feeds CWRs of Industrial area and Goyenka Zone. The other feeder of varying diameter of 450 mm/ 400 mm/ 300 mm /250 mm is transporting water to CWRS at FCI Godown, Van Vihar, Collectoriate, Main Pump House, and Kolindia. The pipe material of this feeder main is of DI except for a length of 3100m of 450mm diameter, which is of AC. At present about 13.5 mld of water is being pumped from this system. There is heavy leakage from the existing rising mains of AC pipelines as well as in the distribution system. The losses are reported to be high and in the tune of 40%. Considering the present production level, the per capita net supply works out to be about 71 lpcd for 2007 estimated population of 114,232, which is much lower than the standard indicated in the CPHEEO manual i.e. 135 lpcd. Detailed plan and commitment to guarantee the required water supply for Churu is given in **Appendix –2**

18. In addition to the inadequate production, the system suffers from old and leaking distribution lines, inequitable pressure distribution etc. At present, there are total 17,668 connections. Out of this, 16,749 connections are domestic. The rest are commercial and industrial. The connections are metered; however, 60% are in working condition. Out of the remaining 40%, 15% of water meter need to be replaced and 25% would be serviceable on repair. At present tube well water is being disinfected through application of bleaching powder, which is rudimentary and inefficient. The existing situation warrants urgent source augmentation, rehabilitation / improvement of the existing distribution system including storage provision. The Subproject is also expected, inter *alia*, to reduce the UFW by billing for actual quantity of water supply by applying volumetric rate. The subproject is designed for a net water supply of 135 lpcd with 20% losses for a design population of 2041. The source augmentation is being done by PHED in stages. Also included in the subproject is adequate disinfection arrangement. All civil works are designed to meet 2041 needs while all mechanical and electrical equipment are designed for 2026 requirement.

2 Sub-project description including detailed scope of work

19. The Subproject will construct the downstream facilities and strengthen the existing water supply system for the town to receive and distribute additional 5.05 MLD water supplied from IGNP on 2011 and 16 mld of water on 2021. The Subproject is also expected, inter alia, to reduce the unaccounted for water (UFW) by billing for the actual quantity of water supplied, since the house connections will be expanded to cover at least 90% of the town population, with either new water meters or a rehabilitated water meters. Disinfection facilities, in the form of chlorinator plants at the CWR in the head works in the town, are also proposed and the distribution network will be expanded and strengthened to fully absorb the additional water supply from the proposed source of IGNP.

20. Scope and components of the works consist of construction of replacement of pumps at existing pump house, providing and laying of transmission/rising main, construction of OHSRs, construction of pump houses including mechanical and electrical works, procurement and installation of bulk water meters and domestic meters including rehabilitation of inefficient pumping machinery, etc., detailed as follows:

- Construction of 7 nos. OHSRs at Agrasen Nagar (750KL), Gandhinagar (750 KL), Vanbihar (750 KL), Goyenka (1000 KL), Bagla well (1500 KL), Johri Sagar (1500 KL) and Kotwali Thana (1500 KL)
- Construction of Pump house 2 locations, at PMC (3 nos. , 48 lps- 49 m head; 49 lps- 45 m head, 74 lps- 42 m head) and at SR zone (with pumps 29 lps- 43 m, 20 lps-31 m ; 19 lps-44 m; 2 nos. each)
- Pipeline from tube well to CWR 110 mm uPVC- 12.5 km
- Provision for DI rising main of dia 150 mm to 450 mm , approximately 12.14 km
- Provision of Distribution pipe line of 315 mm to 110 mm diameter and approximately 77.5 km. length.
- Replacement of old leakage pipeline (110 mm)- approx. 6.5 km
- Provision for 2 nos. chlorinators at pump houses.
- Provision of 13 nos. bulk flow meter.
- Provision of 3800 nos. new domestic meters and repair of 4200 nos. of existing domestic meters.

21. Tube well water of 6.5 MLD is drawn from 54 Tube wells and 29 Open wells as also surface water of 12.05 MLD from IGNP which will be increased to 23 mld in 2021, will be pumped from PMC pump house and will be collected in 7 nos. existing CWR at Industrial Area (200 KL), Goyenka zone (750 KL), FCI Godown (375 KL), Van Vihar, Collectorate (400KL), Main SR zone (900 KL), Kolindia (450 KL) and proposed CWR at Agrasen Nagar (200 KL), near Ramjas well (200KL), Bharti well (300KL), Boontia road (225 KL) and near ITI (200KL) through existing as well as newly proposed pumping mains. Pump houses are proposed to feed water to the proposed OHSRs. There are also 7 nos. of existing IPS from where water will be further pumped to 8 nos. of existing OHSR of 4.34 ML total capacity. From the reservoirs, water will be distributed to the consumers through the rehabilitated or newly constructed distribution network. 100 % consumer metering will be carried out for the design population of 2011. Provision of new domestic meters of 3800 nos. and repair of 4200 nos. of existing meters is proposed. The bulk meters will be provided at all supply points to measure the quantity of water supply and to enable system monitoring. The complete rehabilitation of the existing system will increase the efficiency of the system and reduce the proportionate O& M cost.

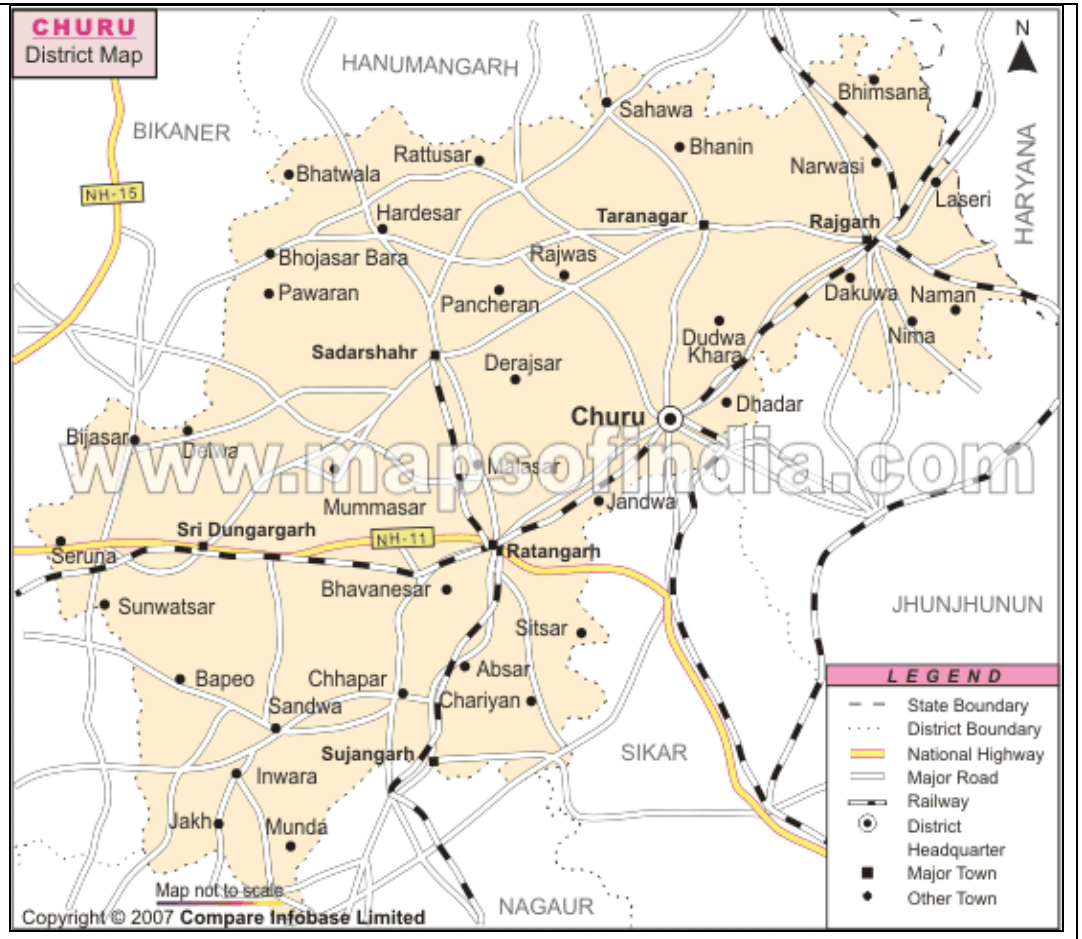
22. A schematic diagram of the proposed water supply system and the proposed layout are shown in **Figure 2.2, 2.3 and 2.4** respectively.

23. The Subproject is designed for a net water supply of 135 lpcd at the household end, for a design population of 2041, and with physical or system losses maintained at 20% after the

completion of the project. All civil works and pipe sizing are designed to meet 2041 (projected population's) needs, while all mechanical and electrical equipment are designed for 2026 (projected population's) requirement.

24. **Table 2.1** shows the nature and size of the various components of the subproject. There are three main elements: augmentation of the water source and supply; treatment facility; expansion/improvement of the distribution network; and reduction of non-revenue water (NRW). The descriptions shown in **Table 2.1** are based on the present proposals, which are expected to be substantially correct, although certain details may change as development of the subproject progresses.

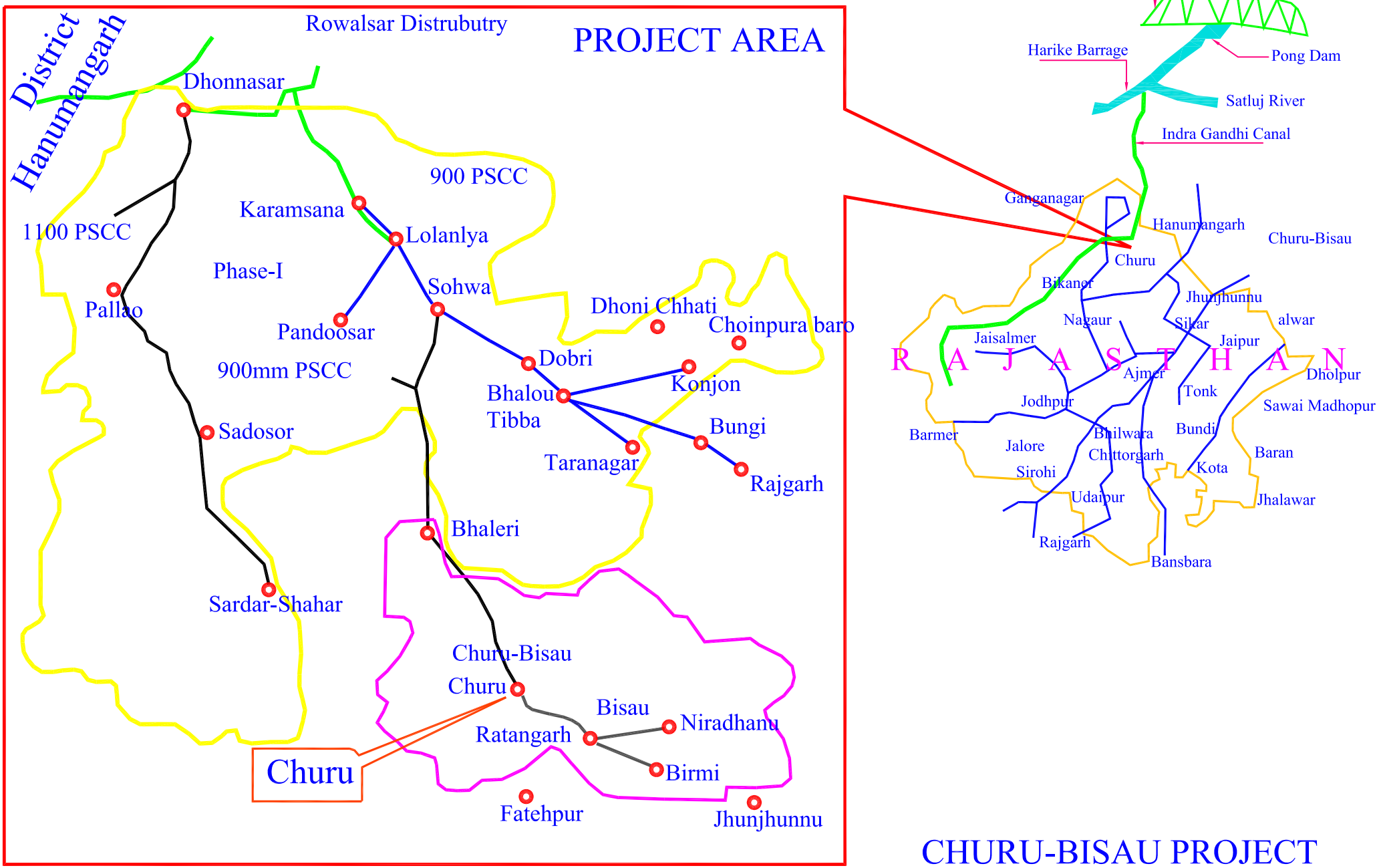
Figure 2.1: Map showing the location of the project



Rajasthan Urban Sector Development Investment Program ADB TA 4814-IND	Govt of Rajasthan Asian Development Bank
Churu Regional Map	

Figure 2.2: Water travel route to Churu

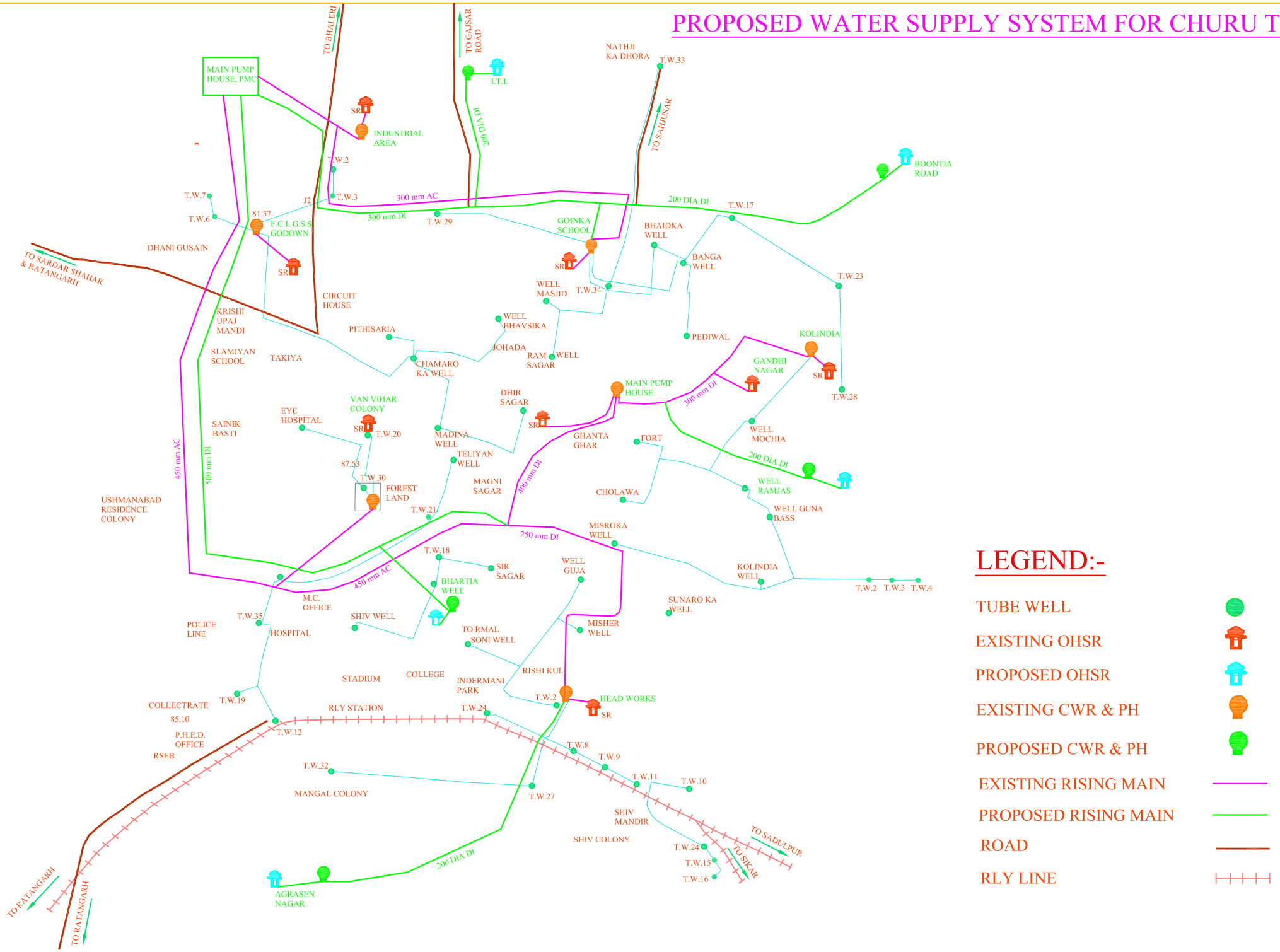
TRAVEL OF WATER



CHURU-BISAU PROJECT

Figure 2.3: Zone wise water supply system- Churu

PROPOSED WATER SUPPLY SYSTEM FOR CHURU TOWN



LEGEND:-

- TUBE WELL
- EXISTING OHSR
- PROPOSED OHSR
- EXISTING CWR & PH
- PROPOSED CWR & PH
- EXISTING RISING MAIN
- PROPOSED RISING MAIN
- ROAD
- RLY LINE

Table 2.1: Improvements in water supply infrastructure proposed in Churu

Infrastructure	Function	Description	Location
1. Source and Supply Augmentation			
Transmission/Rising Main	To collect pure water from intake to CWR and next to the OHSR	Provision for rising main of dia 150 mm to 450 mm and approximately 12.14 km length	The areas to be covered are Agrasen Nagar Colony, Taranagar nagar road Goyanka zone, Bootia road
2. Expansion of Distribution Network			
Distribution mains	Supply water to consumers residing in newly developed area or developing area	Provision of Distribution pipe line of 315 mm to 110 mm diameter and approximately 77.5 km. length.	New pipe line from Nai sarak, near Rly. Station to H. N. Nurshing home, Lal Ghantagarh to Rly. Crossing at Sadulpur gate (NH-65)., Lal Ghantaghar for near Alok cinema, Churu, Collectorate circle to ratngarh Rly Crossing, Pankha circle to near A. V. M, Pankha circle to near Collectorate circle & Collectorate circle to near Rly station (NH-65), Agrasen Nagar distribution network, Distribution for DTO office side locality, Distribution for Usmanabad Colony
Connecting pipelines	Supply of water from tube well to CWR	110 mm uPVC- 12.5 km	CWR sites and tube well sites
Overhead Reservoirs	Increase water supply to regulate water supply	Provision for 7 nos. OHSRs of total capacity of 7.7 ML	At Agrasen Nagar (750KL), Gandhinagar (750 KL), Vanbihar (750 KL), Goyenka (1000 KL), Bagla well (1500 KL), Johri Sagar (1500 KL) and Kotwali Thana (1500 KL)
New pump house	For pumping of water	Construction of 2 nos. pump house	Pump house 2 locations, at PMC (3 nos. , 48 lps- 49 m head; 49 lps- 45 m head, 74 lps- 42 m head) and at SR zone (with pumps 29 lps- 43 m, 20 lps-31 m ; 19 lps-44 m; 2 nos. each)
Chlorinator	To disinfect of water by chlorination.	At 2 locations	At pump house locations
3. Meters and House Connections			
Bulk flow meters	Monitor water flow in the improved network	Total 13 nos.	At different locations
Replacement of non-functional water meters	Monitor and regulate water usage by consumers and improve cost recovery	Provision of 3800 nos. new domestic meters and repair of 4200 nos. of existing domestic meters.	Throughput the city

III. DESCRIPTION OF THE ENVIRONMENT

A. Physical Resources

1 Location

25. The Urban Agglomeration (UA) of Churu district is located in the north-eastern Rajasthan. It is surrounded by Hanumangarh district in the north, Nagaur, Sikar and Jhunjhunu districts in the sourth. Hissar (Haryana) district in the east and Bikaner in the west. The total area of the district is 16,830 sq.km. (4.92% of the State). Churu city is the administrative headquarter of the district. The district has been divided into 5 sub-divisions viz. Churu, Sujangarh, Ratangarh, Sardarsahar, and Rajgarh. There are six tehsil headquarter in this district. Viz. Churu, Sujangarh, Ratangarh, Sardarsahar, Rajgarh and Taranagar. For implementation and coordination of various developmental schemes there are six blocks (Panchayat Samities), one each at tehsil headquarters.

26. Churu is well connected by road network and is connected with Jaipur, Bikaner, Delhi and other important cities. The National Highway 65 (Pali-Ambala) passes through the town, whole NH-11 (Agra-Bikaner) lies about 30 km south of the town. The near by towns of Sikar, Jhunjhunu, Hanumangarh, Ratehpur, Sardarshahar are very well connected with town by regional roads.

27. The town is directly connected by meter gauge rail with Delhi, Jaipur, Bikaner, Sriganganagar. It is about 282 Kms from Delhi, 198 Kms from Jaipur and 180 Kms from Bikaner by rail. The nearest Airport is at Jaipur (206 km). District map of Churu is shown in **Figure 3.1**

2 Topography, Natural hazard and Drought

28. **Topography**: Churu the district headquarter. It is located in the eastern part of the "Thar" Desert and in the middle portion of the north–east Rajasthan at latitude 28^{o}18' north and longitude 74^{o}58' east, at a height of about 286m above the mean sea level.

29. **Natural Hazards**- Earthquake**:** Churu town lies in Low damage risk Zone – II. The area is less prone to earthquakes as it is located on relatively 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 zone.

30. **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 3.1: District map of Churu

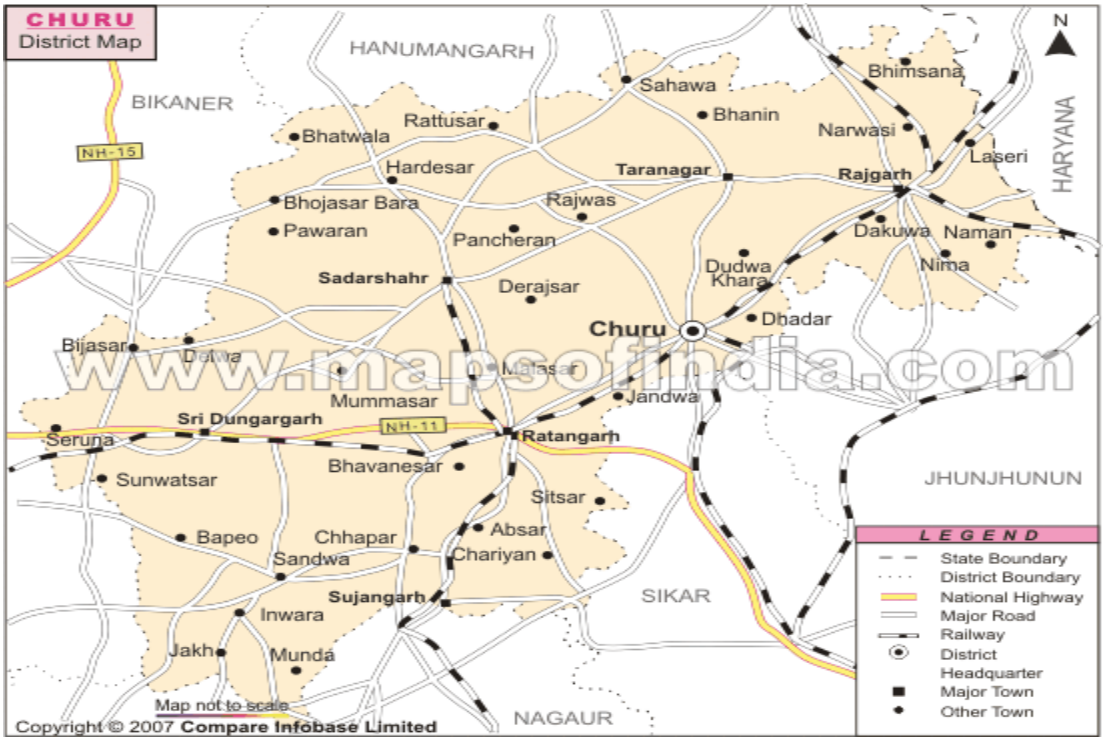


Figure 3.2: Earthquake zones of Rajasthan

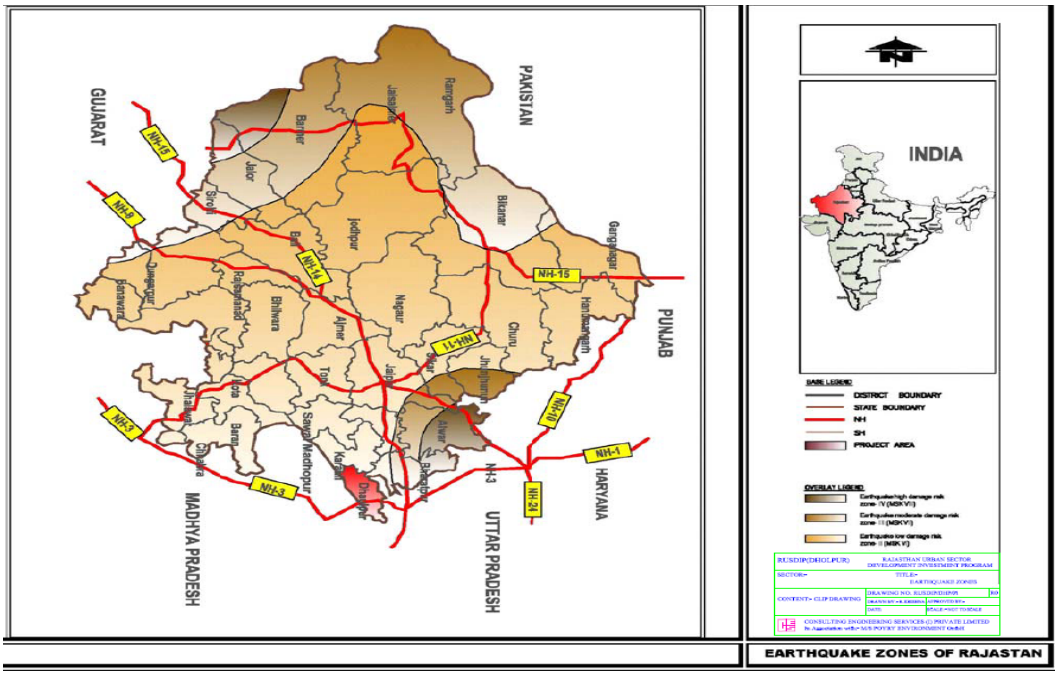
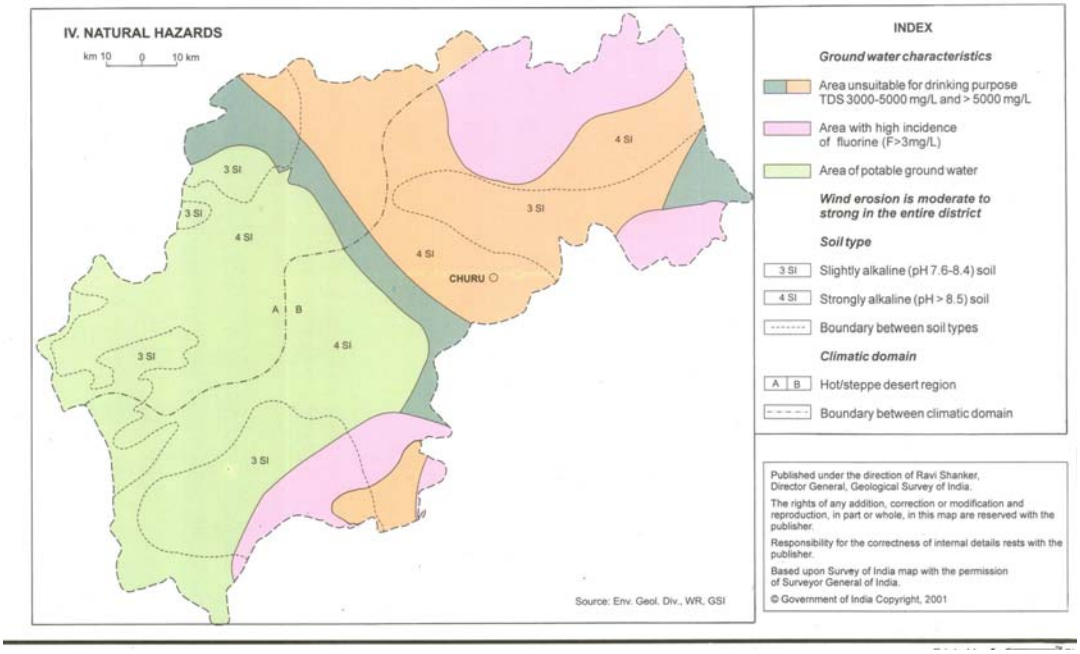


Figure 3.3: Natural Hazard map of Churu (Source: Resource map GSI)



3 Geology, geomorphology, mineral resources and soil

31. The climate of the area is semi-arid to arid and the average annual rainfall is 320 mm. Major part of the district is irrigated by Indira Gandhi Canal System. The Geology of the district is largely concealed by windblown sand and has been worked out on the basis of scanty exposures and from dug well and borehole data. The area a part of the Thar desert , is basically a fluvio –aeolian depositional basin containing 255 m thick pile of Quaternary sediments. It is characterized by an undulatory topography consisting of sand dunes interspersed with interdunal valley and linear depressions. The various rock types of the area belong to the Delhi Supergroup , Erinpura Granite, Malani Igneous Suite and the Marwar Supergroup and the tertiary sediments including the Palana Formation of Palaeocene age. The oldest rock sequence in the area belongs to the Punagarh Group comprising slate, phyllite, quartz-mica schist, ferruginous quartzite etc. of the Delhi Super Group. These rocks are well exposed south of Bidasar and east of Pandurai .The metasediments of the Punagarh Group are intruded by Granite, Pegmatile and amphibolite .The youngest Malani Igneous Suite is represented by Porphyritic rhyolite and granite.

32. The dug-well and borehole data have revealed rocks of the Marwar Super Group occurring beneath thick pile of Quaternary Sediments in Southwestern part of the district. These are divisible into three groups, namely, the Jodhpur Group, the Bilara /Hanseran Evaporite Group and the Nagaur Group. Ground water potential in the area ranges from less than 10 to 100 LPS.

33. Mineral Resources: Phyllite, Slate and Quartzite quarried at Bidasar, Biramsar, Dungras and Gopalpura are utilized as building stone. Rhyolite is extensively quarried from Randisar hill for use as road metal and building stone. Small isolated patches of gypsum are seen at several places around Taranagar. Gypsite occurs at 0.3 to 1.5 m below the surface .The occurrences of

gypsum near Baen, Bhanin, Deogarh and Satyun are promising .Potash minerals such as polyhalite and sylvite have been intersected around 550 m depth in a number of boreholes drilled by the Geological Survey of India at and around Lakhasar , Jhanjheu etc in halite – bearing evaporate sequence of the Hanseran Evaporite Group. Limestone occurrences are located near Asrasar and NW of Mundra. Occurrences of salt are reported from south of Pandurai. Effflorescence of salt petre (Potassium Nitrate) is found on the soil in some places in Rajgarh tehsil.They also contain some amount of sodium chloride and sodium sulphate .Besides these copper mineralization is also observed in the Biramsar hill and in Bidasar area.

34. Geology and mineral map of Churu shown in **Figure 3.4**, while geomorphological map of Churu depicted in **Figure 3.5.**

Figure 3.4: Geology and Mineral map of Churu district (Source: GSI Resource map)

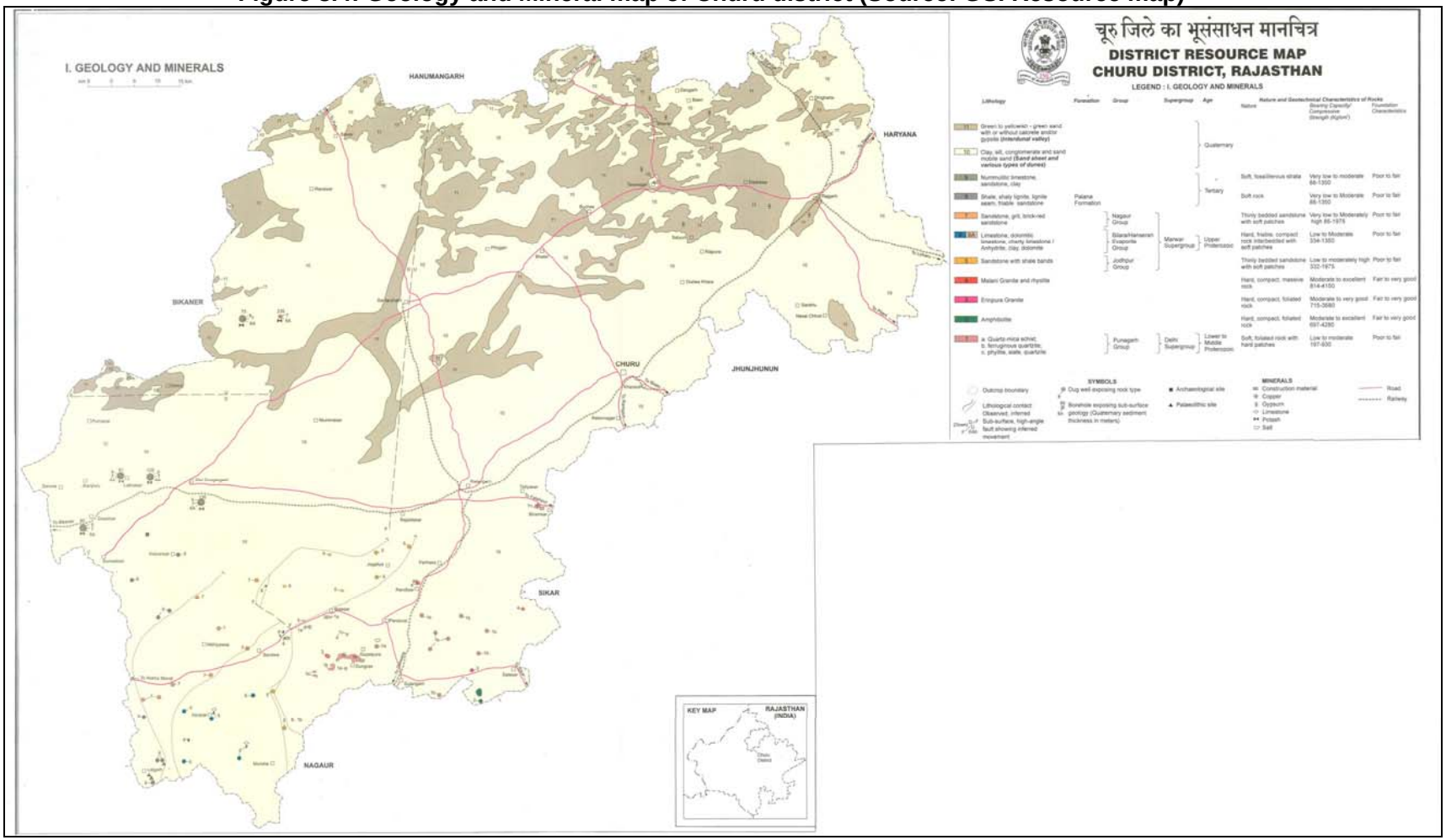
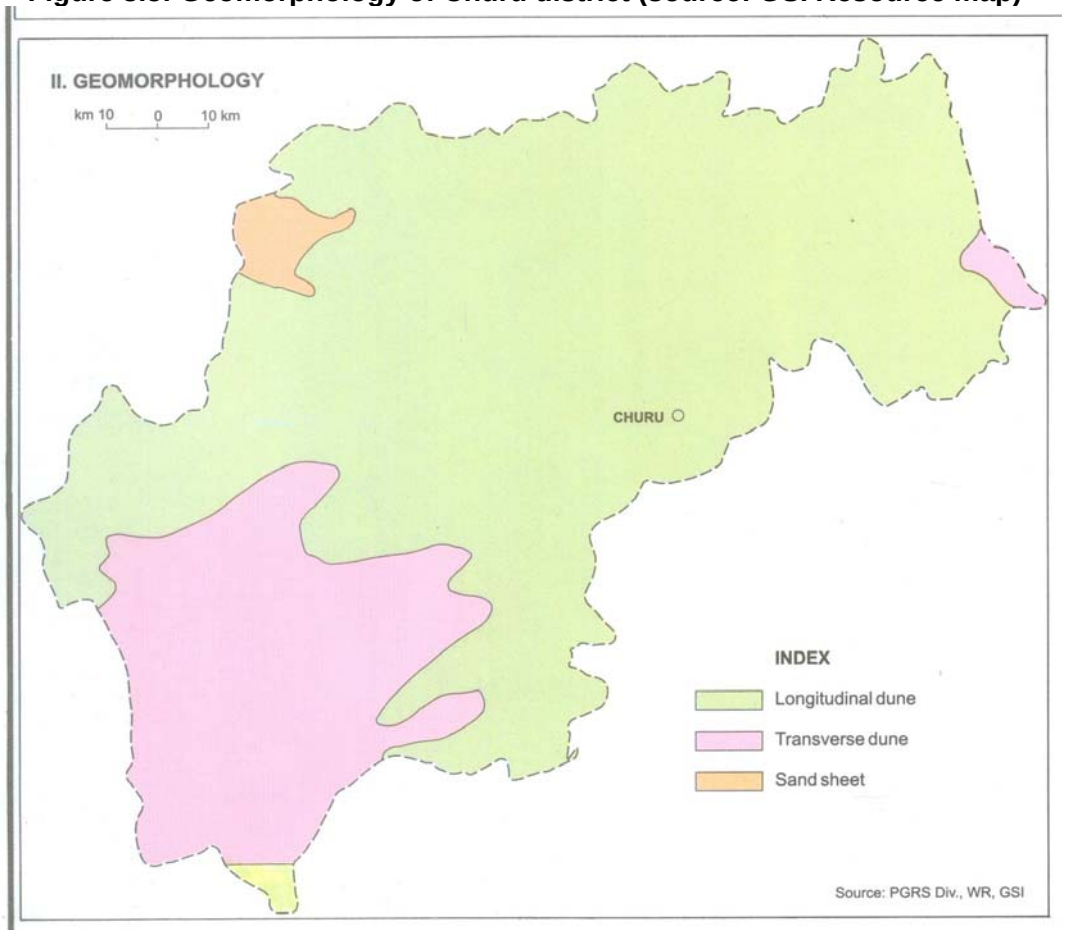


Figure 3.5: Geomorphology of Churu district (source: GSI Resource map)



35. Soil characteristics: Soil of the region falls within rainfall zone of 100-350 mm. The soil is desert type. Sand dunes Aeolian soil is loamy coarse in texture and calcareous. **Table 3.1** shows nutrient level in the Churu soil including area coverage of sodic soil. The nutrient status of the Churu soil is graded as very low to medium level.

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

	Nutrient			Saline Soil(Ha)	Sodic or Alkali(Ha)
	N	P	K		
Status	VL	M	M		250

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

4 Climate

36. The climate of Churu city is hot and arid with large variation in temperature. Rainfall is scanty. The average temperature variation in summers and winters are 37.54^{o} to 24.94^{o} C and 29.05^{o} to 9.15^{o}C respectively. The maximum and minimum temperature recorded is 47.2^{o}C in summer and 0.5^{o} C in winter. The south-west monsoon is active in the region from July to mid September, recording an annual rainfall of 377 mm. Dust storm and thunder storm occur all through the summer and are particularly active in pre-monsoon period. In summer mean humidity as 60%. The predominant wind direction is from west and south-west.

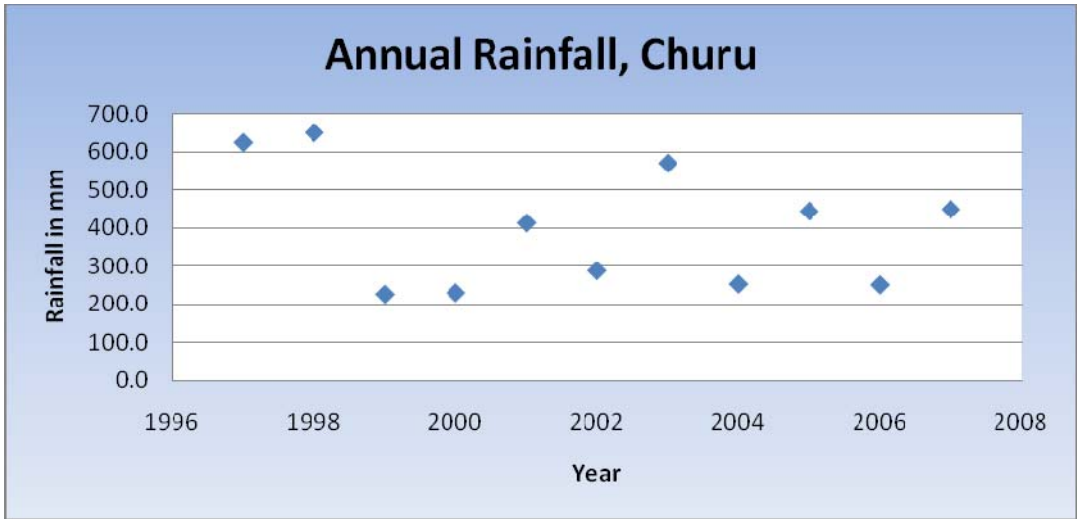
37. The rainfall over Churu is scanty and is concentrated over four month i.e. from June to September. The rains are erratic and so is the distribution of the rainfall. However agriculture and the animal wealth are dependent on rains to large extent. Seasonal Rainfall data for the recent year (2005-2006) shown in **Table 3.2**. **Figure 3.6** shows yearly variation (1997-2007) of rainfall at Churu.

Table 3.2: Rainfall at Churu in recent years (2005-06)

S.No.	Months	Rainfall (mm)
1	June	106
2	July	75
3	August	6
4	September	69
5	October	0
6	November	0
7	December	0
8	January	0
9	February	0
10	March	23
11	April	7
12	May	37
13	**Monsoon Rainfall**	256
14	**Non monsoon rainfall**	67
15	**Annual Rainfall**	**323**

(Source: Irrigation Department, Govt. of Rajasthan)

Figure 3.6: Rainfall at Churu during 1997 to 2007



Source: Deputy Director hydrology water resources ID and R, Jaipur

5 Air Quality

38. There are no data on ambient air quality of Churu Town, which is not subject to monitoring by the Rajasthan State Pollution Control Board (RPCB) as there are no major industries. The nearest station is located at Jaipur (200 km from Churu). Traffic is the only significant pollutant in Churu, so levels of oxides of sulphur and nitrogen are likely to be well within the National Ambient Air Quality Standards (NAAQS). The ambient air quality data is depicted in **Table 3.3.**

Table 3.3: Ambient Air Quality in Jaipur (Annual Average, 2004; units in µg/m3)

Monitoring Station	Land use	SOx	NOx	RSPM	SPM
Jaipur Residential, Rural and others area	Residential	5.57	29.9	106	302
NAAQ Standard	Residential	60	60	60	140
Jaipur Industrial area	Industrial	22.69	9.32	131	300
NAAQ Standard	Industrial	80	80	120	360

RSPM: Respirable Suspended Particulate Matter; SPM: Suspended Particulate Matter

Source: Annual Report 2005-2006 Rajasthan State Pollution Control Board

6 Surface Water

39. There are no monitoring data on surface water quality in and and around Churu. The nearest station is located at Ghagar nadi (230 km from Churu). The parameters as measured by Rajasthan Pollution Control Board are pH, Electrical conductivity (EC), BOD and DO. Water quality data of Ghagar river – up stream and down stream location are shown in **Table 3.4** and **Figures 3.7** and **3.8.**

Table 3.4: Water quality of Ghagar River

Location	Date of Sample Collection	Dissolved Oxygen (mg/lt)	P^H	BOD (mg/lt) (3 days at 27o C)	Conductivity at 25^o C (m-MHO)
Ghagar Nadi , Hanumangarh, up stream	7/29/2005	4.37	8.23	1.39	0.39
Ghagar Nadi , Hanumangarh, down stream	7/29/2005	4.2	8.52	1.26	0.38

Figure3.7: Variation of water quality parameters Ghagar Nadi , Hanumangarh, Up stream

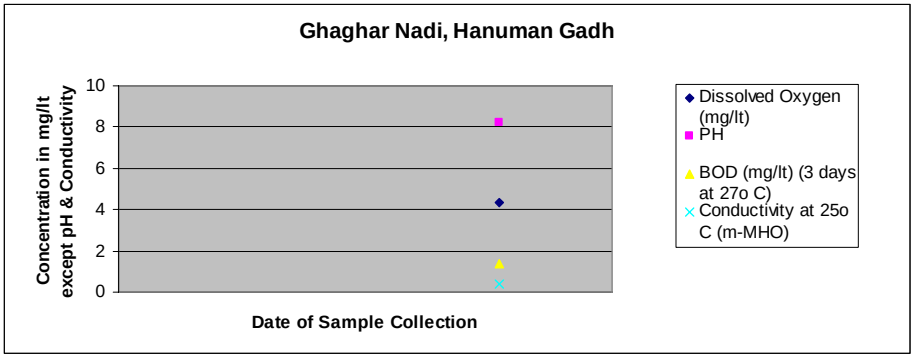
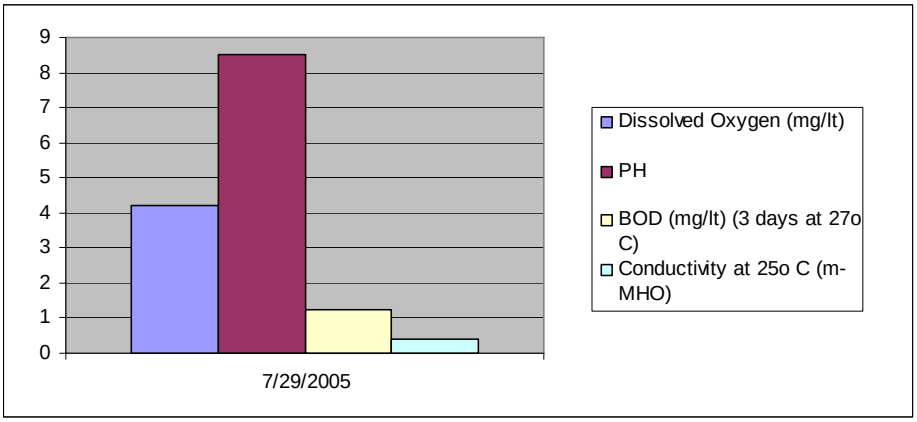


Figure 3.8: Variation of water quality parameters: Ghagar Nadi , Hanumangarh, down stream



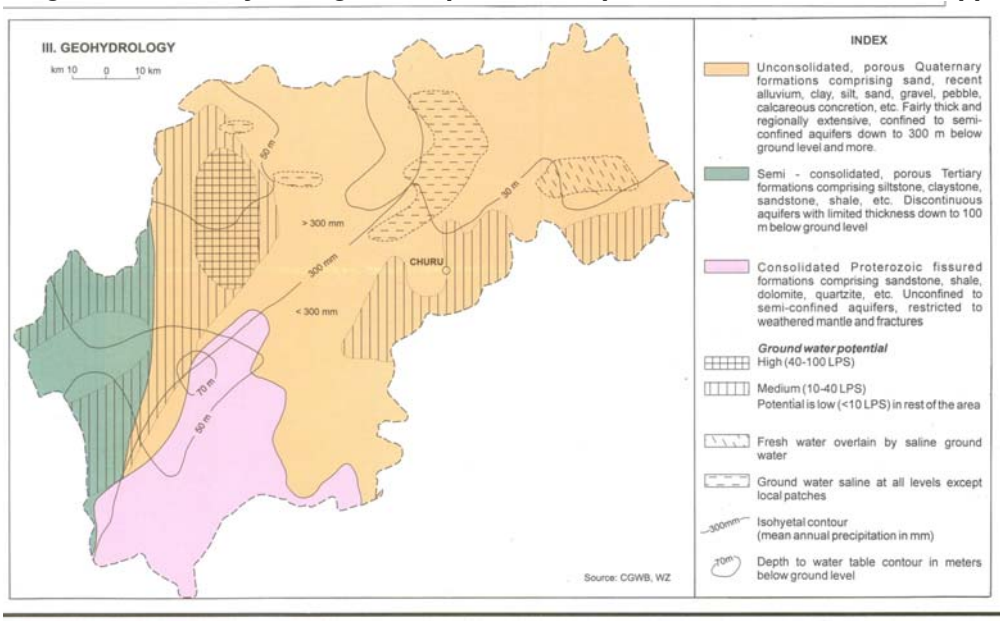
7 Geohydrology and Groundwater

40. Geohydrological map of the Churu district is shown in **Figure 3.9.** For broadly grouping geological formations from ground water occurrence and movement considerations, the various lithological units have been classified into two groups on the basis of their degree of consolidation and related parameters. These are,

- Porous Formations- unconsolidated quaternary formations
- Porous Formations – semi unconsolidated porous tertiary formations
- Fissured formations – consolidated protereozoic formations.

41. On an average 80 % of the district area covered with porous formations.

Figure 3.9: Geohydrological map of Churu (Source: GSI Resource map)



42. There are number of National Hydrographic monitoring stations of Central Ground Water Board in and around Churu. Fluctuation of ground water level is shown in **Table 3.5.** In most of the cases ground water table ranged between 20 -60 m bgl.

Table 3.5: Number and Percentage of National Hydograph Network Stations at Churu with water fluctuation range

Period	No of wells analysed	Range		0-2 m		2-5 m		5-10m		10-20m		20-60m		>60 m	
		Min	Max	No.	%	No.	%	No.	%	No.	%	No.	%	No	%
Jan-06	45	9	59.23	0	0	0	0	2	4.44	6	13.33	37	82.22	0	0
Nov-05	46	8.54	59.26	0	0	0	0	2	4.35	7	15.22	37	80.43	0	0
Aug-05	46	4.65	59.32	0	0	1	2.17	3	6.52	6	13.04	36	78.26	0	0
May-05	43	8.51	62.87	0	0	0	0	2	4.65	7	16.28	33	76.74	0	0

Source: Ground water year book 2005-06 Rajasthan, Central Ground Water Board, Jaipur (2007)

43. The Central Ground Water Board carried out chemical testing of tube well water seasonally. The average concentrations of major constituents are shown in **Table 3.6**.

Table 3.6: Ground Water Quality in and around Churu

Parameters	Maximum Level	Minimum Level	Standard of Drinking water (IS: 10500: 1991)	
			Desirable limit (mg/l)	Maximum Permissible limit (mg/l)
pH	9	7.52		
EC (micro mhos/cm at 25°C)	12720	335		
Cl (mg/l)	3940	28	250	1000
SO_4(mg/l)	2040	5	200	400 (if Mg does not exceeds 30 ppm)
NO_3(mg/l)	1237	2.8	-	100
PO_4(mg/l)	1.71	0		
Total Hardness(mg/l)	3000	80	300	600
Ca(mg/l)	220	16	75	200
Mg(mg/l)	700	5	30	100
Na(mg/l)	2760	16	-	-
K(mg/l)	195	1.56	-	-
F(mg/l)	49	0.3	1.0	1.5
Fe(mg/l)	5.56	0.1	0.3	1.0
SiO_2(mg/l)	50	9		
TDS (mg/l)	8268	218	500	2000

Note: Total – 32 nos. samples

Source: Ground water year book 2005-06 Rajasthan, Central Ground Water Board, Jaipur (2007)

44. The entire Churu city is considered dark zone from groundwater exploitation point of view. As far as groundwater condition is concerned, it is available at a depth of approximately 45-50 m and that too is brackish with TDS level is in the range of 1890 to 4,200 ppm, Chloride level is between 320 to 1160 ppm, Nitrate between 70 to 230 ppm and Fluoride between 1.2 to 1.9 ppm (Ref. PHED).

45. Groundwater quality of Churu city is not in conformity with the set norms of Government of Rajasthan. It is highly brackish and TDS, Chloride, Nitrate and Fluoride content is far beyond the set safe limits and WHO standards. Consumption of this high fluoride content has resulted in bone deformity and joint pains (as evident from Public perception). Further high nitrate water is

not desirable for infants as they may develop ‘Blue-Baby’ disease and elderly persons may face gastric and digestive problem.

B Ecological Resources

46. FLORA : Overwood –Important trees found in the district, others are Acacia nilotica (Kikar) ,*Azadirachta indiaca* (Neem) , *Ziziphus mauritiana* (Ber). The khejra tree (prosopis spicigera) is the most common in the over wood of the district .Its leaves , pods etc are eaten by cattle , and its dried beans are used as vegetables .The Rohira (*Tecoma undulate*) tree furnishes good timber but it is not very common. The Shisham (*Dalbergia sissoo*) very good for furniture ,is also scare in this area.

47. FAUNA: - Fox (*Vulpes leucopus*) , Blue Bull , Common Hare (*Lepus Ruficaudatus*) , Jackal (*Canis Aureus*) , Porcupine (*Hystrix Cristata indica*) , Bats , and Bush rats (*Zerbil*) etc. are found here. The common birds found here are Bulbul (*Molpaotescafer*) , Owl (Bubobubo) , Kite (*Milvus migrano*).

48. No forest area, endangered flora and fauna are reported near the proposed sub-project location.

C. Economic Development

49. Churu being a desert district generally faces famines & drought. The bulk of population depends upon agriculture & animal husbandry. Being district headquarter, Churu town is the main regional centre for the entire district and is working as service centre for providing services like trade and commerce, transport, commercial and other higher level public facilities for the entire district.

50. The economic condition of people in Churu is not satisfactory. As per information in 1998 about 28% population comprised of families below poverty line. These people are mostly labour class working in industries, shops, restaurant, construction, transport and certain other. This aspect has to be given due consideration while designing the housing projects.

51. Total workers in the city as per 2001 census are 25195 out of which 22581 are male workers and 2,614 are female workers. The gross Worker Participation Ratio (WPR) of Churu city is 24.7% while male WPR is 42.5% and female WPR is meager 5.4%. Economic profile is indicative of backwardness of the city. There has been an increase from 23.4% in 1981 in participation rate.

52. Out of the total 25,195 workers, main workers are 21,996 out of which male main workers are 20,568 and main female workers are 1,428. There are only 3,199 marginal workers out of which 2,013 are male and 1,186 are female marginal workers. Marginal workers are only 12.69% of total workers and WPR of marginal worker is meagre 3.1%.

53. The occupational structure as per 2001 census is assessed as follows:

Table 3.7: Distribution of Work Force- Churu District (2001)

Category	Nos.	% of Work Force
1. Main Workers		
Cultivators	814	3.70
Agriculture Labourer	191	0.87
House Hold Industry	1,323	6.01
Other Workers	19,668	89.42
Sub-Total	**21,996**	
2. Marginal Workers		
Cultivators	384	12.00
Agriculture Labourer	226	7.06
House Hold Industry	437	13.66
Other Workers	2,152	67.27
Sub-Total	**3,199**	
Grand Total	**25,196**	

Source: Compiled from District Census Handbook Data 2001

54. The detailed break up of occupational structure of Churu town is not available in 2001 census data. However, the occupational structure data for 1971, 1981 and 1991 are available on the basis of which the estimation for 2001 has been made as shown in the below **Table 3.8**

Table 3.8: Occupational Structure, Churu town 1971 to 2001

Occupation	1971		1981		1991		2001	
	Workers	%	Workers	%	Workers	%	Workers	%
Agriculture, Mining and allied activities	2352	21.15	2159	14.85	3455	17.97	3226	16.40
Industrial	2167	18.12	2305	15.85	2963	15.41	3245	16.50
Construction	874	7.31	1314	9.04	2162	11.25	2262	11.50
Trade & Commerce	2206	18.44	3184	21.89	4364	22.70	4524	23.00
Transport & Communication	1187	9.93	1588	10.92	1802	9.37	1868	9.50
Other Services	2996	25.05	3992	27.45	4479	23.30	4543	23.10
Total	11962	100.0	14542	100.0	19225	100.0	19668	100.0

Source: Census of India and Estimates

55. The occupational structure of people in Churu town shows that town is a commercial centre as well as service town. A number of district level offices are located in the town and as such about 23% workers are engaged in service sector. Industrial activity is not very significant due to lack of water and power as well as raw material even the woollen mill is not working at present. Therefore, employment in industrial sector is only 16%. It may be mentioned that Churu is famous for mason and construction workers. They are not only working gin Churu or other neighbouring states, but also in Gulf countries. The high percentage of workers of about 11.25% in construction justifies this fact.

56. **Power status of the area:** There is no power generation unit at Churu. The consumption of electricity by different sectors is shown in Table below.

Table 3.9: Consumption of Electricity in Million Kwh (2003-04)

District	Domestic	Non- Domestic (Commercial)	Industrial	Public Lighting	Public Water Works	District	Domestic
			Small	Medium	Large		
Churu	68.123	13.806	9.73	9.452	2.88	2.272	50.464

1 Land use

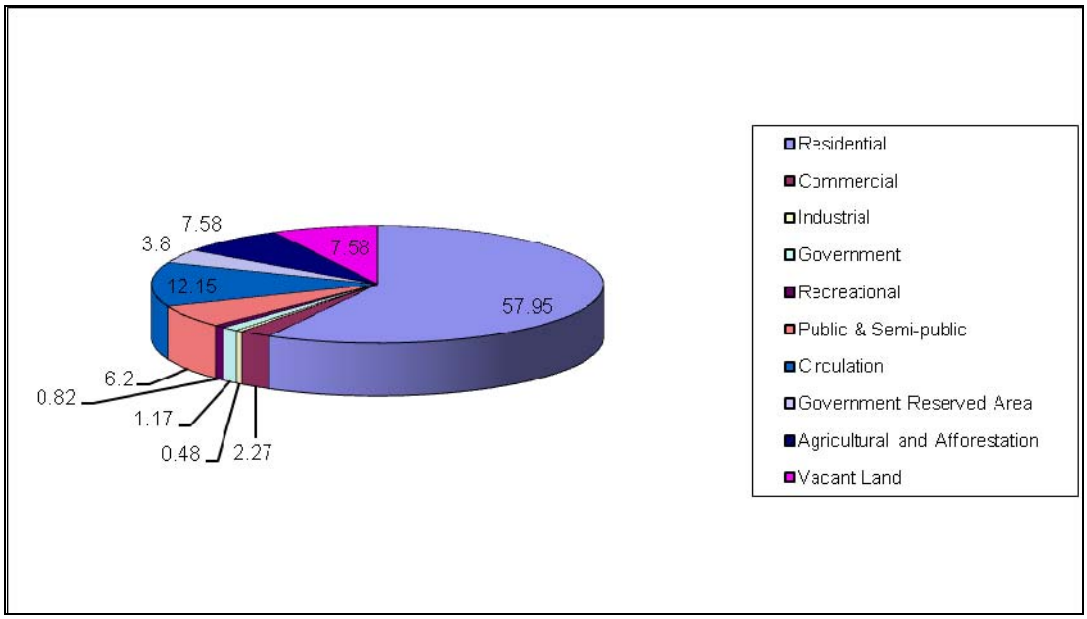
57. The Municipal Limits of Churu cover an area of about 30 sq.km. In 1983 only 1450 acres or about 20% of Municipal Area could be called as Urban Area. The rest is mostly forest area, agriculture or vacant land. Out of the 1450 acres of urban area only 81.04% i.e. 1175 acres is developed area. The core of the town (old walled city area) is densely built up; whereas fringe areas of the town are comparatively open. A Land-use Plan-2006 is attached as **Figure 3.10.**

58. Within the developed area about 71.5% is under residential use. Only 0.60% is under industrial use. The Trade and Commerce and Governmental activity comprises 2.80% and 1.45% respectively. Whereas 7.65% fall under public and semi-public use. The details of existing land-use are given in table below.

Table 3.10: Existing Land-use, Churu, 1983

Sr. No.	Use	Area in ha	%age of Developed Area	%age of Urbanised Area
1	Residential	339	71.50	57.95
2	Commercial	13	2.80	2.27
3	Industrial	3	0.60	0.48
4	Government	7	1.45	1.17
5	Recreational	5	1.02	0.82
6	Public & Semi-public	36	7.65	6.20
7	Circulation	71	14.98	12.15
8	**Developed Area**	**474**	**100.00**	**81.04**
9	Government Reserved Area	22	-	3.80
10	Agricultural and Afforestation	44	-	7.58
	Vacant Land	44	-	7.58
	Urbanised Area	585	**-**	**100.00**

Figure 3.10: Existing Land-use and % of Urban Area – Churu



2 Commerce, Industry and Agriculture

59. Most of the commercial activities in Churu are along the major roads, which are concentrated mainly around the old fort area and clock tower area. These markets are locally known as 'Gudri Bazar', Katla Bazar (which extends from fort to clock tower) and 'Utrada Bazar'. The road width of these markets is too narrow to meet the volume of traffic in these areas.

60. The railway station and nearby bus stand are new areas for the development of commercial activities. A shopping centre of the town has also come up along Nai Sarak. The newly developed residential colonies are without shopping facilities. The residents have to traverse a considerable distances to meet their shopping needs. Also there is no provision for separate specialised, wholesale market dealing with hardware, building material, cloth, machineries etc. This creates mixed traffic in the core city area all the time leading to traffic congestion.

61. Churu town is industrially undeveloped, though a good number of industrialists hail from Churu region. Because of shortage of water, raw materials and infrastructural facilities, industrial activities are not picking-up. As per information collected, there were 247 registered industrial units in the town, which, in all, employ about 1,000 workers. There is not a single large scale industry in the town. Only a few small scale units like woollen mill, saw mill and a few casting industries have been established on Churu-Jhunjhunu road and near the railway station. There are also some small units of dying and printing, guar gum, cement work, metal industries, whose main products are nails, steel furniture, steel almirahs etc., which are scattered all over the town. Besides, some cottage industries also exist in the town, which deal in silver utensil, potteries and shoe making.

62. RIICO has also developed an industrial area comprising of 50 acres along Bhaleri road in north-west direction of the town, where 97 units are functioning. The area has not been developed fully due to paucity of required infrastructure like water supply, raw material,

transportation etc. there is not a single large scale Industry in the town. Only a few numbers of units of RIICO Industrial area at North .Three are two large and medium industries and 3963 small industries. The area has not been developed fully due to paucity of required infrastructure like water supply, raw material, transportation etc. The industries are related to Alluminium ,Utensils,Churan,chatni ,Papad.

63. In and around the Churu city area there are about 50-60% of lands used for agricultural purpose. Crop production statistics as depicted in **Table 3.11** indicates that crop production is more in Kharif season in compared to Rabi season.

Table 3.11: Crop production in around Churu

Type of Crops	Under Rabi Crops 2003-04 (Prod in Tonnes)	Under Kharif Crops 2003-04 (Prod in Tonnes)
Cereals	35570	394433
Pulses	34218	175779
Food Grains	69788	570212
Oilseeds	33131	19291
Others	2561	113864
Total	**105570**	**703367**

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

3 Infrastructure

64. Water supply: Water supply service is the highest priority for people of Churu. PHED and Churu Municipal Board always put the service at the first place while framing any plan for the city. Churu PHED also prepared water management and augmentation plan with the financial aid from GoI & GoR. Present level of water supply is about 106 LPCD.

65. Water supply to Churu is from groundwater source 10.38 MLD (54 Tubewells and 29 Open wells) and surface water sources 0.820 MLD in the city. The city is divided into 8 water supply zones covering 41 municipal wards. The approximate total length of the existing water supply distribution network is 57.14 km and includes all localized distribution networks. Approximately 3.92 ML of water is stored in 8 Service reservoirs and 7 clear water reservoirs. Poor households are served by 86 public stand posts. At a minimum, most zones receive 1-2 hours of water supply per day – supply is, however, dependent on the availability / yield of water from the localized supply system. Water is supplied through 17,561 water connections comprising domestic (~95 percent), non-domestic (~4 percent) and industrial (~1 percent). While most connections are metered, it is estimated that only 10 percent of these meters are in working condition.

66. Present water supply of Churu city is only 106 lpcd, which is less than the standard level of 135 lpcd for desert district level. To augment this level as it is mentioned that Churu-Bisau scheme, which is being designed for the population of 2021 with an estimated population of 1,50,376, while using 20 underground water sources in addition to 12,048 KLD of IGNP allocations which is under process.

67. Sewerage System: As is the case with all medium towns in Rajasthan, Churu too does not have any sewerage system. WCs are connected to septic tanks in most of the houses, while some houses, due to lack of space, discharge WC effluent directly in to open drains. In some households, especially in slum areas, open defecation is still a common practice. As per census

survey only 83.3% households have toilet facilities. The rest 17.7% defecate in open area or along roadside. Katchhi Basties completely lack toilet facilities. Out of the total toilets only 66% have water connections. Sullage generated from houses is directly discharged in to open drains, which ultimately ends up in low-lying areas, forming pools (Locally called Ginanies). Details of the system are covered in next section on drainage. The open drains carrying wastewater and the resultant pools are causing unsanitary conditions, which are threat to public health.

68. Sanitation: Only 50-60% of the households reportedly have septic tanks and soak 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.

69. Drainage: The topography of Churu city is cup shaped, the town being surrounded by sand dunes. Due to scanty rains in the region, natural drainage system has not been evolved. In fact there is no river/rivulet in the entire Churu district. In Churu town itself no natural drainage system exists to drain away the rainwater or wastewater from the town. Presently there exists a minimal network of storm water drains in the city. The existing network of (roadside) storm water drains in Churu has been identified under three broad categories as follows: (i) open pucca (concrete drains) and (ii) closed pucca. (iii) Kutchha.

70. Industrial Effluents. Small industries exists in under RIICO, 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 RIICO'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.

71. Solid Waste: MBC's jurisdiction is spread over an area of 33.80 sq.Km, which includes core old city area and some rural parts at the fringes. 30 tons of solid waste is collected daily and in addition to household (domestic) solid waste, the main waste generation sources in the town are vegetable and fruit markets, commercial and institutional establishments including hotels and eateries, construction activities, and other tourism related activities.

72. The MSW generated in the Churu city (including slum area) mainly consist of domestic refuses, waste from Commercial Area, Vegetable-Fruit market, bio-medical waste, waste from Hotels and Restaurants, Industries etc. The waste collection system being followed is quite primitive, individual households/units throw the garbage on road side/open drains close to their houses and the sweepers collect the garbage in the form of small heaps on road sides. Similarly the open drains are also cleaned periodically and the sludge is heaped adjacent to the drain where it is left for 2-3 days to get dried and lifted. Tractor trolleys then lift these dumps the heaped garbage once or twice a day. In the process part of the garbage gets dispersed on the road or finds it way into to the open drains or open low lying pits (Ginanis).

4 Transportation

73. **Table 3.12** provides a breakdown of road surface composition in 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 3.12: Road Surface Composition

Surface Type	PWD (km)	MC (km)	UIT (km)	Total (km)	Dist.
Concrete	12.125	23.616	0	35.74	27.50
Bituminous	13.305	56.729	0	70.02	2.32
WBM	0	0	0	0	0
Gravel/Earthern	0	21.98	0	0	0
Total	**25.425**	**102.3285**	**0**	**127.743**	**0**

Source: PWD Churu

74. A well planned road network comprising of bypass, arterial, sub arterial and major roads was proposed in the Master Plan. A link road connecting Sikar road and Sadulpur road was proposed in the south so that this regional traffic may not unnecessarily has to enter the town. Similarly a ring road (Bye pass) was proposed in the east and north connecting all the important roads such as Sadulpur road, Taranagar road, Bhaleri road, Sadulshahar and Ratangarh road. This road has not been developed as yet. Similarly a number of link roads were also proposed to solve the city traffic problem. However the bus and truck stands proposed in the Plan could develop.

D. Social and Cultural Resources

1 Demography

75. The population of the district is more than 1.92 million. The population density 114 persons per sq.km, which is less than the state's population density of 165 persons per sq. km. The literacy rate of the district is 66.97%, which is little higher than the state literacy rate (61.03%).

76. The condition of residential development in Churu is not uniform. The development in old city area has been as per needs of the people having high density, multi-storied houses, narrow lanes and almost total lack of open space. Even in some parts the dry latrine system prevails. There is no arrangement for drainage, sewerage, proper waste collection and public facilities. In outer areas the development in few planned residential colonies and civil line area, is satisfactory. However, the condition in private unauthorised, colonies as well as Katchhi Basti areas is worse with most of the essential public facilities lacking.

77. Churu city with population of 1,01,874 (2001 Census) constitutes nearly 5.3% total population and 19% of the total urban population of the district. This indicates that apart from Churu there are other dominant urban centers in the district. Scheduled Cast (SC) and Scheduled Tribe (ST) constitute nearly 11% of the town’s population, which is much lower than 26% for the entire district.

78. Churu Municipal area comprises is 30 sq.km and of 41 wards. The ward Nos. 3, 27 and 41 are highly populated wards with more than 4000 population where as ward no. 25 has the lowest population of 1515 persons.

Table 3.13: Ward wise Population of Churu City, 2001

Ward No	Population			Sex Ratio
	Persons 2001	Male	Female	
1	2,603	1,387	1,216	877
2	2,577	1,327	1,250	942
3	4,081	2,156	1,925	893
4	2,080	1,098	982	894
5	2,010	1,005	1,005	1000
6	2,708	1,422	1,286	904
7	1,868	964	904	938
8	2,429	1,230	1,199	975
9	3,220	1,673	1,547	925
10	2,285	1,136	1,149	1011
11	2,756	1,464	1,292	883
12	2,806	1,510	1,296	858
13	2,523	1,341	1,182	881
14	1,953	1,018	935	918
15	2,314	1,155	1,159	1003
16	2,185	1,071	1,114	1040
17	2,589	1,282	1,307	1020
18	2,400	1,200	1,200	1000
19	2,510	1,269	1,241	978
20	1,666	855	811	949
21	3,258	1,717	1,541	897
22	2,400	1,299	1,101	848
23	2,853	1,468	1,385	943
24	2,507	1,342	1,165	868
25	1,515	769	746	970
26	1,726	882	844	957
27	4,031	2,094	1,937	925
28	2,202	1,118	1,084	970
29	1,600	855	745	871
30	1,714	906	808	892
31	2,303	1,175	1,128	960
32	2,284	1,191	1,093	918
33	3,118	1,683	1,435	853
34	2,611	1,321	1,290	977
35	2,483	1,281	1,202	938
36	2,259	1,203	1,056	878
37	1,946	1,028	918	893
38	2,012	1,070	942	880
39	2,261	1,170	1,091	932
40	3,002	1,529	1,473	963
41	4,226	2,415	1,811	750
Total	**101,874**	**53,079**	**48,795**	**919**

(Source: Census of India, 2001)

79. The decennial growth of the city since 1901 has exhibited a continuous increase trend upto the year 1951 i.e. from 2.43% to 41.66%. The rate of growth was highest during 1941-1951 i.e. 41.66%. In the next decade i.e. 1951-1961 there was a sudden reversal in the trend when it fell only to 4.20%. In the next four decades there has been a swing in both directions with rise of 27.46% and 33.48% in 1961-1971 and 1981-1991 and decline in growth rate to 16.71% and 22.96% during the 1971-1981 and 1991-2001. The lower growth rate during recent years could be attributed to lack of employment opportunities, together with out migration of businessmen to the metropolitan cities of the country.

2 Health, educational and recreational facilities

80. Recreational (Parks and Open Spaces); There is only one recognised park known as Indramani Park in the town, which is maintained by the Municipal Board. This park is not properly developed and maintained because of scarcity of water. One stadium known as Indira Stadium, covering an area of 5.2 acres is located near railway station behind PWD rest house, which is used for public meetings and sports meets. But this ground lacks basic facilities required for a stadium. Some local level play grounds are available in the town. The town also has sufficient number of 'Bagichis' catering to the recreational needs of the public and act as open spaces for the town. There is little scope for further development of gardens and parks in the town due to scarcity of water.

81. The level of educational facility in Churu is quite satisfactory. Percentage of enrolment of total school age children in the age group 6-11 is 88.27%. This percentage drops to 51% and 53% for Middle and Secondary and Higher Secondary schools respectively. The figures included students coming to these schools from the nearby villages.

82. There are good educational facilities in Churu district, which serve both townspeople and inhabitants of surrounding villages and towns in the hinterland. There are 1122 primary schools, 214 secondary schools and 109 higher secondary schools, plus eleven general degree colleges.

Table 3.14: Educational facility of Churu District

Primary School	1122
Upper Primary School	807
Secondary School	214
Senior Secondary School	109
College	11
Professional college	2
Professional Training Institute	6
D.I.E.T.	1
Sanskrit College	1

(Source: Official website of district)

83. As the district headquarters town, Churu is the main centre for health facilities in the area and there is a district general hospital, 11 general hospital, 55 primary health centers are in the Churu. The detail of the health facilities given in **Table 3.15**.

Table 3.15: Health facility Churu District

General Hospital	11
PHC	58
Sub Centre	348
Ayurvedic and Unani Hospital	114
Private Hospital	13

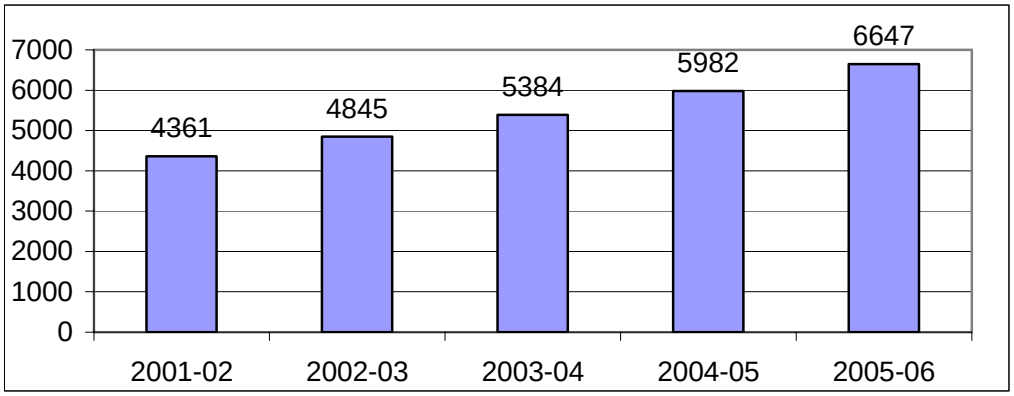
(Source: Official website of district)

3. History, culture and tourism

84. Churu has moderate tourist inflows with main attractions being Jain Temple , Ganga Mata Temple , Balaji Temple , Satya Narain Temple . The tourist attractions within the city are places Nagar Shree Museum , Taknet Chhatri , Nath Ji ka Dhora , Bagla Dharmshala , Sethani ka Jhohra , Aath Khamba ki Chhatri.

85. Churu functions as an ideal weekend resort for inhabitants of the Delhi Metropolis in addition to being a place of interest for foreign tourists. The position of tourists arrival in the last 5 years is shown in **Figure 3.11.**

Figure 3.11: Tourist inflow at Churu



Source: Department of Tourism, Govt. of Jaipur

86. The State Government has initiated Heritage Walk Project, Heritage Conservation Plan in 28 towns including Churu.

IV. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES: LOCATION AND DESIGN

87. 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.

88. In many environmental assessments there are certain effects that, although they will occur during either the construction or operation stage, should be considered as impacts primarily of the location or design of the project, as they would not occur if an alternative location or design was chosen. For example, if a groundwater aquifer was depleted by excessive abstraction this would be an impact of both the location and design, because groundwater may not be depleted if the design had used surface water to augment the supply, and the specific aquifer would not have been depleted if the well field was located elsewhere.

89. 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 localised and not greatly significant;
- Most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving trenching and other 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.

V. POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES: INFRASTRUCTURE CONSTRUCTION

A. Screening out areas of no significant impact

90. From the descriptions given in Section III, it is clear that implementation of the project will affect quite long tracts of land both inside and outside the town where the distribution main and network extensions will be constructed, and also a series of specific locations. Design project report has been prepared and is under review.

91. However it is not expected that the construction work will cause major negative impacts. This is mainly because:

- Pipelines will be mainly located on unused ground alongside existing roads and can be constructed without causing major disruption to road users and adjacent houses, shops and other businesses;
- New facilities within and outside the town (ORs, etc) will be located on government-owned land that is not occupied or used for any other purpose;

- Most pipeline construction will be conducted by small teams working on short lengths at a time so most impacts will be localised and short in duration;

- The overall construction programme will be relatively short for a project of this nature, and is expected to be completed in 3 years.

92. As a result 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	There is no wildlife or rare or endangered species in the town or on the government owned areas outside the town on which facilities will be built
Coastal resources	Churu is not located in a coastal area
Population and communities	Construction will not affect population numbers, location or composition

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

94. Rapid Environmental Impact Assessment checklist is given in **Appendix- 3**. Since the present scope of work is under review the checklist is developed tentatively on the basis of present conceptual scope.

B. Source and supply augmentation

1 Construction method

95. As explained above, augmentation of the water source and supply will involve construction of the following:

- 12.14 Km of rising main at different areas are to be laid from the CWR to the respective OHSRs

2 Physical Resources

96. Excavation for infrastructure will generate waste soil and stone. There will therefore be quite large physical changes at the construction sites, and this quantity of waste could not be

dumped without causing further physical impacts (on air quality, topography, soil quality, etc) at the point of disposal. The work will probably be conducted in the dry season, so there is also a lot of potential for the creation of dust.

97. Action will therefore be needed to reduce physical impacts at both the construction and disposal sites, by controlling dust and reducing the amount of material to be dumped. The Contractor should therefore be required to:

- Contact the town authorities to find beneficial uses for as much waste material as possible, in construction projects, to raise the level of land prior to construction of roads or buildings, or to fill previously excavated areas, such as brickworks;

- Prevent the generation of dust (which could affect surrounding agricultural land and crops) by removing waste material as soon as it is excavated (by loading directly onto trucks), and covering with tarpaulins to prevent dust during transportation.

98. Another physical impact that is often associated with large-scale excavation is the effect on drainage and the local water table if groundwater and surface water collect in the voids. However, this should not be a problem in this case, given the low rainfall and deep water table (>20 m) in this area, and the fact that the Contractor will almost certainly plan excavation work to avoid the monsoon season.

3 Ecological Resources

99. There are no protected areas or locations of any ecological interest at or near any of the sites affected by these works, so it is unlikely that the construction process will have any ecological impacts. The only concern would be if trees were removed unnecessarily. To avoid this, the Contractor should be required to plant and maintain three new trees for every one that is removed.

4 Economic Development

100. The raising mains will be located on government owned land, so there should be no need to acquire land from private owners, which might affect the income and assets of owners and tenants. There should also be no effects on other features with economic implications (such as infrastructure, industry and commerce), as there are none of these facilities on these sites.

101. There could however be significant disruption of traffic, business and other activities, if trucks carrying waste material were allowed to enter Churu town or other built-up areas. The transportation of waste will be implemented by the Contractor in liaison with the town authorities, and the following additional precautions should thus be adopted to avoid these impacts:

- Planning transportation routes so that heavy vehicles do not enter Churu Town or other built-up areas and do not use narrow local roads, except near delivery sites;

- Scheduling the transportation of waste to avoid peak traffic periods.

5 Social and Cultural Resources

102. 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. Given that the locations proposed for these facilities are uninhabited and show no obvious signs of having been used to any extent in the past, then it could be that there is a low risk of such impacts at these sites. Nevertheless this should be ascertained by consulting the appropriate authorities, and appropriate steps should be taken according to the nature of the risk. This should involve:

- Consulting historical and archaeological authorities at both national and state level to obtain an expert assessment of the archaeological potential of all proposed sites;
- Selecting alternative sites for any work proposed in areas of medium or high risk;
- Including 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 to the project;
- Developing a protocol for use by the Contractor in conducting any excavation work, to ensure that any chance finds are recognised and 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.

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

104. 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 ensure that such gains are directed towards communities most directly affected by this part of the scheme, the Contractor should be required to employ at least 50% of this labour force from communities within a radius of say 2 km from each site, if sufficient people are available.

C. Network improvement

1 Construction method

105. Expansion of the distribution network will involve construction of:

- Laying of 77.5 km of new distribution pipe line of different diameter
- Construction of 7 overhead reservoirs

- Construction of 2 new pump houses
- Construction of chlorinator rooms

106. Reduction of non-revenue water will involve:

- Replacement of 6.5 km of old leakage pipeline
- Installation of bulk flow meters at each storage reservoir and pump station;

107. These all involve the same kinds of construction and will produce similar effects on the environment, so their impacts are considered together.

108. It is expected that the distribution mains will be buried in trenches adjacent to roads, in the un-used area within the ROW, at the edge of the tarmac. However the distribution mains will be located in roads and streets in the town, where in some places this area is occupied by drains or the edges of shops and houses etc, so to avoid damage to property some trenches may be dug into the edge of the road.

109. Trenches will be dug using a backhoe digger, supplemented by manual digging where necessary. Excavated soil will be placed alongside, and the pipes (brought to site on trucks and stored on unused land nearby) will be placed in the trench by hand or using a small rig for the larger DI pipes. Pipes will be joined by hand, after which sand from local quarries will be shovelled into the trench beneath and around the pipe for support and protection. Soil will then be replaced manually on top of the pipe and compacted by a vibrating compressor. Where trenches are dug into an existing roadway, the bitumen or concrete surface will be broken by hand-held pneumatic drills, after which the trench will be excavated by backhoe, and the appropriate surface will be reapplied on completion.

110. Pipes are normally covered by 1.2 m of soil, and a clearance of 100 mm is left between the pipe and each side of the trench to allow backfilling. Trenches will be smaller for the distribution main (minimum of 1.4 m deep and 0.3 m wide). Old pipes will be replaced by new one after taken out old pipe by digging.

111. New pipes and connections to the distribution main will be provided to house connections, and these will run to individual dwellings in small hand-dug trenches, or on the surface. New consumer meters will be located outside houses, attached to a wall or set onto the ground. In slum areas water will be provided via communal taps from where people will collect their water.

112. Seven overhead reservoirs will be built on government land in various locations in the town. The foundations for the overhead reservoirs (OR) will be excavated by backhoe, with soil being loaded onto trucks for disposal. Aggregate and concrete will be tipped into each void to create the foundations and floor, after which metal reinforcing rods will be added to create vertical supporting pillars of the OR. Sections of reinforcing will then be encased in wooden shuttering and concrete will be poured in, and this process will be repeated to gradually create each structure from RCC, including the tank of the OR and the above-ground portion of the GR. Surfaces will be smoothed and finished where necessary by hand.

2 Physical Resources

113. Although replacement of parts at the pump house should not have noticeable environmental effects, the remainder of this component involves some quite large-scale excavation, so physical impacts could be significant and will need to be mitigated.

114. This work is similar to the source augmentation component in that construction will involve quite extensive excavation, although in this case it will be spread over various locations, many of which are in the town, so the nature and significance of the impacts could be different.

115. If average trench dimension 1.25 x 0.6 m for the 77 km distribution main, then trench construction will excavate around 57,750 m^3 of material. After construction, approximately 8% of the trench will be occupied by the pipe, 15% by backfilled sand, and 77% by excavated soil replaced on top and side of the pipe. This means that around 8662 m^3 of sand will be brought to site, 44467 m^3 of soil will be retained for replacement in the trench, and 13282 m^3 of waste material will be left over. Additional smaller quantities of waste will be produced by the other excavation work, in particular the storage reservoirs. This is less material than produced by big excavation but it adds a further to the total waste produced by this subproject, and in this case the impact of dust will be more significant because much of the work will be conducted in inhabited areas. It will thus be very important to limit physical impacts by finding beneficial uses for waste material as recommended above, and to apply additional precautions to limit the production and spread of dust. The Contractor should therefore be required to:

- Contact the town authorities to find beneficial uses for waste material, in construction projects, to raise the level of land prior to construction of roads or buildings, or to fill previously excavated areas, such as brickworks;
- Prevent the generation of dust by removing waste soil as soon as it is excavated;
- Plan the work carefully so that sand is only brought to site when it is needed;
- Cover or damp down sand and soil retained on site to reduce dust in windy weather;
- Use tarpaulins to cover loose material during transportation to and from the site.

116. The other important physical impact associated with excavation (effects on surface and groundwater drainage) should again be negated by the low rainfall and very low water table in this area, and the fact that the Contractor will almost certainly conduct the excavation work in the dry season.

117. Physical impacts will also be reduced by the method of working, whereby the network will probably be constructed by small teams working on short lengths at a time, so that impacts will be mainly localised and short in duration. Physical impacts are also mainly temporary as trenches will be refilled and compacted after pipes are installed, and any disturbed road surfaces will be repaired. Because of these factors and the mitigation measures proposed above, impacts on the physical environment are not expected to be of major significance.

3 Ecological Resources

118. There are no significant ecological resources in and around the project area, so the network improvements should have no ecological impacts. Roadside trees should not be removed unnecessarily to build the trenches, and to mitigate any such losses the Contractor

should be required to plant and maintain three new trees (of the same species) for each one that is removed.

4 Economic Development

119. Most of this work will be conducted on government owned land in the ROW of roads, where there is no need to acquire land from private owners. It may be necessary however to acquire small amounts of land in places along the transmission main route to avoid bends in the road and allow the pipeline to follow a more direct path. If this is the case, the government will purchase land through the mechanism of the Land Acquisition Act (1894), where prices are established on the basis of recent transactions. ADB policy on Involuntary Resettlement requires that the owners and users of acquired land do not suffer economically as a result of the project, and a separate Resettlement Plan and Resettlement Framework have been prepared to examine these and related issues. This establishes that no more than 10% of the land of any owner or occupant should be acquired, and that in addition to the price of the land, farmers should be compensated for any standing crops or trees they lose.

120. Although most of the work will not require land acquisition it could still have economic impacts, if the presence of trenches, excavated material, workers and machinery discourage customers from visiting shops and businesses, which lose income as a result. These losses should be short in duration as most of the pipeline work should last for only a few days at any one site. Nevertheless the loss of income could still be significant for small traders and other businesses that exist on low profit margins. These impacts should therefore be mitigated by:

- Compensating shopkeepers and other affected businesses for lost income;
- Leaving spaces for access between mounds of excavated soil, and providing footbridges so that pedestrians can cross open trenches;
- Increasing the workforce in these areas to ensure that work is completed quickly;
- Consulting affected businesspeople and informing them in advance when work will occur.

121. Excavation work could damage existing infrastructure located alongside roads, such as storm drains where present, and the sewer network inside the fort area. It will be particularly important to avoid damaging existing water pipes as these are mainly manufactured from Asbestos Cement (AC), which can be carcinogenic if inhaled, so there are serious health risks for both workers and citizens (see below). It will be important therefore to avoid these impacts by:

- Obtaining details from the Municipal Board of the nature and location of all infrastructure, and planning pipeline routes (in and outside the town) to avoid any conflict;
- Integrating construction of the various Churu subprojects (in particular water supply and sewerage) so that:
  - Different infrastructure is located on opposite sides of the road where feasible;

- Roads and inhabitants are not subject to repeated disturbance by trenching in the same area at different times for different purposes.

122. Transport is another type of infrastructure that will be affected by some of the work, particularly construction of pipelines in the narrower streets where there is not enough space for excavated soil to be piled off the road. The road itself may also be excavated in places where there is no available land to locate pipelines alongside. Traffic will therefore be disrupted, and in some very narrow streets the whole road may need to be closed for short periods. The Contractor should therefore plan this work in conjunction with the town authorities and the police force, so that work can be carried out during periods when traffic is known to be lighter, and alternative routes and diversions can be provided where necessary. The Contractor should also increase the workforce in areas such as this, so that the work is completed in the shortest possible time.

123. It is inevitable that there will be an increase in the number of heavy vehicles in the town (particularly trucks removing waste material for disposal), and this could disrupt traffic and other activities, as well as damage fragile buildings if vibration is excessive. These impacts will therefore need to be mitigated by:

- Careful planning of transportation routes with the municipal authorities to avoid sensitive areas as far as possible, including narrow streets, congested roads, important or fragile buildings and key sites of religious, cultural or tourism importance;

- Scheduling the transportation of waste to avoid peak traffic periods, the main tourism season, and other important times.

5 Social and Cultural Resources

124. As was the case for the source and supply augmentation works, there is a significant risk that the network improvements, which involve further extensive disturbance of the ground surface, could damage undiscovered remains, or even unknown sites. The risks are in fact very much higher in this case, as most of the work will be conducted in Churu town, which has been inhabited for a long period, and where there is therefore a greater risk of artefacts being discovered. The preventative measures described in Section V will thus need to be employed and strictly enforced. These are:

- Consulting national and state historical and archaeological authorities to assess the archaeological potential of all construction sites;

- Selecting alternative routes or sites to avoid any areas of medium or high risk;

- Including state and local archaeological, cultural and historical authorities and interest groups as project stakeholders to benefit from their expertise;

- Developing a protocol for use in conducting all excavation, to recognise, protect and conserve any chance finds (see Section V.B.5 for details).

125. The network improvements will also disturb some more modern-day social and cultural resources, such as schools, hospitals, temples, and also sites that are of tourism importance. Impacts could include noise, dust, and interrupted access for pedestrians and vehicles, and if

pneumatic drills are used to break the surface of roads, there could be a risk of damage from vibration. Given the historical importance of Churu, any such damage or disruption could be highly significant, so very careful mitigation will be needed to protect these resources and to enable usage by local people and visitors to continue throughout the construction work. This will be achieved through several of the measures recommended above, including:

- Consulting the town authorities to identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity;
- Limiting dust by removing waste soil quickly, bringing sand to site only when necessary, covering and watering stockpiles, and covering soil and sand when carried on trucks;
- Increasing the workforce in sensitive areas to complete the work quickly;
- Providing wooden bridges for pedestrians and metal sheets for vehicles to allow access across open trenches where required (including access to houses);
- Using modern vehicles and machinery with standard adaptations to reduce noise and exhaust emissions, and ensuring they are maintained to manufacturers' specifications.

126. In addition the Executing Agency and Contractor should:

- Consult municipal authorities, custodians of important buildings, cultural and tourism authorities, and affected communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals.

127. A different but no less significant impact is the effect on people and communities if water supplies are closed down for extended periods when work is conducted on the network. This would be inconvenient in the short term, and there could be health risks if the water supply was unavailable for several successive days or longer. It will therefore be important to take the necessary measures to avoid such a situation. This will require:

- Detailed planning of the construction program to keep the cessation of water supplies to the minimum possible (in both area and duration);
- Provision of alternative potable water to affected households and businesses for the duration of the shut-down;
- Liaison with affected persons to inform them of any cessation in advance, and to ensure that they are provided with an alternative supply.

128. 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.

129. An additional, particularly acute health risk presented by this work derives from the fact that, as mentioned above, the existing water supply system comprises mainly AC pipes, so there is a risk of contact with carcinogenic material if these pipes are uncovered in the course of the work. Precautions have already been introduced into the design of the project to avoid this, of which the most important are that:

- No work is proposed on those parts of the existing system that contains AC pipes (ring, carrier and distribution mains), and these will be left in situ undisturbed, so there will be no deliberate excavation of AC pipes;
- The locations of the new network will be planned to avoid all locations of existing AC pipes so AC pipes should also not be discovered accidentally.

130. Given the dangerous nature of this material for both workers and citizens, one additional measure should be taken to protect the health of all parties in the event (however unlikely) that AC pipes are encountered. This is that, during design of the water supply system, the design consultant should develop a protocol to be applied in any instance that AC pipes are found, to ensure that appropriate action is taken. This should be based on the approach recommended by the United States Environmental Protection Agency (USEPA)[2], and amongst other things, should involve:

- Training of all personnel (including manual labourers) to enable them to understand the dangers of AC pipes and to be able to recognise them in situ;
- Reporting procedures to inform management immediately if AC pipes are encountered;
- Development and application of a detailed H&S procedure to protect both workers and citizens. This should comply with national and international standards for dealing with asbestos, and should include:
  - Removal of all persons to a safe distance;
  - Usage of appropriate breathing apparatus and protective equipment by persons delegated to deal with the AC material;
  - Procedures for the safe removal and long-term disposal of all asbestos-containing material encountered.

[2] In the USA, standards and approaches for handling asbestos are prescribed by the Occupational Health and Safety Administration (OHSA) and the Environmental Protection Agency (EPA) and can be found at http://www.osha.gov/SLTC/asbestos

131. There could again be some short-term socio-economic benefits from the construction work if local people gain employment in the workforce. To ensure that these benefits are directed to communities that are affected by the work, as suggested in Section IV.B.5, the Contractor should be required to employ at least 50% of his labour force from communities in the vicinity of construction sites. Creating a workforce from mainly local people will bring additional benefits by avoiding problems that can occur if workers are imported; including social difficulties in the host community and issues of health and sanitation in poorly serviced temporary camps.

VI. POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES: OPERATION AND MAINTENANCE

A. Screening out areas of no significant impact

132. Because a water supply system should operate without the need for major repair and maintenance (see below), there are several environmental sectors which should be unaffected once the system begins to function. These are identified in **Table 6.1** 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 6.1: Fields in which operation and maintenance of the completed water supply system is not expected to have significant impacts

Field	Rationale
Climate	Extraction and use of water from river will not affect climate
Fisheries & aquatic biology	Intake of water do not support a significant aquatic flora or fauna
Wildlife, forests, rare species, protected areas	There are none of these features near to project site, but after finalisation of alignment reviewing should be done again
Coastal resources	Churu is not located in a coastal area

B. Operation and maintenance of the improved water supply system

133. The main requirement for maintenance of the transmission/rising main and distribution system will be for the detection and repair of leaks. The generally flat topography and the usage of good quality DI and MDPE/UPVC pipes should mean that pipeline breaks are very rare, and that leaks are mainly limited to joints between pipes. The repair of household connections and the provision of new connections to slums and developing areas to increase the number of people supplied should reduce the incidence of illegal connections, which are often a major source of leaks.

134. The bulk meters installed at storage reservoirs and pumping stations will allow amounts of water flowing through individual parts of the network to be monitored, which will pinpoint areas where there are leaks, and/or where water is being taken from the system illegally. A small Leak Detection Team will then visit these areas with audio devices to locate individual leaks, which will then be repaired in essentially the same way that the pipes were installed. Trenches will be dug to reveal the leaking area and the faulty connection will be re-fitted, or the pipe will be removed and replaced if necessary. If illegal connections are found these will be removed and the pipe will be re-sealed, or a new connection with a meter will be provided for the household.

135. There will also be some small scale maintenance required at the new OR sites, which will involve the same sort of checking of pumps and other equipment as conducted at the WR, plus the regular replenishment of chlorination cylinders to maintain water treatment. Two or three men will be employed at each site for this purpose.

136. Proper disposal of solid sludge, chlorine cylinder from water treatment plan are most important

C. Environmental impacts and benefits of the operating system

1 Physical Resources

137. If trenches are dug to locate and repair leaks or remove and replace lengths of pipe or illegal connections, the work will follow the same procedure as occurred when the infrastructure was improved. In this case soil and backfilled sand will be removed to expose the leaking junction or pipe, and if necessary a new pipe will be brought to site and replaced. The trench will then be refilled and re-compacted. This work should be very infrequent, and will affect individual small locations for short periods only (an average of a few hours for most repairs). Physical impacts will therefore be negligible. Work will not be conducted during rainfall so there will be no effect on drainage, and the removed material will be replaced in the trench so there will be no waste. There should also be no need to cover excavated material to prevent dust as it will have been wetted by the leaking water.

138. One of the main risks of improving a water supply system through increased abstraction is that the source will be used unsustainably, at a rate that is above the level of natural replenishment, and that the source becomes depleted as a result. There is downstream abstraction and some water is used by local farmers, this requires only a proportion of the volume available, and the Irrigation Department has granted approval for the abstraction for the municipal supply. It should also be noted that water conservation measures included in the subproject (in particular the replacement of leaking distribution mains and faulty house connections) should significantly reduce system losses, and thus limit the volume needed.

2 Ecological Resources

139. There are no significant ecological resources in or around the town, so any repairs or maintenance work can be conducted without ecological impacts. As there is no significant flora and fauna in or around the sites.

3 Economic Development

140. Although network repairs could result in shops losing some business if the work means that access is difficult for customers, any losses will be small and short-lived and will probably be at the level of normal business fluctuations. It should therefore not be necessary to compensate for such losses. Nevertheless simple steps should be taken to reduce the inconvenience of the works, including:

- Informing all residents and businesses about the nature and duration of any work well in advance so that they can make preparations if necessary;

- Requiring contractors employed to conduct these works to provide wooden walkways across trenches for pedestrians and metal sheets where vehicle access is required;

- Consulting the local police regarding any such work so that it can be planned to avoid traffic disruption as far as possible, and road diversions can be organised if necessary.

141. The provision of an improved and expanded water supply system is not expected to have direct economic benefits for business or industry, as connections will only be provided to domestic users. However businesses will almost certainly benefit from the expected improvement in the health and wellbeing of their workforce (see below) as this should result in fewer days lost through illness, and overall increased productivity.

4 Social and Cultural Resources

142. Although there is a high risk of excavation in the town discovering material of historical or archaeological importance, there will be no need to take precautions to protect such material when areas are excavated to repair leaks in the network, as all work will be conducted in trenches that have already been disturbed when the infrastructure was installed.

143. Repair work could cause some temporary disruption of activities at locations of social and cultural importance such as schools, hospitals, temples, tourist sites etc, so the same precautions as employed during the construction period should be adopted. These include:

- Consulting the town authorities to identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity;

- Completing work in these areas quickly;

- Providing wooden bridges for pedestrians and metal sheets for vehicles to allow access across open trenches where required;

- Consulting municipal authorities, custodians of important buildings, cultural and tourism authorities and local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals.

144. The responsible authorities will employ local contractors to conduct network repairs, and contractors should be required to operate the same kinds of Health and Safety procedures as used in the construction phase (see Section V.C.5) to protect workers and the public. This should include application of the asbestos protocol if any AC pipes are encountered, and prohibition of the use of AC pipes for any repair or maintenance work.

145. The use of local contractors will provide economic benefits to the companies and the workers they employ. There is however little prospect of directing these benefits to persons affected by any maintenance or repair works as contractors will utilise their existing workforce. To provide at least some economic benefits to affected communities, persons employed to maintain the ORs and CWR should be residents of the neighbouring areas.

146. The citizens of the town will be the major beneficiaries of the improved water supply, as they will be provided with a constant supply of better quality water, piped into their homes. This should improve the social capital of the city, and individual and community health and well-being. Diseases of poor sanitation, such as diarrhoea and dysentery, should be reduced, so people should spend less on healthcare and lose fewer working days due to illness, so their economic status should also improve, as well as their overall health.

VII. INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MONITORING PLAN

A. Summary of environmental impacts and mitigation measures

147. **Table 7.1** lists the potential adverse impacts of the Churu water supply subproject as identified and discussed in Sections IV, V and VI, and the mitigation proposed to reduce these impacts to acceptable levels. The table also shows how the mitigation will be implemented, who will be responsible, and where and when the mitigation activities will take place. The mitigation programme is shown as the quarter of each year in which each activity will occur, which relates to the project programme described in Section II.B. The final column assesses whether the proposed action will successfully mitigate the impact (shown as 0), and indicates that some of the measures will provide an additional benefit (shown as +).

B. Institutional arrangements for project implementation

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

- LSGD is the Executing Agency (EA) responsible for management, coordination and execution of all activities funded under the loan.
- The Implementing Agency (IA) is the Project Management Unit of the ongoing RUIDP, which will be expanded to include a broader range of skills and representation from the Urban Local Bodies (ULB, the local government in each town). Assigned as the RUSDIP Investment Program Management Unit (IPMU), this body will coordinate construction of subprojects across all towns, and ensure consistency of approach and performance.
- The IPMU will be assisted by Investment Program Management Consultants (IPMC) who will manage the program and assure technical quality of design and construction; and Design and Supervision Consultants (DSC), who will design the infrastructure, manage tendering of Contractors and supervise the construction process.
- Investment Program Implementation Units (IPIU) will be established in seven zones across the State to manage implementation of subprojects in their area. IPIUs will be staffed by professionals seconded from government departments (PHED, PWD), ULBs, and other agencies, and will be assisted by consultants from the IPMC and DSC as necessary.
- The IPMU will appoint Construction Contractors (CC) to build elements of the infrastructure in a particular town. The CCs will be managed by the IPIU, and construction will be supervised by the DSC.

- LSGD will be assisted by an inter-ministerial Empowered Committee (EC), to provide policy guidance and coordination across all towns and subprojects. The EC will be chaired by the Minister of Urban Development and LSG, and members will include Ministers, Directors and/or representatives of other relevant Government Ministries and Departments.

- City Level Committees (CLCs) have also been established in each town, chaired by the District Collector, with members including officials of the ULB, local representatives of state government agencies, the IPIU, and local NGOs and CBOs. The CLCs will monitor project implementation in the town and provide recommendations to the IPIU where necessary.

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

Figure 7.1: Institutional Responsibly- RUSDIP

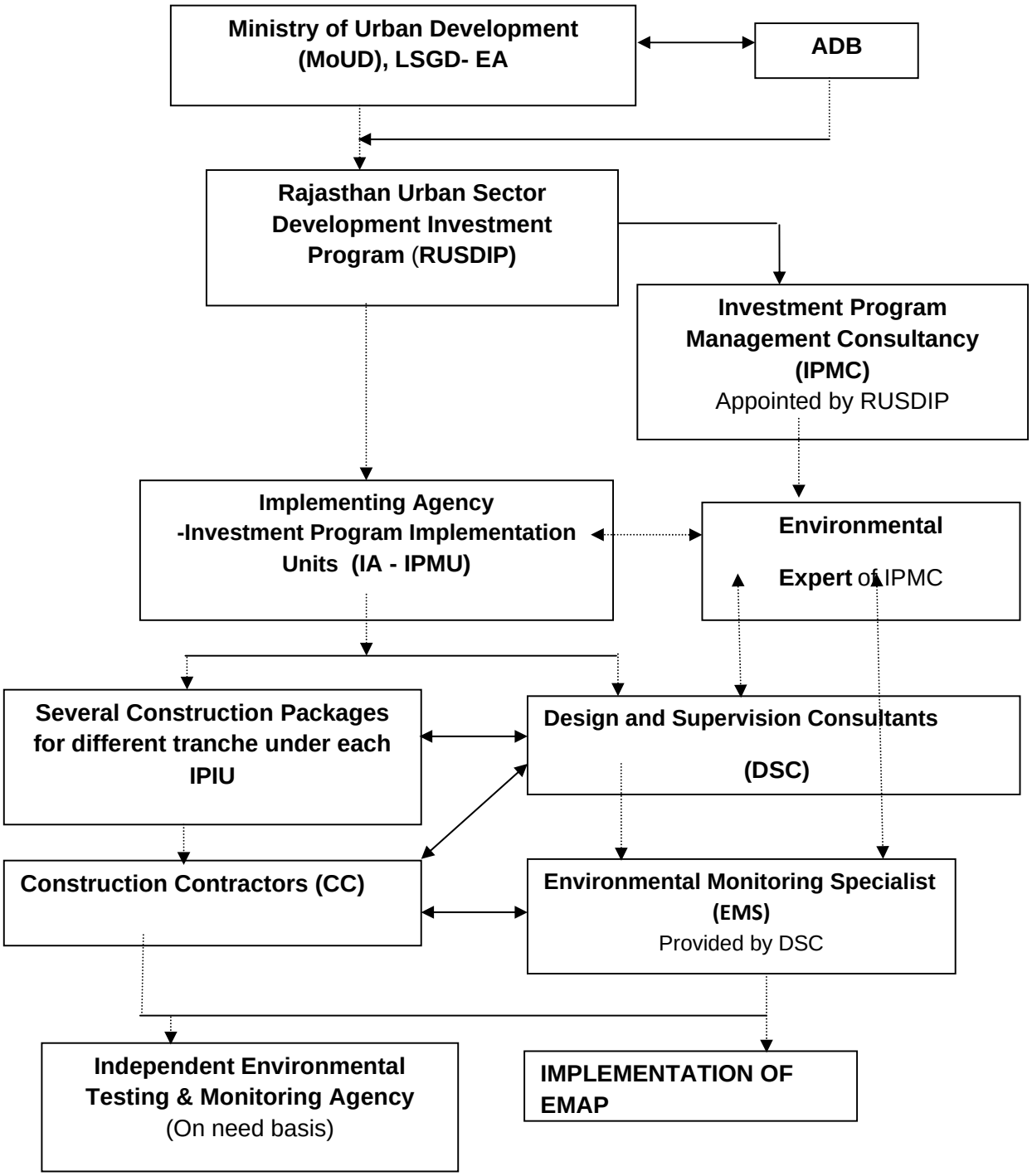


Table 7.1: Environmental impacts and mitigation for the Churu Water Supply Subproject (Black = continuous activity; Grey = intermittent)

Potential Negative Impacts	Sig	Dur	Mitigation Activities and Method	Responsibility	Location	2008				2009				[3]
Construction: Source Augmentation Works						D	D	3	4	1	2	3	Op	
Excavation for raising main produce waste soil	M	P	Find beneficial uses for waste soil in construction, land raising and infilling of excavated areas	Contractor	All sites									+
Waste soil could create dust in windy weather	M	T	Remove waste soil as soon as it is excavated	Contractor	All sites									0
			Use tarpaulins to cover dry soil when carried on trucks											0
Trees may be removed at OHSR site	M	P	Plant and maintain three trees for every one removed	Contractor	All sites									0
Traffic and activities may be disrupted by trucks carrying waste soil	M	T	Plan routes to avoid Churu Town and narrow roads	Contractor	From reservoir site									0
			Schedule transportation to avoid peak traffic periods											0
Ground disturbance could damage archaeological and historical remains	S	P	Request state and local archaeological authorities to assess archaeological potential of all work sites	DSC	All sites									0
			Select alternatives if sites have medium-high potential	DSC										0
			Include state and town historical authorities as project stakeholders to benefit from their expertise	LSGD										0
			Develop and apply protocol to protect chance finds (excavation observed by archaeologist; stop work if finds are suspected; state authority to plan appropriate action)	DSC and Contractor										+
Economic benefits if local people are employed in Contractor's workforce	M	T	Contractor should employ at least 50% of workforce from communities in vicinity of work sites	Contractor	All sites									+
						2008				2009/2010				
Construction: Network Improvements						D	D	3	4	1	2	3	Op	
Trenching will produce additional amounts of waste soil	M	P	As above: find beneficial uses in construction or infill	Contractor	All sites									+
Waste soil and imported sand may create dust	M	T	As above: remove waste quickly, cover/spray stockpiles	Contractor	Network sites									0
			Only bring sand (for backfill) to site when needed											0
			Cover soil and sand when transported on trucks											0

Sig = Significance of Impact (NS = Not Significant; M = Moderately Significant; S = Significant). Dur = Duration of Impact (T = Temporary; P = Permanent)
D = Detailed Design period; Op = Period when infrastructure is operating
[3] This column shows impacts remaining after mitigation: 0 = zero impact (impact successfully mitigated); + = positive impact (mitigation provides a benefit)
* Mitigation of these impacts will be provided through a separate Resettlement Plan

Trees may be removed along pipeline routes	M	P	As above: avoid removing trees, plant 3 for every 1 cut	Contractor	Network									0
Some farm land may need to be acquired where route of transmission main diverges from alongside main road	M	P	*Purchase land as described in Resettlement Framework	LSGD	Where necessary									0
			*Avoid taking >10% of the land of any owner or tenant	DSC										0
			* Compensate farmers in cash for loss of crops and trees	LSGD										0
Shops may lose income if customers' access is impeded	M	T	*Compensate businesses for lost income	LSGD	Network sites									0
			Leave spaces for access between mounds of soil	Contractor										0
			Provide bridges to allow people & vehicles to cross trench	Contractor										0
			Increase workforce in these areas to finish work quickly	Contractor										0
			Inform shopkeepers of work in advance	LSGD										0
Trenching could damage other infrastructure	S	P	Confirm location of infrastructure and avoid these sites	DSC	Network sites									0
			Locate water and sewer pipes on opposite sides of roads	DSC										0
Roads/people may be disturbed by repeated trenching	M	T	Integrate subprojects to conduct trenching at same time	DSC/LGD	Network									0
Traffic will be disrupted if lack of space means that dug soil is placed on road and/or water pipes have to be located in the road itself	M	T	Plan work with town authorities – work when traffic is light	Contractor	Network sites									0
			Ensure police provide traffic diversions when necessary											0
			As above: increase workforce to finish this work quickly											0
Trucks removing waste could disrupt traffic and vibration could damage fragile buildings	M	T	Plan routes to avoid narrow streets, congested roads, important/fragile buildings, key religious & tourism sites	Contractor	Network sites									0
			Plan work to avoid peak traffic, main tourism season	Contractor	Network									0
Major risk that ground disturbance in town could damage archaeological and historical remains	S	P	As above: ask authorities to assess potential of all sites	DSC	All sites									0
			As above: alternative sites where risk is high/medium	DSC										0
			As above: include state/local authorities as stakeholders	LSGD										0
			As above: apply protocol to protect chance finds	DSC/CC										+
Sites of social/cultural importance (schools, hospitals, temples, tourism sites) may be	M	T	Identify buildings at risk from vibration damage and avoid using pneumatic drills or heavy vehicles nearby	Contractor	Network sites									0

disturbed by noise, dust, vibration and impeded access			As above: remove waste quickly, cover/spray stockpiles, import sand only when needed, cover soil/sand on trucks											0
			As above: increase workforce to finish work quickly											0
			As above: use bridges to allow access (people/vehicles)											0
			Use modern vehicles/machinery & maintain as specified	Contractor	All sites									0
			Consult relevant authorities, custodians of buildings, local people to address issues & avoid work at sensitive times	Contractor	Network sites									0
People will be inconvenienced and their health may be at risk if water supply system is shut down for long period	M	T	Plan work programme to keep shutdown to minimum	DSC	Network sites									0
			Provide alternative water to affected residents	LSGD										0
			Inform communities of any shutdown in advance	LSGD										0
Workers and the public are at risk from accidents on site	M	T	Prepare and implement a site Health and Safety Plan that includes measures to:	Contractor	All sites									0
			- Exclude the public from all construction sites;											0
			- Provide Health & Safety Training (including process of transmission of HIV/AIDS) for all personnel;											0
			- Provide Health & Safety training for all personnel;											0
			- Follow documented procedures for all site activities;											0
			- keep accident reports and records											0
Existing water supply system uses AC pipes, a material that can be carcinogenic if inhaled as dust particles	S	T	Design infrastructure to avoid known locations of AC pipes	DSC	All sites									0
			Train construction personnel in dangers of asbestos and how to recognise AC pipes in situ	Contractor	All sites									0
			Develop & apply protocol to protect workers and public if AC pipes are encountered. This should include:	DSC and Contractor	Network sites									0
			- immediate reporting of any occurrence to management	Contractor										0
			- removal of all persons to a safe distance											0
			- use of appropriate breathing apparatus and protective suits by workers delegated to deal with AC material											0
			- safe removal and long-term disposal of AC material											+
Economic benefits for people employed in workforce	S	T	As above: 50% of workforce from affected communities	Contractor	All sites									+
Operation and Maintenance														
Shops may lose small amounts	NS	T	As before: inform shopkeepers of work in advance	GA	Network									0

of income if customers' access is impeded by network repair works			As before: provide walkways and bridges for vehicles	OMC	sites									0
			As before: request police to divert traffic if necessary	OMC										0
Sites of social/cultural importance may be disturbed by noise, dust, vibration, impeded access for short time during network repairs	NS	T	As before: avoid using drills/trucks near fragile buildings	OMC	Network sites									0
			As before: complete work quickly in sensitive areas	OMC										0
			As before: provide walkways/bridges for people/vehicles	OMC										0
			As before: consult authorities and communities, inform them of work in advance, avoid sensitive periods	GA										0
Health and safety of workers & the public could be at risk from repair work and AC pipes of old water supply system	S	T	Prepare and operate H&S Plan with same measures as used in construction phase	OMC	All sites									0
			Apply previously-developed protocol to protect all persons if AC pipes are encountered											0
Local people will benefit if employed by project	S	P	Workers employed to maintain ORs and CWGR should be residents of neighbouring communities	GA	All sites									+

150. Resettlement issues will be coordinated centrally by a Resettlement Specialist within the IPMU/ IPMC, who will ensure consistency of approach between towns. A local Resettlement Specialist will also be appointed to IPIUs of zones in which there are resettlement impacts and they will prepare and implement local Resettlement Plans following the framework established in Tranche 1.

151. 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 Monitoring Specialist (EMS) who is part of the DSC team will implement the Environmental Monitoring Plan from each IEE (see below), to ensure that mitigation measures are provided and protect the environment as intended. Domestic Environmental Consultants (DEC) will be appointed by each IPIU to update the existing IEEs in the detailed design stage, and to prepare IEEs or EIAs for new subprojects, where required to comply with national law and/or ADB procedure.

C. Environmental Monitoring Plan

152. **Table 7.1** shows that most mitigation activities are the responsibility of the Construction Contractors[4] (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.

153. A program of monitoring will be conducted to ensure that all parties take the specified action to provide the required mitigation, to assess whether the action has adequately protected the environment, and to determine whether any additional measures may be necessary. This will be conducted by a qualified Environmental Monitoring Specialist (EMS) from the DSC. The EMS will be responsible for all monitoring activities and reporting the results and conclusions to the IPMU, and will recommend remedial action if measures are not being provided or are not protecting the environment effectively. The EMS may be assisted by environmental specialists in particular technical fields, and junior or medium-level engineers who can make many of the routine observations on site. Post-construction monitoring will be conducted by the relevant Government Agency (GA) to whom responsibility for the infrastructure will pass once it begins to operate[5].

154. **Table 7.1** shows that most of the mitigation measures are fairly standard methods of minimising disturbance from building 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 residents, as most of the measures are aimed at preventing impacts on people and the human environment.

[4] During implementation the contractor will submit monthly progress reports, which includes a section on EMP implementation to the IPIU. The IPIU will submit reports to the IPMU for review. The IPMU will review progress reports to ensure that the all mitigation measures are properly implemented. The IPMU will consolidate monthly reports and submit quarterly reports to ADB for review

[5] In the operational period some infrastructure will be the responsibility of the Municipal Boards/Councils, whilst others will be the responsibility of the appropriate branch of the State government (such as PWD, PHED, etc)

155. **Table 7.1** shows the proposed Environmental Monitoring Plan (EMP) for this subproject, which specifies the various monitoring activities to be conducted during all phases. Some of the measures shown in **Table 7.1** have been consolidated to avoid repetition, and there has been some re-ordering to present together those measures that relate to the same activity or site. The EMP describes: (i) mitigation measures, (ii) location, (iii) measurement method, (iv) frequency of monitoring and (v) responsibility (for both mitigation and monitoring). It does not show specific parameters to be measured because as indicated above, most measures will be checked by simple observation, by checking of records, or by interviews with residents or workers.

156. Given the scale of the investment in providing the infrastructure, LSGD will also wish to conduct monitoring during the operational period to confirm the long-term benefits of the scheme. **Table 7.2** shows that this will cover two elements, which will monitor:

- The chemical and bacteriological quality of water provided by the municipal system;
- The health of the population and the prevalence of diseases of poor sanitation.

Table 7.2: Environmental Monitoring Plan

Mitigation Activities and Method	Location	Responsible for Mitigation	Monitoring Method	Monitoring Frequency	Responsible for Monitoring
CONSTRUCTION					
Find beneficial uses for waste soil (construction, land raising, infill)	All sites	Contractor	Site observations; CC records	Monthly	EMS
Remove waste soil as soon as it is excavated	All sites	Contractor	Site observations	Weekly	EMS
Use tarpaulins to cover dry soil and sand when carried on trucks	All sites	Contractor	Observations on and off site	Weekly	EMS
Cover or damp down soil and sand stockpiled on site	Inhabited areas	Contractor	Site observations	Weekly	EMS
Only bring sand (for backfill) to site when needed	Inhabited areas	Contractor	Site observations; CC records	Weekly	EMS
Leave spaces for access between mounds of soil	Network sites	Contractor	Site observations	Weekly	EMS
Plan truck routes to avoid Churu Town, narrow or congested roads, important or fragile buildings, religious and tourist sites	All sites	Contractor	Observations off site; CC record	Weekly	EMS
Plan transport of waste to avoid peak traffic and tourist season	All sites	Contractor	Observations on and off site	Weekly	EMS
Plant and maintain three trees for every one removed	All sites	Contractor	Observations on/off site; CC records	Monthly	EMS
*Acquire land as described in Resettlement Framework	Where required	LSGD	Landowner surveys; LSGD record	As needed	IMA[6]
*Avoid taking >10% of the land of any owner or tenant	Where required	DSC	Owner/tenant surveys; DSC records	As needed	IMA
* Compensate farmers in cash for loss of crops and trees	Where required	LSGD	Farmer surveys; LSGD records	As needed	IMA
*Compensate businesses for lost income	Where required	LSGD	Shopkeeper survey; LSGD record	As needed	IMA
Provide bridges to allow people & vehicles to cross trench	Network sites	Contractor	Site observation; resident survey	Weekly	EMS
Increase workforce in inhabited areas to finish work quickly	Network sites	Contractor	Site observations; CC records	Monthly	EMS
Inform shopkeepers and residents of work in advance	Network sites	LSGD	Resident surveys; CC records	Monthly	EMS
Consult town authority and avoid existing infrastructure	All sites	DSC	Site observation; design reports	Monthly	EMS
Locate water and sewer pipes on opposite sides of roads	Network sites	DSC	Site observation; design reports	Monthly	EMS
Integrate subprojects to conduct trenching at same time	Network sites	DSC/LSGD	Site observation; design reports	Monthly	EMS
Plan work with town authorities – work when traffic is light	Network sites	Contractor	Site observations; CC records	Monthly	EMS
Ensure police provide traffic diversions when necessary	Network sites	Contractor	Site observations; CC records	Monthly	EMS
Request archaeological authorities to assess potential of all sites	All sites	DSC	DSC records; design reports	As needed	EMS
Select alternatives if sites have medium or high potential	All sites	DSC	DSC records; design reports	As needed	EMS
Include state and town historical authorities as stakeholders	All sites	LSGD	CC records; observations at meetings	As needed	EMS
Develop and apply archaeological protocol to protect chance finds	All sites	DSC and CC	DSC and CC records; site observations	Weekly	EMS
Avoid using pneumatic drills near buildings at risk from vibration	All sites	Contractor	Site observations; CC records	Weekly	EMS
Use modern vehicles and machinery and maintain as specified	All sites	Contractor	Site observations; CC records	Monthly	EMS
Consult authorities, custodians of buildings, communities: address key issues, avoid working at sensitive times	Network sites	Contractor	Site observations; CC records; resident surveys	Monthly	EMS

[6] Resettlement issues (asterisked) will be monitored by an Independent Monitoring Agency (IMA) established under the Resettlement Framework

Mitigation Activities and Method	Location	Responsible for Mitigation	Monitoring Method	Monitoring Frequency	Responsible for Monitoring
Plan work to minimise shutdown of water supply system	All sites	DSC	Design reports; resident surveys	Monthly	EMS
Provide alternative water to affected residents	All sites	LSGD	Site observation; resident survey	Weekly	EMS
Inform communities of any shutdown in advance	All sites	LSGD	Site observation; resident survey	Weekly	EMS
Prepare and implement a site H&S Plan including personal protection from transmission of HIV/AIDS (safety of workers/public)	All sites	Contractor	Site observations; CC records	Monthly	EMS
Exclude public from the site	All sites	Contractor	Site observations; CC records	Monthly	EMS
Ensure that workers wear Personal Protective Equipment	All sites	Contractor	Site observations; CC records	Monthly	EMS
Provide Health and Safety training including process of transmission of HIV/AIDS for all personnel	All sites	Contractor	CC records; worker interviews	Monthly	EMS
Follow documented procedures for all site activities	All sites	Contractor	Site observations; CC records	Monthly	EMS
Keep accident reports and records	All sites	Contractor	CC records	Monthly	EMS
Design infrastructure to avoid known locations of AC pipes	Network sites	DSC	DSC records; design reports	As needed	EMS
Train all personnel in dangers and recognition of AC pipes	All sites	Contractor	Site observations; CC records	Monthly	EMS
Develop and apply protocol if AC pipes are encountered	All sites	DSC/CC	DSC & CC records; site observations	Weekly	EMS
If AC pipes are encountered, report to management immediately	All sites	Contractor	Site observations; CC records	Weekly	EMS
Remove all persons to safe distance	All sites	Contractor	Site observations; CC records	Weekly	EMS
Workers handling AC: wear breathing apparatus; protective suits	All sites	Contractor	Site observations; CC records	Weekly	EMS
All AC material must be removed and disposed of safely	All sites	Contractor	Observations on and off site; CC records	As needed	EMS
Employ at least 50% of workforce from communities near sites	All sites	Contractor	CC records; worker interviews	Monthly	EMS
OPERATION AND MAINTENANCE					
Inform shopkeepers and residents of work in advance	Network sites	GA	Resident surveys	Monthly	
Provide walkways and bridges for vehicles	Network sites	OM Contractor	Site observation; resident survey	Monthly	
Request police to divert traffic if necessary	Network sites	OM Contractor	Site observations	Monthly	
Avoid using drills or trucks near fragile buildings	Network sites	OM Contractor	Site observations	Monthly	
Complete work quickly in sensitive areas	Network sites	OM Contractor	Site observations; OMC records	Monthly	
Consult and inform authorities & people, avoid sensitive periods	Network sites	OM Contractor	Site observation; resident survey	Monthly	
Prepare and operate H&S plan to protect workers and citizens	All sites	OM Contractor	Site observations; OMC records	Monthly	
Apply AC protocol to protect all persons if AC pipes encountered	All sites	OM Contractor	Site observations; OMC records	Monthly	
Employ people who live nearby to maintain RWR, OR and GR	All sites	GA	Employer record; worker survey	Monthly	
LONG-TERM SURVEYS					
Survey of chemical and bacteriological quality of municipal water	WTP and Domestic sites	LSGD	Water quality sampling and analysis	Annual for 5 years	Consulting laboratory
Survey of public health and incidence of water borne disease	Churu Town	LSGD	Hospital records; resident surveys	Annual for 5 years	Social studies consultant

157. An accredited laboratory will be appointed to monitor the quality of water at the point of supply to consumers (in houses and slums), and a domestic social studies consultant will be appointed to monitor public health and the incidence of disease. These surveys will be conducted annually over the first five years of operation of the system, and require the initial collection of baseline data on pre-project conditions, during the construction period.

D. Environmental management and monitoring costs

158. Most of the mitigation measures require the 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 costs of mitigation by the contractors (those employed to construct the infrastructure or the local companies employed to conduct O&M when the system is operating) 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. Costs of acquiring land and compensating shopkeepers and farmers for loss of income **(Table 7.1)** are calculated separately in the budgets for the Resettlement Framework and Resettlement Plans so are also excluded from this analysis.

159. Since at present all sub-projects are under conceptual stage the finalisation of environmental management and monitoring cost can be done after designing of the sub-projects.

160. The remaining actions in the Environmental Management Plan are:

- The environmental monitoring during construction, conducted by the EMS; and
- The long-term post-construction surveys that will be commissioned by LSGD.

161. These have not been budgeted elsewhere, and their costs are shown in **Table 7.3**, with details of the calculations shown in footnotes beneath the table. The figures show that the total cost of environmental management and monitoring for the subproject as a whole (covering design, 1 ½ years of construction and the first five years of operation) is INR 2.2 million, ie US$ 58,420.

Table 7.3: Environmental management and monitoring costs (INR)

Item	Quantity	Unit Cost	Total Cost	Sub-total
1. Implementation of EMP (2 years)				
Domestic Environmental Monitoring Specialist	1 x 3 month	130,000[7]	390,000	
Survey Expenses	Lump sum	120,000	120,000	5,10,000.00
2. Survey of municipal water quality(6 years)				
Domestic Consultant	6 x ½ month	130,000	390,000	
Sample Analysis	6 x 20	4,000[8]	480,000	
Other Expenses	Lump sum	200,000	200,000	10,70,000.00
3. Survey of public health (6 years)				
Domestic Consultant	6 x ½ month	130,000	390,000	
Other Expenses	Lump sum	250,000	250,000	6,40,000.00
4. Environmental mitigation measures and cost of greenery development	Lump sum			
TOTAL				22,20,000.00

E. Associated Facilities

[7] Unit costs of domestic consultants include fee, travel, accommodation and subsistence
[8] Cost of a standard suite of drinking water quality parameters (pH, turbidity, chlorinity, alkalinity, conductivity, TDS, DO, total and faecal coliforms, and selected metals) per sample

162. Indira Gandhi Nahar Project (IGNP) is one of the most gigantic projects in the world aiming to dedesertify and transform desert waste land into agriculturally productive area. The project objectives include drought proofing, providing drinking water, improvement of environment, afforestation, employment, rehabilitation, development and projection of animal wealth and increasing agricultural produce. The project construction commenced in the year 1958. Indira Gandhi Nahar Project was designed to utilise 9,367 Mm^3/yr of the total 10,608 Mm3/yr allocated to Rajasthan from the surplus waters of the Ravi and Beas rivers. This water from IGNP shall connect to the sub-project as stated in Section II.B.

163. The RUIDP and the project authorities shall, at the time of connecting to the downstream water resource points of the IGNP would determine if the water supply storage/treatment facilities put up to ADB funded water supply would connect are also compliant with Indian Environmental Laws. This measure is required to be ensured by RUIDP for all ADB assisted projects because the way these water source facilities are operated and maintained can greatly affect the health of the population, the quality of the environment, the benefits to the poor at the consumption point.

164. Environmentally safe, continuous and reliable water sources and adequate capacity for treatment, transmission, and distribution, as well as properly functioning pumps, reservoirs, and networks are a must for RUIDP to mandate a safe water supply service to the local population

VIII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Project stakeholders

165. Most of the main stakeholders have already been identified preliminary. Since sub-project components in preliminary stage, detail public consultation will be considered after finalisation of sites and working components. If any other stakeholders that are identified during project implementation will be brought into the process in the future. Primary stakeholders are:

- Residents, shopkeepers and businesspeople who live and work alongside the roads in which network improvements will be provided and near sites where facilities will be built
- Owners and users of any land that is acquired along the transmission main route;
- Custodians and users of socially and culturally important buildings in affected areas;
- State and local authorities responsible for the protection and conservation of archaeological relics, historical sites and artefacts;
- State and local tourism authorities.

166. Secondary stakeholders are:

- LSGD as the Executing Agency;
- Other government institutions whose remit includes areas or issues affected by the project (state and local planning authorities, Department of Public Health

Engineering, Local Government Dept, Ministry of Environment and Forests, Roads and Highways Division, etc);

- NGOs and CBOs working in the affected communities;
- Other community representatives (prominent citizens, religious leaders, elders, women's groups);
- The beneficiary community in general; and
- The ADB, the Government of India, Ministry of Finance

B. Consultation and disclosure to date

167. Some informal discussion was held with the local people during site visit. Issues discussed are

- 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
- Movement of wild animals

168. Local populations are very much interested on the project and they will help project authorities in all aspects.

169. Local populations are very much interested on the project and they will help project authorities in all aspects. But mitigation measures will be required at project sites to minimize the impact on environment.

170. The public Consultation and group discussion meeting were conduct by RUIDP on Date 26 June , 2008 after advertising in Local NEWS papers. The objective of the meeting was to appraise the stakeholders about the environmental and social impacts of the proposed program and the safeguards provided in the program to mitigate the same. In the specific context of Churu, the environmental and social impacts of the proposed subprojects under Tranche 2 in Churu were discussed.

171. Meetings and individual interviews were held at potentially temporarily affected areas; and local informal interviews were conducted to determine the potential impacts of sub-project construction to prepare the sample Environmental Framework. A town-wise stakeholder consultation workshop was conducted which provided an overview of the Program and sub-

projects to be undertaken in Churu; and discussed the Government and ADB's Environment policies acts and potential environment impacts of the sub-projects in Churu. During the workshop, Hindi versions of the Environmental Framework were provided to ensure participants understood the objectives, policy principles and procedures related to Environment, English and Hindi versions of the Environmental Framework have been placed in the Urban Local Body (ULB) office and Environmental Framework will be provided later on. The NGO to be engaged to implement the Mitigation Measures will continue consultations, information dissemination, and disclosure. The Environmental Framework will be made available in the ULB office, Investment Program Project Management Unit and Implementation Unit (IPMU and IPIU) offices, and the town library. The finalized IEE containing Mitigation Measures will also be disclosed in ADB's website, the State Government website, the local government website, and the IPMU and IPIU websites. ADB review and approval of the RP is required prior to award of civil works contracts.

C. Major Issues discussed during Public consultation are

(i) Proposed water supply project should ensure enough supply of drinking water in all wards of city.

(ii) Executive agency should give preference to engage internationally reputed contractor like Gammon, HCC, etc as people do not faith about the local contractors in respect of quality of works as well as timely completion of work;

(iii) Efforts should be made by government to supply drinking water round the clock;

(iv) Livelihood affected households should be given assistance in the mode of cash compensation;

(v) Local people should be employed by the contractor during construction work;

(vi) Adequate safety measures should be taken during construction work;

(vii) Mobile kiosks/vendors/hawkers have shown willingness to shift in nearby places without taking any compensation and assistance from the Executing Agency;

(viii) Local people have appreciated the water supply proposal of the government and they have ensured that they will cooperate with the Executing Agency during project implementation.

D. Future consultation and disclosure

172. 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, who will conduct a wide range of activities in relation to all subprojects in each town, to ensure that the needs and concerns of stakeholders are registered, and are addressed in project design, construction or operation where appropriate. The programme of activities will be developed during the detailed design stage, and is likely to include the following:

- <u>Consultation during detailed design:</u>

- 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;

- Structured consultation meetings with the institutional stakeholders (government bodies and NGOs) to discuss and approve key aspects of the project.

➢ Consultation during construction:

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

- 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;

➢ Project disclosure:

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

- 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;

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

IX. FINDINGS AND RECOMMENDATIONS

A. Findings

173. The Project is designed to improve the quality of life of small town residents and enhance the small towns' roles as market, services, and manufacturing centers. . It has a strong community development focus reinforced by integrated poverty reduction, health and hygiene improvement investment projects. The towns' economies will benefit from enhanced productivity as a result of health improvement, time savings in collecting water, as well as from increased urban efficiency arising from improved roads, bridges, drainage, drinking water and sanitation. Residents in towns will also benefit from savings in health care costs.

174. During project design, community meetings were held with beneficiaries to discuss sanitation, poverty, resettlement, affordability issues, and environmental concerns. Socioeconomic surveys obtained information and individual views on current situations and future preferences. Potential environmental impacts of urban infrastructure improvements are

mainly short-term during the construction period and can be minimized by the proposed mitigating measures and environmentally sound engineering and construction practices

175. The process described in this document has assessed the environmental impacts of all elements of the infrastructure proposed under the Churu Water Supply Subproject. Potential negative impacts were identified in relation to both construction and operation of the improved infrastructure, but no impacts were identified as being due to either the project design or location. 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 outline designs for the infrastructure. These include:

176. This means that the number of impacts and their significance has already been reduced by amending the design.

177. Changes have also been made to the location of elements of the project to further reduce impacts. These include:

- Locating all facilities (OR, CWR) on government-owned land to avoid the need for land acquisition and relocation of people;
- Locating the distribution main and raising main in the ROW alongside a main road, to reduce the acquisition of agricultural land and impacts on livelihoods of farmers and workers.

178. Regardless of these and various other actions taken during the IEE process and in developing the project, there will still be impacts on the environment when the infrastructure is built and when it is operating. This is mainly because of the invasive nature of trenching and other excavation; because the distribution network is located in an ancient town where there are densely populated areas and sites of historical and tourism interest; and because Rajasthan is an area with a rich history, so there is a high risk that ground disturbance may uncover important remains. Because of these factors the most significant impacts are on the physical environment, the human environment, tourism, and the cultural heritage.

179. During the construction phase, impacts mainly arise from the need to dispose of large quantities of waste soil and import a similar amount of sand to support the pipes in the trenches; and from the disturbance of residents, businesses, traffic and important buildings by the construction work. These are common impacts of construction in urban areas, and there are well developed methods for their mitigation. These include:

- Finding beneficial uses for waste material;
- Covering soil and sand during transportation and when stored on site;
- Planning work to minimise disruption of traffic and communities;
- Providing temporary structures to maintain access across trenches where required.

180. There could also be a need to acquire small amounts of farm land along the route of the distribution main, where it is impracticable for the pipeline to follow bends in the road. Such impacts are also frequently encountered and are dealt with by a combination of the legal

process and additional measures required by ADB policy on Involuntary Resettlement. Actions are discussed in a separate Resettlement Plan and Resettlement Framework, and include:

- Acquisition of land through the GOI Land Acquisition Act, through which the market value is paid, based on an analysis of recent transactions;
- Ensuring that no more than 10% of the land of a single owner or tenant is acquired;
- Providing additional compensation for loss of standing crops and productive trees.

181. 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. These include:

- Assessing the archaeological potential of all proposed construction sites, and selecting alternative locations to avoid any areas of medium or high risk;
- Including archaeological, cultural and historical authorities and interest groups as project stakeholders to benefit from their expertise;
- Developing a protocol for use in conducting all excavation to ensure that any chance finds are recognised, protected and conserved.

182. The use of AC pipes in the existing water distribution network presents a particular problem, as workers and the public will need to be protected from inhalation of asbestos dust, which can be carcinogenic. This will be addressed by a number of measures, including:

- Limiting network improvements to expansion of the area covered, and leaving the existing AC system (ring, carrier and distribution mains) in situ undisturbed;
- Training staff and workers to raise awareness of the dangers of AC and enable early recognition of such pipes if encountered accidentally;
- Development of a protocol based on USEPA guidelines, to protect workers and the public if AC pipes are encountered (including evacuation of the immediate area, use of protective equipment by workers, and safe removal and disposal of AC material).

183. There were limited opportunities to provide environmental enhancements, but certain measures were included. For example it is proposed that the project will:

- Employ in the workforce people who live in the vicinity of construction sites to provide them with a short-term economic gain;
- Ensure that people employed in the longer term to maintain and operate the new facilities are residents of nearby communities.

184. These and the other mitigation and enhancement measures are summarised in **Table 7.1**, which also shows the location of the impact, the body responsible for the mitigation, and the program for its implementation.

185. Once the system is operating, most facilities will operate with routine maintenance, which should not affect the environment. Leaks in the network will need to be repaired from time to time, but environmental impacts will be much less than those of the construction period as the work will be infrequent, affecting small areas only. It will also be conducted in areas that have already been excavated, so there will be no need to protect archaeological material.

186. The main impacts of the operating water supply system will be beneficial as the citizens of Churu will be provided with a constant supply of water, which will serve a greater proportion of the population, including slum-dwellers. This will improve the quality of life of people as well as benefiting both individual and public health as the improvements in hygiene should reduce the incidence of disease associated with poor sanitation. This should lead to economic gains as people will be away from work less and will spend less on healthcare, so their incomes should increase.

187. **Table 7.1** also assesses the effectiveness of each mitigation measure in reducing each impact to an acceptable level. This is shown as the level of significance of the residual impact (remaining after the mitigation is applied). This shows that all impacts will be rendered at least neutral (successfully mitigated), and that certain measures will produce a benefit (in addition to the major benefits provided by the operating schemes).

188. Mitigation will be assured by a programme of environmental monitoring conducted during both construction and operation to ensure that all measures are provided as intended, and to determine whether the environment is protected as envisaged. 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. There will also be longer-term surveys to monitor the expected improvements in the quality of domestic water and the health of the population.

B. Recommendations

189. 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 Status report **(Table 7.1)** and in the Resettlement Framework for the RUSDIP are implemented in full, as described in these two documents;
- The Environmental Monitoring Plan proposed in Section VII of this report and the internal and external monitoring proposed in the Resettlement Framework are also implemented in full.

X. CONCLUSIONS

190. The environmental status of the proposed improvements in water supply and distribution infrastructure in Churu Town has been assessed. Issues related to Involuntary Resettlement were assessed by a parallel process of resettlement planning and will be compensated by measures set out in detail in the Resettlement Framework for the subproject.

191. The overall conclusion of above processes is that provided the mitigation, compensation and enhancement measures are implemented in full, there should be no significant negative environmental impacts as a result of location, design, construction or operation of the subproject. There should in fact be some small benefits from recommended mitigation and enhancement measures, and major improvements in quality of life and individual and public health once the scheme is in operation.

192. There are no uncertainties in the analysis, and no further studies are required to comply with ADB procedure or national law

Appendix – 1 Photographs

Photo Gallery, Churu

	
OHSR Site Agarsen Nagar	OHSR Site Agarsen Nagar
	
Present OHSR at Van Vihar Colony	Present OHSR at Van Vihar Colony
	
OHSR site near Old City	Fountain at Road Circle

ANNEXURE – II-B PHED LETTER

OFFICE OF THE CHIEF ENGINEER (SPECIAL PROJECT)
PUBLIC HEALT H ENGINEERING DEPARTMENT RAJASTHAN
F – 18, New Building, I Floor, 2, CIVIL LINES - JAIPUR - 302006
0141-2220553 Fax -0141-2222585 email: *rj_cesp@water.nic.in*

No. CESP/PHED/F.231/RUSDIP/2007-08 Dated : 11/7/08

The Project Director,
Rajasthan Urban Infrastructure Development Project,
JLN Marg,
Jaipur (Raj)

SUB : Information required by ADB Mission regarding water supply projects under execution with PHED.

In the meeting held under the Chairmanship of Addl. Project Director, on 30th May 2008, in which the members of ADB Review Mission, Addl. Project Director I and II, Superintending Engineer (Water Supply), RUIDP, and other officers of RUIDP were present. The ADB Mission desired the details of surface water availability in water supply projects under execution with PHED which have been taken as source of water by RUIDP for their projects.

The town wise details are as under :-

1. **Urban Water Supply Scheme, Bharatpur :-** Presently, Bharatpur water supply is dependent upon local tube wells and surface water from Bandh Baretha. PHED is implementing a multi village multi town drinking water supply project from Chambal River as source. The work of main transmission system consisting of intake works, raw water reservoir, raw water transmission main, filter plant etc. is under progress and is likely to be completed by June 2010. This project is designed to cater to a water demand of 43 MLD sufficient upto the year 2031.

2. **Urban Water Supply Scheme, Dholpur :-** Long term demand of Urban Water Supply Scheme, Dholpur, is proposed to be met from the intake works being constructed under Chambal-Dholpur-Bharatpur Drinking Water Supply Project. The total capacity of intake works is to lift 237 MLD of water against which the present system is sufficient to cater to a total water demand of 147 MLD. It is proposed to supply 15 MLD. of raw

water from the intake works to Dholpur Town, sufficient for the year 2031.

3. **Urban Water Supply Scheme, Churu :-** Urban Water Supply Scheme, Churu, is dependent upon local ground water as well as surface water brought through multi town multi village drinking water supply scheme namely; Churu-Bisau Scheme. The scheme provides for a water demand upto 12 MLD for the town likely to be sufficient upto the year 2021, in conjunction with the ground water.

4. **Urban Water Supply Scheme, Barmer :-** The present water supply of Barmer is dependent on ground water, brought to the town from the tube wells situated around Barmer. Ground water is depleting fast and it is difficult to maintain the service level. PHED has taken up a multi village multi town drinking water supply scheme and the work of main transmission system consisting of Intake works at Indira Gandhi Main Canal, raw water reservoir, filter plant, clear water storage, pumping station and pipeline upto Barmer has been awarded. Work is likely to be completed by September 2009. The transmission system provides for the water demand of 120 MLD of Barmer Town and 691 villages of Barmer and Jaisalmer for the year 2036.

5. **Urban Water Supply Scheme, Nagaur :-** Present water supply is dependent upon ground water being brought from a distance of 40 Kms. and source is depleting fast. PHED is implementing a multi town multi village drinking water supply scheme to bring surface water from the Indira Gandhi Canal. The work on main transmission system, consisting of Intake works, raw water reservoirs, WTP, transmission main etc. costing Rs.310.00 Crores is under progress and is likely to be completed by September 2009. The transmission system is sufficient to cater to water demand of Nagaur Town for the year 2031. Nagaur Lift Water Supply Project, Phase-I, is designed to cater 552 MLD demand of five towns namely; Nagaur, Basni, Moondwa, Kuchera and Riyanbari) and 502 villages of District Nagaur.

6. **Urban Water Supply Scheme, Karauli :-** Urban Water Supply Scheme, Karauli, is presently dependent upon ground water. As a long term solution, PHED is implementing a multi town multi village drinking water supply namely; Chambal Sawaimadhopur Nadauti Project with Chambal River as source

he

of water. The work of main transmission system consisting of Intake works, raw water reservoir, WTP, clear water reservoir, pumping station, main transmission pipeline etc. is under execution. The work is likely to be completed by March 2010. This project shall cater to the water demand of 23.26 MLD of Karauli Town for the year 2031.

7. **Urban Water Supply Scheme, Sawaimadhopur :-** Urban Water Supply Scheme, Sawaimadhopur, is presently dependent upon ground water. As a long term solution, PHED is implementing a multi town multi village drinking water supply namely; Chambal Sawaimadhopur Nadauti Project with Chambal River as source of water. The work of main transmission system consisting of Intake works, raw water reservoir, WTP, clear water reservoir, pumping station, main transmission pipeline etc. is under execution. The work is likely to be completed by March 2010. This project shall cater to the water demand of 37.66 MLD of Sawaimadhopur Town for the year 2031.

CHIEF ENGINEER (SP) 11/7/08
PUBLIC HEALTH ENGG. DEPTT.
RAJASTHAN, JAIPUR (RAJ)

Appendix- 3: RAPID ENVIRONMENTAL ASSESSMENT (REA) CHECKLIST

Country/Project Title: India/Rajasthan (Churu) Urban Sector Development Investment Programme (Tranche-II).

Sub-Project: Construction of Water Supply Project in Churu

SCREENING QUESTIONS	Yes	No	REMARKS
A. Project Siting Is The Project Area…			There is no protected/environmental sensitive area along the Water Supply line.
▪ Densely Populated?		No	
▪ Heavy with Development Activities?		No	
▪ Adjacent To or Within Any Environmentally Sensitive Areas?		No	
• Cultural Heritage Site		No	
• Protected Area		No	
• Wetland		No	
• Mangrove		No	
• Estuarine		No	
• Buffer Zone of Protected Area		No	
• Special Area for Protecting Biodiversity		No	
• Bay		No	
B. Potential Environmental Impacts Will The Project Cause…		No	
▪ Pollution of raw water supply from upstream wastewater discharge from communities industries, agriculture and soil erosion runoff		No	No such impact is anticipated, since in present scope of work no water intake system considered in the sub-project

SCREENING QUESTIONS	Yes	No	REMARKS
▪ Impairment of historical/cultural/monuments/areas and loss/damage to these sites.		No	No as such sensitive area nearby
▪ Hazards of land subsidence caused by excessive ground water pumping.		No	Indra Ghandhi Canal is the source of Surface water for this project.
▪ Social conflicts arising from displacement of communities.		No	No as such displacement of communities. Most of the construction is within the government land. No need of R& R for this project.
▪ Conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?		No	Present sub-project consist of downstream facilities and strengthen the existing water supply system for the town to receive and distribute additional 5.05 MLD water supplied from IGNP on 2011 and 16 mld of water on 2021. No conflicts expected
▪ Unsatisfactory raw water supply (e.g excessive pathogens or mineral constituents)		No	There will be treatment of raw water before distribution and regular water monitoring will be carried out by the line department (PHED)
▪ Dilivery of unsafe water to distribution system.		No	Raw water will be treated before distribution and this will be ensured by line department (PHED).
▪ Inadequate protection of intake works or wells, leading to pollution of water supply.		No	As said above that source of water is blended water from IGNP and existing ground water source.
▪ Over pumping of ground water, leading to salinaization and ground subsidence.		No	Abstraction of ground water is not change in the scheme. No over pumping will be allowed.
▪ Excessive alagae growth in storage reservoir.		No	Water tanks will be covered and treated properly to avoid any algal growth.
▪ Increase in production of sewrage beyond capabilities of community facility.		No	No such impact is anticipated.
▪ Inadequate disposal of sludge from water treatment plants		No	There will be proper sludge disposal from water treatment plant at pre designated locations.
▪ Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities.	Yes		Mitigation measures will be considered through development of green buffer zone around the pumping station
▪ Impairment associated with transmission lines and access roads.	Yes		Temporary impairment with access roads is anticipated. This will be mitigated through alternative arrangements.

SCREENING QUESTIONS	Yes	No	REMARKS
▪ Health hazards arising from inadequate design of facilities for receiving storing and handling chlorine cylinders.		No	Chlorine gas will be used after taking precautionary measures
▪ Health and safety hazards to workers from the management of chlorine used for disinfection and other contaminants		No	Health and safety manual will be followed for handling of chlorine gas. Safety hazard rules will be complied.
▪ Resettlement problems in areas requiring large plots of land.		No	No resettlement is required for proposed project.
▪ Noise and dust from construction activities.	Yes		Short term impacts on air and noise level is expected. Proper mitigation measures should be considered.
▪ Increased road traffic due to interference of construction activities.	Yes		During construction phase application of traffic management plan will be considered at specific location
▪ Continuing soil erosion/silt runoff from construction operations	Yes		No excavation work will be allowed during monsoon. So chances of silt movement with runoff water is minimum
▪ Delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution system.		No	The line department will ensure safe water distribution. For this regular monitoring will be carried out by PHED.
▪ Delivery of water to distribution system which is corrosive due to inadequate attention to feeding of corrective chemicals.		No	The line department will ensure about non corrosiveness of distribution system before distributing this water. For this regular monitoring will be carried out by PHED.
▪ Accidental leakage of chlorine gas.		No	Proper storage of chlorine gas is essential
▪ Excessive abstraction of water affecting downstream water users.		No	Sufficient water is available from IGNP
▪ Competing uses of water.		No	No such competition is envisaged as sufficient water is available in IGNP downstream.
▪ Increase sewerage flow due to increased water supply.		No	New sewerage system has been proposed based on increased water supply estimates.
▪ Increased volume of slugage (wastewater from cooking and washing and sludge from wastewater treatment plant)		No	New sewerage and drainage system has been proposed based on increased water supply and storm water.