Environmental Assessment Report

Initial Environmental Examination: Sikar Urban Drainage Sub - Project
Project Number: 40031
November 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

WEIGHTS AND MEASURES

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

NOTE{S}

(i) In this report, "$" refers to US dollars.
(ii) “INR” and “Rs” refer to Indian rupees

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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

[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

is thus not required for the drainage 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 Sikar drainage subproject. 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 drainage 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 drainage system is inadequate for the needs of the growing population. There are open drains alongside certain roads and streets, but many are blocked and overflowing, and most contain household sewage discharged through illegal connections. Leakage from drains and the municipal water supply system is a major problem in the historical evidences where many structures are suffering serious water damage. 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 Sikar and the other urban centres to those expected of modern Asian towns.

B. Location, Size and Implementation Schedule

15. The sub-project is located in Sikar, the headquarters town of Sikar District, in the north -east of Rajasthan in north-western India **(Figure 2.1**). The infrastructure will be located in and around the town, where new concrete *nallahs* (drainage channels) will be built to carry waste water for final disposal. **Figure 2.2** and **2.3** shows proposed drainage network for Sikar.

16. Detailed design will be completed end of 2008 and construction will begin in first part of 2009, and should take around twelve months, so all work should be completed by the end of 2009.

C. Existing drainage situation

17. Based on the slope and gradient, Sikar town can be divided into multiple drainage zones. Storm drainage from the zone under consideration ultimately discharges to the village Nani Forest Area located about 1.5 Km from the outskirt of Sikar town. Storm

drainage from the major portion of the town ultimately discharges to the Forest *Nallah*. One of the main drains is Bus Depot to Dujod Gate which is ultimately connecting to the Forest *Nallah* through Well of Raiji. The existing drains within the area are highly inadequate in the sizes and thus cannot cater the storm flow resulting in flooding of the catchment areas for considerable period of time even after moderate showers. The catchment areas are densely populated and Bus depot, Inter City Bus terminus and main commercial areas of the town are located in the zone.

D. Expected subproject outcomes

18. The following are the expected outcome from the Subproject:

- substantial reduction in water flooding of the catchment area both in term of the water depth and duration of flooding;
- reduction in financial loss prevalent without the Subproject due to loss of business during acute water flooding in the area for substantial period of time;
- uninterrupted business activities in the areas;
- less damage to the roads and thereby savings in road maintenance cost; and
- overall improvement of the environmental condition of the area

19. Drain from Roadways Bus stand to Dujod Gate has been selected in this project report due to the following reasons: -

I. There is no existing arrangement to drain out of water near Road ways bus stand which causes submergence of area during rainy season.
II. The drain has been proposed keeping in mind the allocated funds, the maximum coverage of area by natural ground slope.
III. This drain will have the maximum connectivity of existing small drains.
IV. As this drain has the linking to existing drain near Dujod Gate so that the problem of existing drainage at Dujod Gate will be solved.
V. This drain is along the major roads of the town so it can be utilized as a drainage channel of the city after master planning of the city drainage.

20. The route of proposed drain has been given in **Figures 2.2 and 2.3** and details are as follows:-

- Node 14 – 4: This part of the drain (225 m) starts from Housing Board colony along Road ways bus stand ends at corner of Bus stand. This covers the part catchment of Zone 3 having area 2.3 Hact.
- Node 4 – 6': This part of the drain (160 m) starts from corner of roadways bus stand and ends at mid of bus stand road, along Road ways bus stand road. This covers the cumulative catchment of Zone 3 having area 283.50 Hact.
- Node 6' – 3: This part of the drain (180 m) starts from mid of roadways bus stand goes to bus stand circle along Road ways bus stand road and ends at bus stand circle. This covers the cumulative catchment of Zone 3 having area 298.0 Hact.

- Node 3 – 19: This part of the drain (250 m) starts from bus stand circle goes to Bajaj Circle along Devipura road and ends at Bajaj Circle. This covers the cumulative catchment of Zone 3 having area 360.0 Hact.
- Node 19 – 18: This part of the drain (850 m) starts from Bajaj Circle goes to Ajmer Bus stand along Devipura road and ends at road triangle at Ajmer bus Stand. This covers the cumulative catchment of Zone 3 having area 360.0 Hact.
- Node 18 – 20: This part of the drain (330 m) starts from Ajmer bus stand goes to Dujod Gate and ends to existing drain near Bur Tree. This covers the cumulative catchment of Zone 3 having area 372.0 Hact.

E. Subproject description including detailed scope

21. The total length of the new drain will be constructed in Random Rubble (RR) masonry channel with cement concrete bed increasing the velocity of water in the drain which will consequently increase the water carrying capacity of particular section and the biggest section will be constructed as Reinforced Cement Concrete of size 3.5mx4.0m to accommodate the flow of all the three drains connecting to this main drain. This in turn will facilitate in evacuating the storm water rapidly and thus resulting in substantial reduction in water flooding of the catchments area both in term of the water depth and duration of flooding.

22. Works involve cleaning of the existing drain, construction of drainage channel, culverts and covering of the drain at sections for providing access, Details of work is described below

1. Wooden balli with horizontal PVC strips Barricading is provided on both side of drain
2. Excavation of Drain from 1.50 to 4.50m depth.
3. Transportation of excess earth is proposed with a lead of 3 Km.
4. From node no 14 to 4 Pre – cast vibro pressed drains 80 mm thick is provided.
5. Type of Masonry is Random Rubble Stone masonry with cement mortar 1:6.
6. Base concrete of 1:3:6 (M – 10) of 200 mm thick.
7. 50 mm thick PCC flooring with 1:2:4 (M – 15).
8. Parapet wall is provided 30 cm above on both side of drain.
9. Inlet slots will be left in road side parapet wall for the entering of run – off into drain 10 m c/c distance.
10. RCC Slab road crossings are provided as per IRC SP – 13 plate no. 6 wherever road crossings come.
11. Covering of Drain all along the length with pre – cast RCC M – 20 slabs, except in the length of road crossings and drain openings which are provided for cleaning of drain.
12. Plastering in side of drain on both faces and both inner and outer sides of parapet wall with cement mortar 1:4, 20 mm thick.

13. Cement Concrete Coping all along the drain length over both parapet walls with CC 1:2:4.
14. Cutting of road side trees from node no. 19 to 18 which will come in drain width.
15. Cement concrete and BT road cutting is proposed.
16. Reinstatement of CC road in two layers 100 mm Base coarse in M – 15 and 100 mm wearing coarse in M – 20.
17. Reinstatement of BT road is proposed with 75 mm GSB, two layers of 75 mm WMM, 20 mm thick wearing coat with premix carpet (PMC) with sealcoat and two layers of primer coat and tack coat.
18. Weep holes will be provided on both sides of wall at 2 m c/c distance in horizontal and vertical both directions.
19. De-silting of Existing Drain from Dujod Gate to End of drain near forest land in length of 3000m.
20. Transportation of Silt up to lead of 3 Km.
21. Dismantling of Existing drain from node no. 4 to 3.
22. Covering of Existing drain in a length of 300 m, near IHSDP housing Scheme and end of drain near forest land with RCC slab and openings are left for cleaning and these openings will be covered with RCC M – 20 Precast slabs, these precast slabs will rest on RCC lintels.
23. Raising the height of Wall of existing drain from Raiji's well to End of drain near forest land and flush cut pointing on both side of wall with cement mortar 1:3.
24. White washing on road side face of raised wall.
25. Coping on raised wall.
26. De-weeding of drain from Raiji's well to End of drain near forest land.
27. Repair of old masonry from Raiji's well to end of drain near forest land in different patches.
28. Plastering of drain from Raiji's well to end of drain near forest land.
29. Openings are made in covered drain from Dujod Gate to Salasar Bus stand for cleaning of drain and these openings are covered with SFRC manhole frame and cover embedded in RCC slab.
30. SFRC footrests are proposed at every opening for descending of labour for cleaning of drain in future.

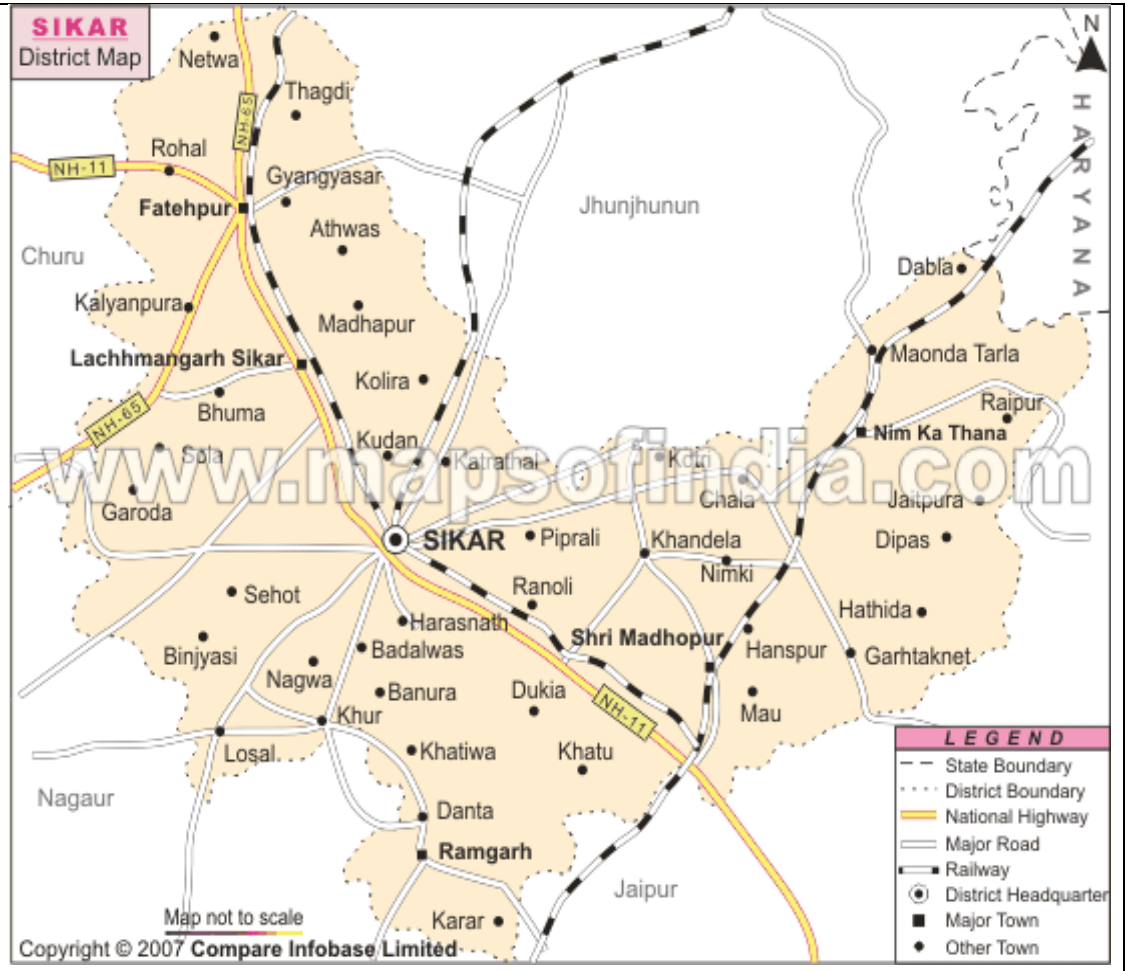
23. Average annual rainfall in the town is 494 mm, of which 85% precipitation occurs in July and August with average rainy days being 26 in a year. Maximum rainfall recorded ever is 180 mm occurred on 24 June 1996. Average maximum daily rainfall is about 80 mm. Depending on the importance of the town and following the CPHEEO Manual the return period has been considered as one year. From the analysis of last 15 years annual peak rainfall, the rainfall design intensity for the specified return period are calculated by Least

Square Method. Equivalent coefficient of runoff was selected and Rational Formula is adopted to arrive at runoff from a particular catchments area.

24. The above description is based on the present proposals, and is expected to be substantially correct, although certain details may change as development of the sub-project progresses.

25. Photo graphs of site are Attached as **Appendix 1**

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**
Sikar Regional Map	

Figure 2.2: Proposed drainage catchment at Sikar

FOR TENDER PURPOSE ONLY

DUJOD GATE

20 20' 18 18' 18 19 19' 19 16 15 17 8 9 7 6 6' 5 3 3' 4 14 10 12 2 1 11 13

17.6 Ha. 10.30 Ha. 7.50 Ha. 5.10 Ha. 5.30 Ha. 2.30 Ha. 20.50 Ha. 7.24 Ha. 5.5 Ha. 2.30 Ha. 14.60 Ha. 18.49 Ha. 26.51 Ha. 15.72 Ha. 87.42 Ha. 123.81 Ha. 48.74 Ha.

UNICK MARKETING COMPANSAM
SAW MILL
MOTOR'S SHOWROOM
WELL
SEVA KOCHING CENTER
ASIAN MARKETING
KOHINOOR PUBLIC SCHOOL
KHATRI PLAZA
DIST. TELICOM CENTRE
B.S.N.L. S.R.
SIKAR SAHKARI BANK
BASANT VIHAR COLONY
PETROL PUMP
RENUKA DIGNOSTIC CENTER
BAJAJ CIRCLE
D E V I P U R A R O A D
SHREE BAL BHARATI VIDYA MANDIR
KUMAWAT STEELS
RAJENDRA PRASAD HOSPITAL
SHAWHARI HOSPITAL
T I L A K N A G A R
S.R. DEVIPURA BALAJI TEMPLE
MANSHA RAM
J A N A K I C O L O N Y
V I H A R
SHAMSHAN BHUMI
A S H O K N A G A R
LAND MAP OFFICE
RANI SATI TEMPLE
RANI SATI ROAD
ASHOK VIHAR
BRANCH OFFICE OF DAINIK BHASKAR
R.S.R.T.C. BUS STAND
ANIMAL HOSPITAL
DEP. OF PASHU PALAN VIBHAG
QTS. OF FOREST DEP.
OUT HEAD OFFICE OF STATE
S.R.
P A R K
SINDHI COLONY
DEEP
K.U.M.C.
D E V I P U R A
KRISHI VIKAS MANDI
KRISHI S.T.D.
SCIENCE CENTRE
S.R. CIRCLE OFFICE PHED SIKAR
HOUSING BOARD
KATCHI BASTI
SUBHASH COLONY
T/W
P.H.E.D. T/W.
R.S.E.B.
P.H.E.D.
OPEN LAND
BEED
SHRI DIGAMBER JAIN MANDIR
SUBHASH BODY MAKER
ADARSH VIDHYA MANDIR SCHOOL
DY. DIRECTOR SURVEY DEP. SIKAR
GURJAR HOSTEL
FOOD CORP. OF INDIA
OPEN LAND FOR FOREST DEP.
J A I P U R B Y P A S S
WELL
SANGAM BAL NIKETN
I.T.I. SIKAR
GAHALOT MOTAR'S SHEKHAWATI HOTEL & REST.
BHAGAT SINGH NAGAR
WELL;
STADIUM
PANICHAR HOUSE
S.R.B. BANK
RAJ.IND'S
GOYAL IND' S PASHU AHAR
ANURAG & COMPANY
AGARWAL IND'S
MISHRA IND'S
RAJ. STATE GANGA NAGAR SUGGAR MILL
R.S.E.B. GRID
RAJ ENG. CONT'S
RAJ. FINCA CORP.
SURAJ D.A. MILL
ASS.PASS IND.'S
HERO HONDA SHOWROOM
FRIENDS REST.
MAHINDRA TRACTORS
SIKAR TRANSPORT
SHUBHAM MOTORS
DELITE REST.
T O J A I P U R
GAHALOT IND'S
TRANSPORT NAGAR
POONIA WINES
BIDASAR TRADING COMPANY
ROSHAN TRADING (P) LTD.
SIDDHARTH GRAINITE
GANGOTRI PASHU AHAR
OPEN LAND
SAW MILL
DURGA GRAINITE
RIICO AREA
GOMTI GRAINITE
K.R. GRAINITE
ANURAG GRAINITE
KHETAN GRAINITE
RAHUL GRAINITE
OM SHIV GRAINITE
SHREE LAL GRAINITE
PANNA GRAINITE
SURAJ GRAINITE
H.M.T. IND'S
RAJ IND'S
AGARWAL IND'S
ROOP IND'S

LEGEND	
87.42 Ha.	CATCHMENT AREA
	FLOW DIRECTION
	PROPOSED DRAIN
	EXISTING DRAIN
	NATURAL WATER COURSE
	CATCHMENT AREA

TITLE:
NODES OF PROPSED DRAIN WITH CATCHMENT OF EXISTING AND PROPOSED DRAIN

CLIENT:
RAJASTHAN URBAN INFRASTRUCTURE DEVELOPMENT PROJECT RAJASTHAN

DRAWING NO: SKR / DR / 01 / 02

SCALE:

DRAFTED BY: RAVI SUTHAR

CHECKED BY: SURESH JAIN

APPROVED BY:

DATE: 25/04/2008

SUBMITTED BY:
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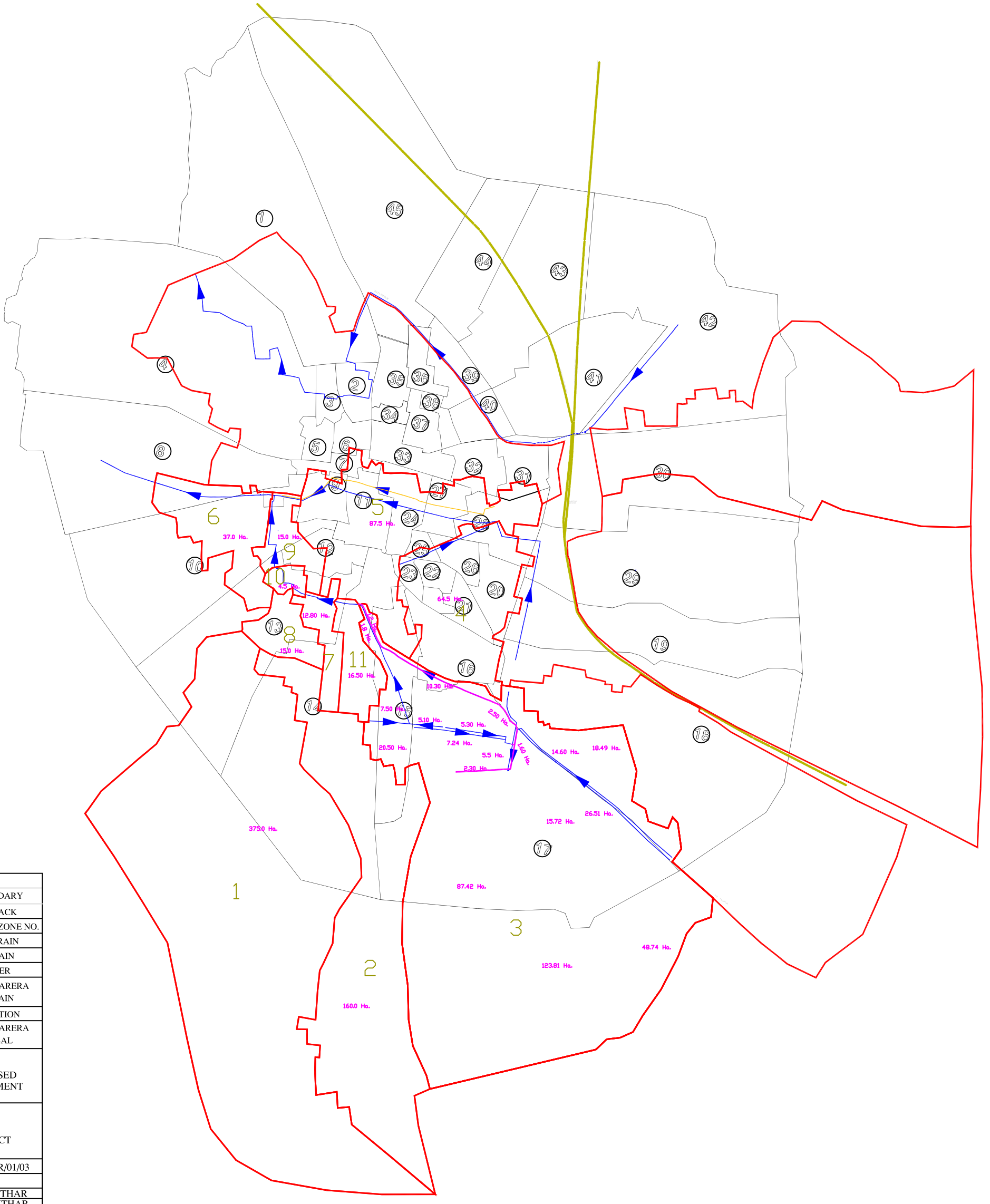
Figure 2.3: Proposed drainage catchment with wards at Sikar



LEGEND	
	WARD BOUNDARY
	RAILWAY TRACK
	CATCHMENT ZONE NO.
	PROPOSED DRAIN
	EXISTING DRAIN
17	WARD NUMBER
	CATCHMENT ARERA PACKAGE DRAIN
	FLOW DIRECTION
	CATCHMENT ARERA FINAL DISPOSAL

TITLE:
WARD MAP OF SIKAR
EXISTING AND PORPOSED
DRAINS WITH CATCHMENT
AREA

CLIENT:
RAJASTHAN URBAN
INFRASTRUCTURE
DEVELOPMENT PROJECT
RAJASTHAN

DRAWING NO: SKR / DR/01/03

SCALE:

DRAFTED BY: RAVI SUTHAR

CHECKED BY: RAVI SUTHAR

APPROVED BY:

DATE: 01/08/2008

SUBMITTED BY:
SPAN SNC LAVLIN
92 - C, GURUDWARA ROAD,
MADANGIR, NEW DELHI-110062

III. DESCRIPTION OF THE ENVIRONMENT

A. Physical Resources

1. Location

26. The Urban Agglomeration (UA) of Sikar is situated at the foothills of the Aravalli Mountain series and is strategically located between the State capital of Jaipur and the National Capital of New Delhi. Sikar city is one of the Historical city of the Rajasthan state and it is also a Railway Junction. Historical monuments such as Victoria Diamond jubili hall Tatya Tope Samadhi,Rani Mahal Madhav Niwas are some of the places of Tourist's attractions. This town is Origin of rich Marwaris and is known as Sekhawati Region. Colourful frescoes on the walls of Forts, Palaces Havelis, Baoris depict daily rich life & Culture, religion and Architecture.

27. The district is located in the north-eastern part of the state. It is bound in the north by Jhunjhunun District, in the north-west by Churu district, in the south-west by Nagaur district and in the south-east by Jaipur district. It also touches Mehandergarh district of Haryana on it's north-east corner.

28. Sikar is situated at the junction of National Highways (NH-11), State Highways (SH - 8), & (SH -20) and, provides connectivity to Delhi via Jhunjhnu. It is also having the connectivity to Jabalpur & Bikaner,state via Jaipur state capital . District map of Sikar shown in **Figure 3.1.**

2. Topography, Natural hazard and Drought

29. ***Topography****:* Sikar lies between the East longitude 75^{o}16'and North latitude 27^{o} 30'. It is situated at the center of Sikar District at 437 meters above MSL.

30. ***Natural Hazards***- Earthquake**:** Sikar 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.

31. ***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 3-4 meter on an annual basis combined with significant drawdown conditions.

Figure 3.1: District Map of Sikar

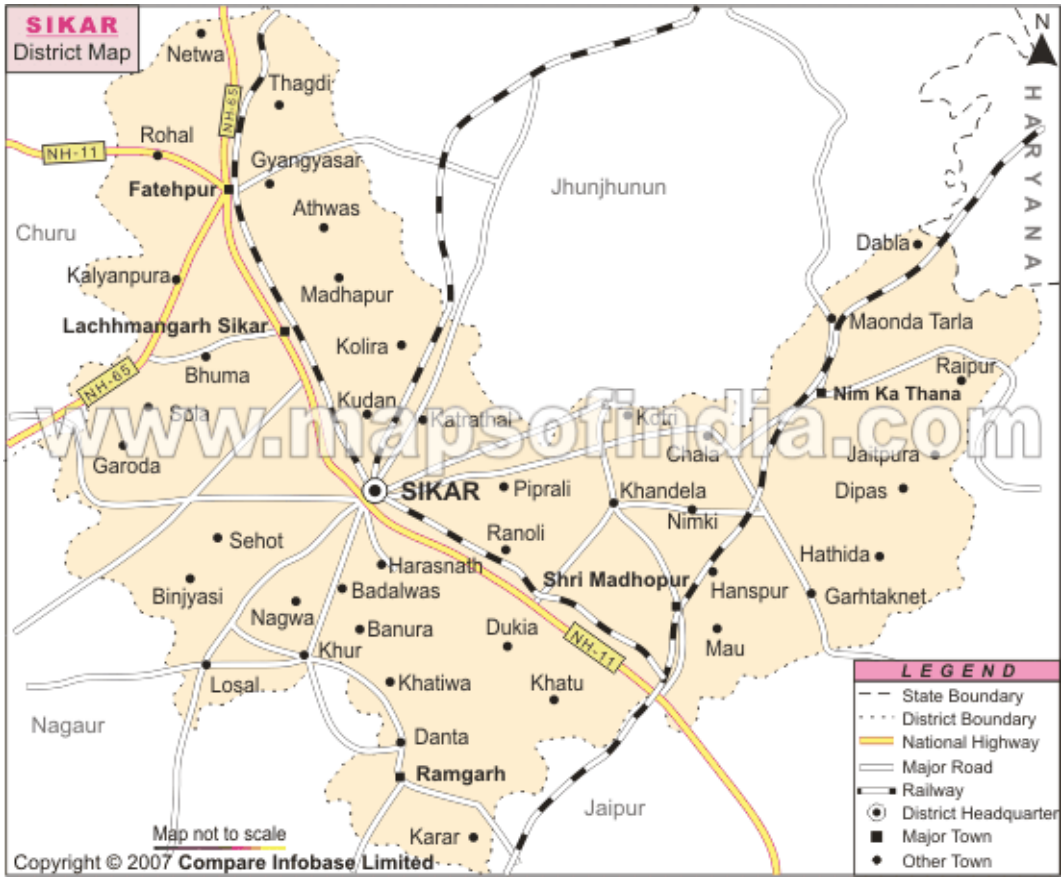


Figure 3.2: Earthquake zones of Rajasthan

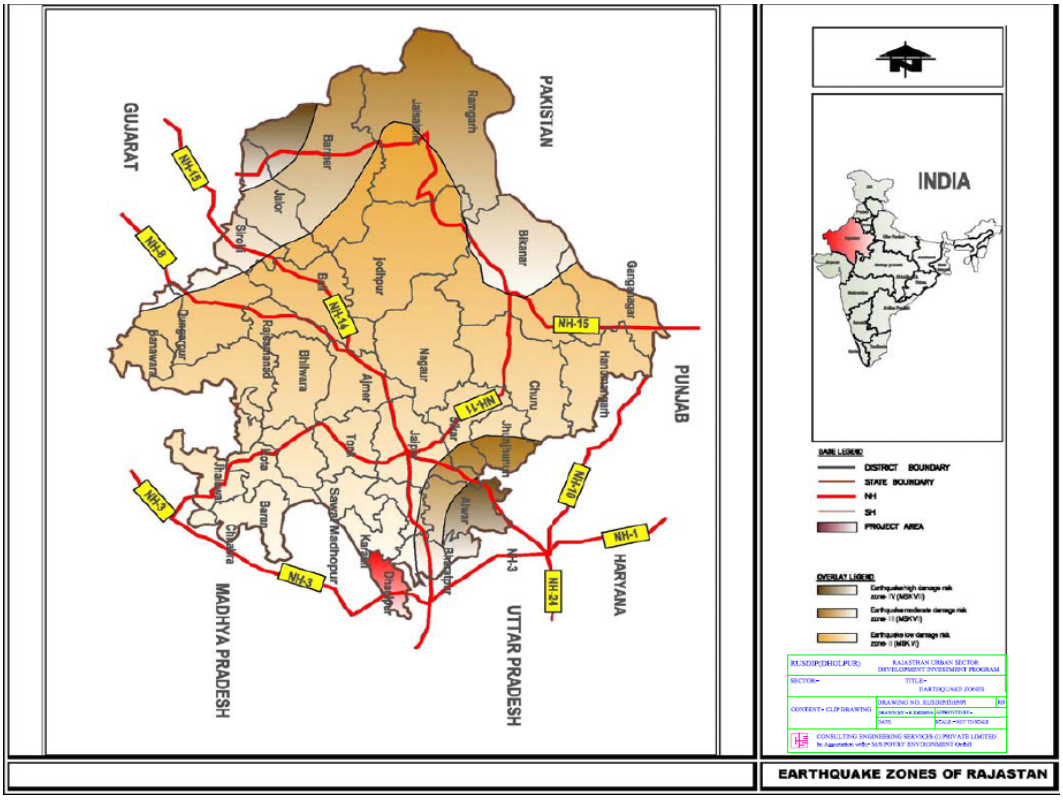
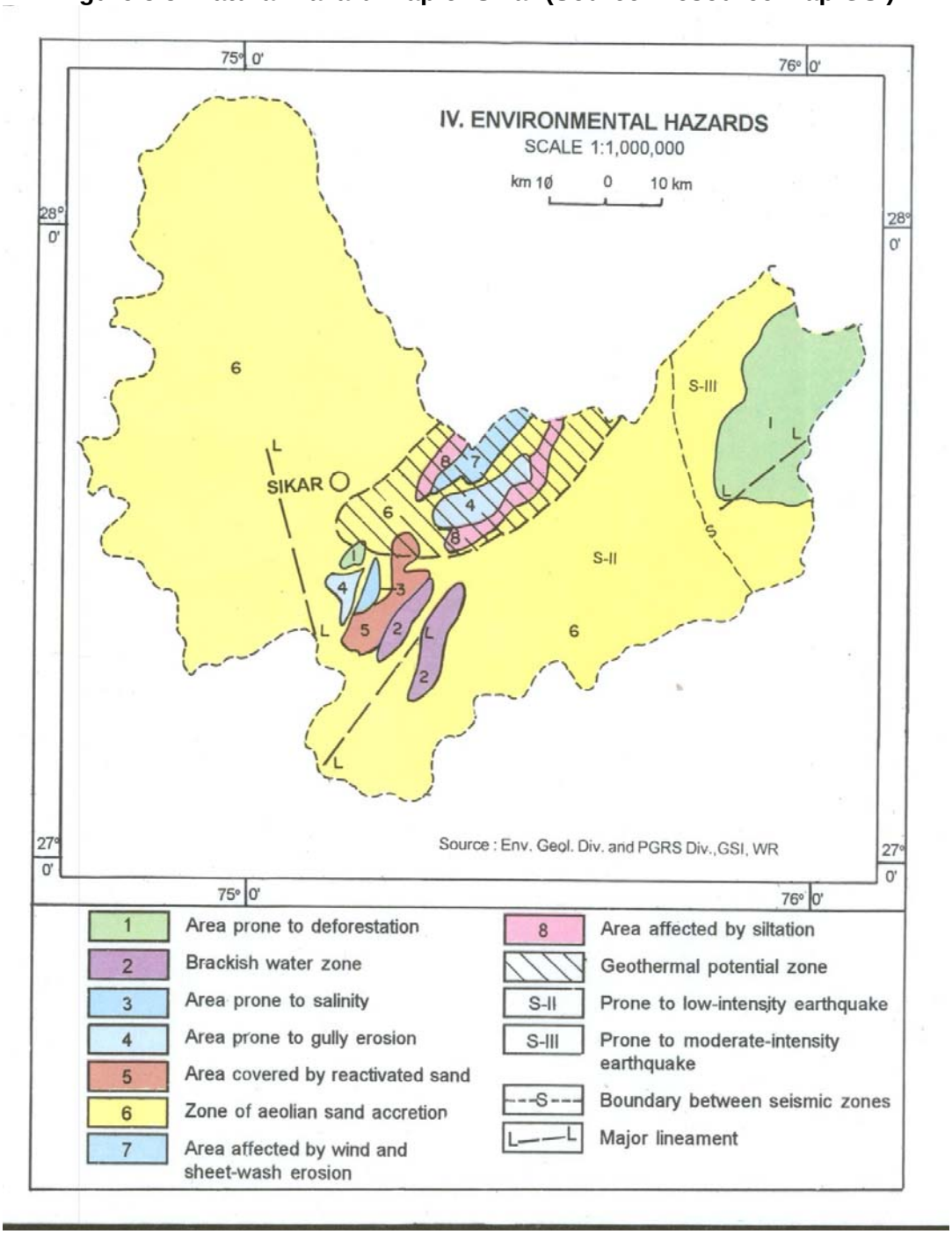


Figure 3.3: Natural Hazard map of Sikar (Source: Resource map GSI)



3. Geology, geomorphology, mineral resources and soil

32. Sikar district in northcentral of Rajasthan, covers an area of 7732 km^2 . The district has six tehsils namely Fatehpur, Lachhmangarh, Sikar, Danta Ramgarh, Shri Madhopur and Nim – ka – Thana. There is network of railways and Roads in the area. Semi arid to arid climate prevails in the district. The average annual rainfall is 460mm. The district can be divided into two main topographic units the western half characterized by dunal country and

waste land, and the eastern half characterized by NE-SW trending hill ranges. These hill ranges act as natural barriers and restrict large scale sand migration from the west.

33. Geologically, the district is not of much significance as the major part of the district is covered by Aeolian sand and sand dunes. Hard rock exposures are mainly confined to the eastern part of the district as isolated outcrop or as thin linear ridges. The Saladipura Group (Archaean) comprisin quartzite, paragneiss dolomatic marble and schist, exposed in the central part of the Khetri Copper belt (Lower Proterozoic age) tappers down in the northcentral part of the district. The lithounits of the Khetri Copper belt mainly include quartize, phyllite, calc – silicate and marble. Quartzite, staurolite – garnet – biotite schist and marble belonging to Shyangarh Group of Delhi Supergroup are juxtaposed with the Saladipura Group in the southern and eastern part of the district, the scanty outcrops of the Ajabgarh Groups of the Delhi Supergroup (Lower to Middle proterozoic). Granite, pegmatites quartz veins gabbro are the acid and basic intrusive. Faults, shears, fold axis are the manifestation of deep- seated tectonic in the area.

34. Geomophologically the district is classified into seven geomorphic units namely longitudinal dune, transverse dune, obstacle dunes, sand sheet, piedmont, ridge and valley and pediment. The shadow zones behind ridge and valley acting as sand barriers, are the only areas used for cultivation of seasonal crops. The area is characterized by two hydrogeological domains unconsolidated porous Quaternary formations and consolidated fissured formations with ground water potential ranging from less than 1 to 100 LPS, The district forms the catchment areas for various river valleys. These are Dohan in the northeast, Sabi, Sota and Banganga in the east and Mendha in the south. Although, these river systems originate from Sikar district, they remain dry for the most part of the year due to scanty rainfall and sand migration. As the district is prone to sand accumulation and migration, the effects of environmental hazards related to desertification is visible at most of the places these includes disorganisation of river valley, salinity of ground water and over-stepping of recent dunes over the cultivated lands.

35. ***Mineral Resources*****:** Huge deposit of pyrite - pyrrhotites is recorded from Saladipura (27°40':75°31') which is mined extensively for sulphur extraction. The estimated reserves of 111.62 million tonne (Mt) of pyrite -pyrrhotite with an average of 21.63% Sulphur. Extensive ancient mining activities for copper in the form of old Working and slag, dump are recorded from a number of places within the South Khetri Belt namely Baleshwar (27°43':75°55') South of Mavanda (27°48':75°50').NW of Ghata (27°35':75°50')etc. Apatite is found In Kerpura (27°39' - 75°34') Salwari (27°39':75°36') area In post Delhi - granite as veins. P_2O_5 contains is nearly 41%. Fluorite occurs as siringers, veins and pockets in quartz veins, amphibole rich rock and granite Limestone deposit near Patan (27°50': 75°58') is estimated to contain 6.98 Mt of limestone with 46.54% CaO. Other occurrences are reported from Raipur Jhingar (27°38' : 76°01') and Saladipura. The Khandela area has revealed the presence of moderately radioactive zones in quartz - biotite schist aplitic rocks and quartz-tourmaline veins. The Uranium zone contains 0.04 to 0.11% O_3U_8. The mineralised zone also contain molybdenum and copper mineralization. Barytes occurrences are reported from Kalakhera of Gaonri (27°42':75°50'). Iron ore occurrene from Kalakhera (27°42':75°59') and NW of Jhalra (27°52':75°52') Clay deposit is located NE- of Churla (27°34':75°56') Calcite occurrences are located at Mavanda, Raipur. West of Kalakhera north of Saladipura and many other places' Calcite occurs as veins, pockets and lenses in the marble and gneisses of Delhi Supergroup.

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

Figure 3.4: Geology and mineral map of Sikar district (Source: GSI Resource map)

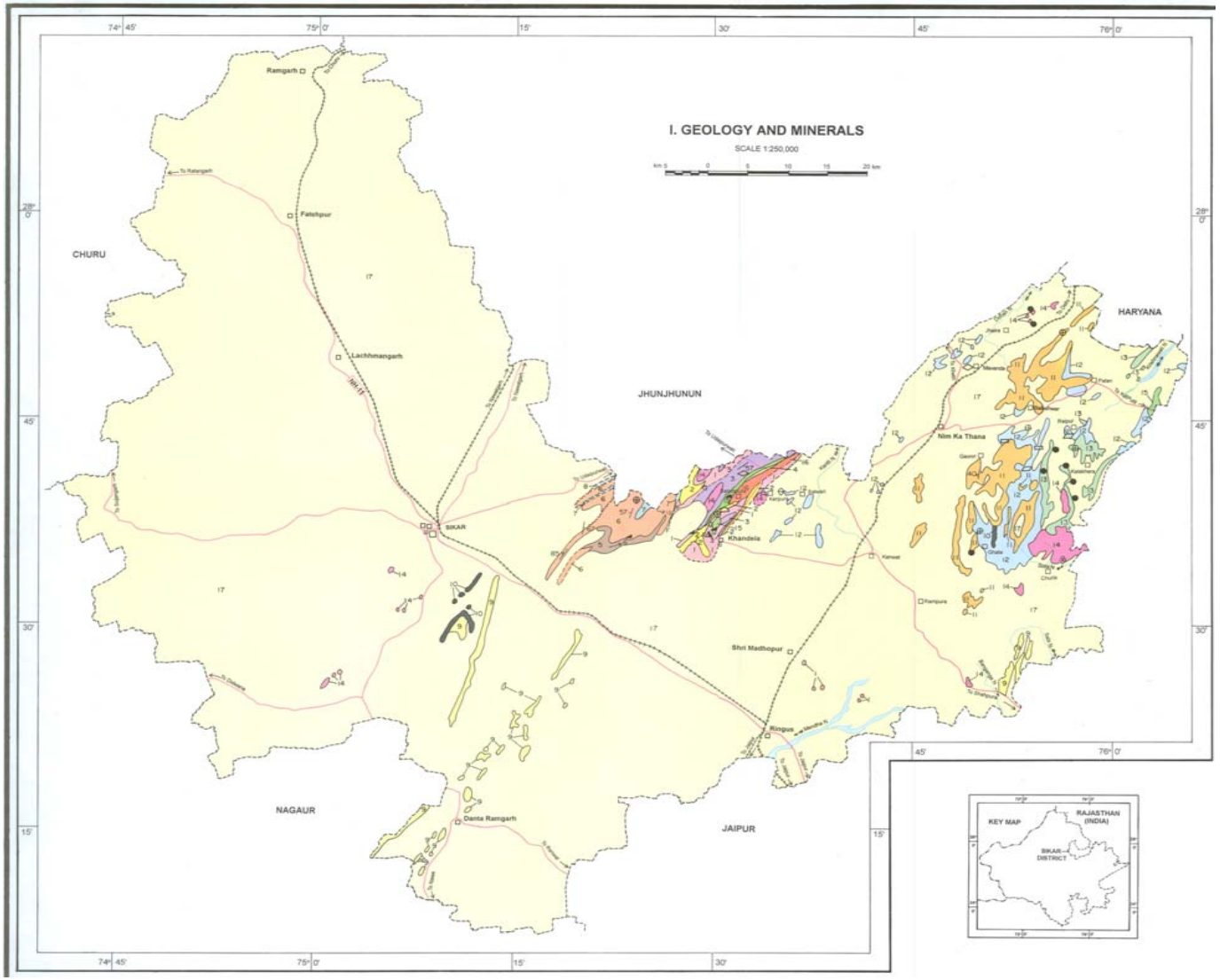
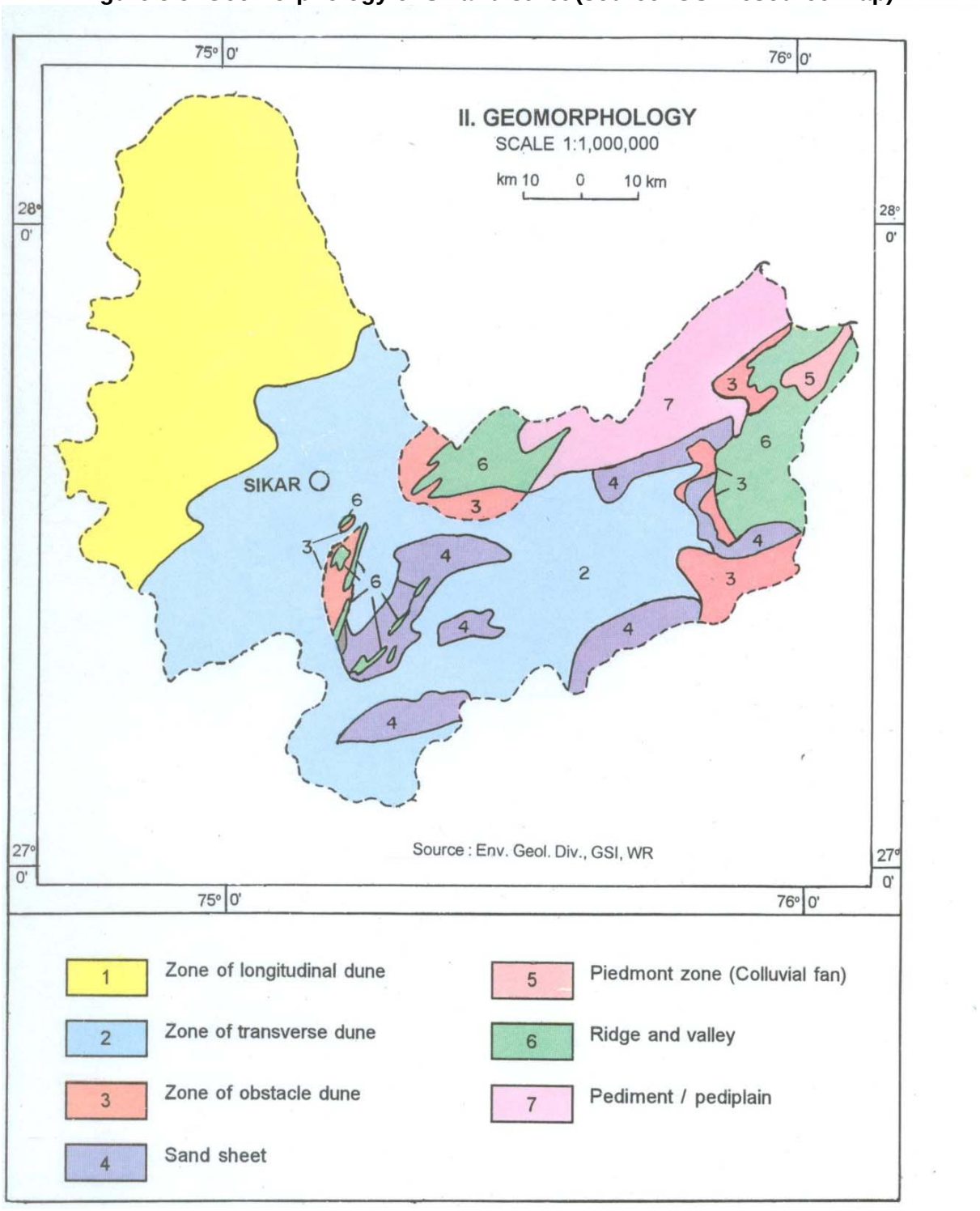


Figure 3.5: Geomorphology of Sikar district (source: GSI Resource map)



37. *Soil characteristics:* Soil of the region falls within rainfall zone of 300 – 500 mm. The soil is sandy loam, sallow depth red soils in depressions. **Table 3.1** shows nutrient level in the Sikar soil including area coverage of saline and sodic soil. The nutrient status of the Sikar soil is graded as low to medium level.

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

	Nutrient			Saline Soil(Ha)	Sodic or Alkali(Ha)
	N	P	K		
Status	L	M	M	59936	30036

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

4. Climate

38. The district has a hot summer, scanty rainfall, a chilly winter season and general dryness of the air except in brief monsoon season. The average maximum & minimum temperature are 46 & zero degree celsius respectively. The normal rainfall, mostly received from south-west monsoon is 46.60 cms.

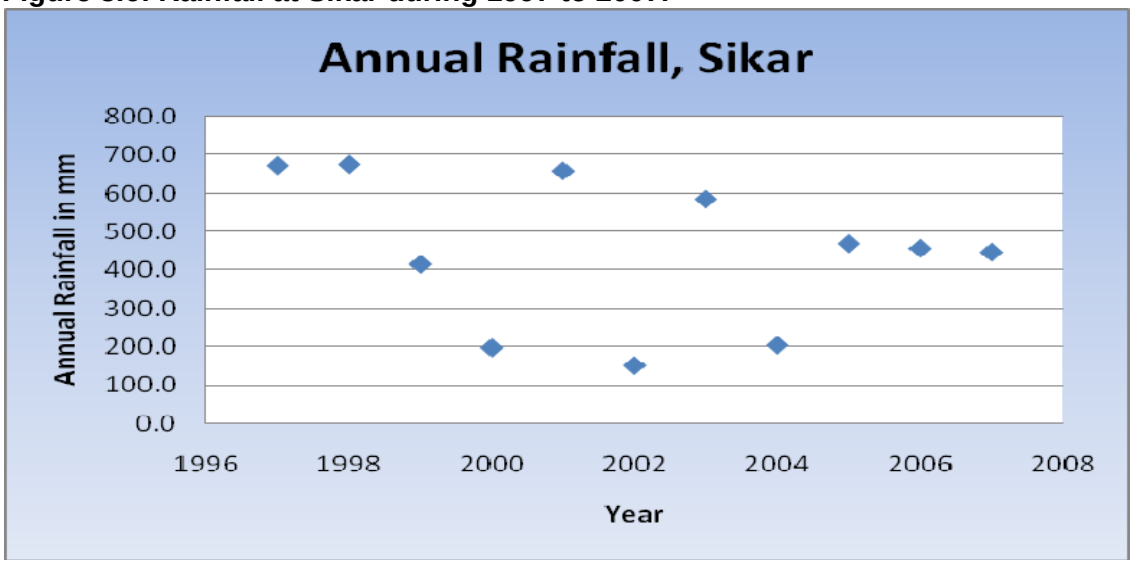
39. The rainfall over Sikar is scanty and is concentrated over four month i.e. from June to September. The rains are erratic and so is the distribution of the rainfall. However agriculture and the animal wealth are dependent on rains to large extent. Seasonal Rainfall data for the recent year (2005-2006)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

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

	Months	Rainfall (mm)
1	June	123
2	July	229
3	August	0
4	September	81
5	October	0
6	November	0
7	December	0
8	January	0
9	February	0
10	March	18
11	April	0
12	May	80
13	**Monsoon Rainfall**	433
14	**Non monsoon rainfall**	98
15	**Annual Rainfall**	**531**

(Source: Irrigation Department, Govt. of Rajasthan)

Figure 3.6: Rainfall at Sikar during 1997 to 2007.



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

5. Air Quality

40. There are no data on ambient air quality of Sikar 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 (115 km from Sikar). Traffic is the only significant pollutant in Sikar, 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*
JaipurIndustrial 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

41. There are no monitoring data on surface water quality in and around Sikar. The nearest station is located at Ghagar nadi (260 km from Sikar). 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° 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

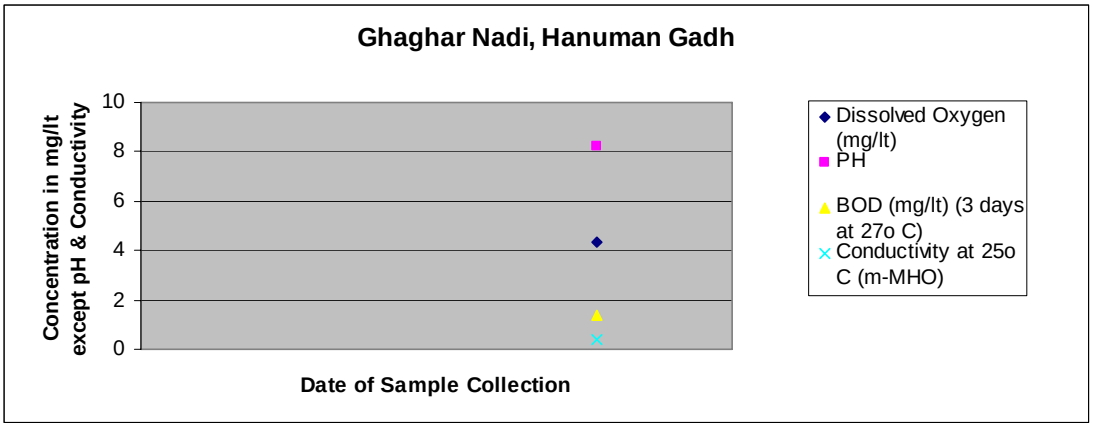
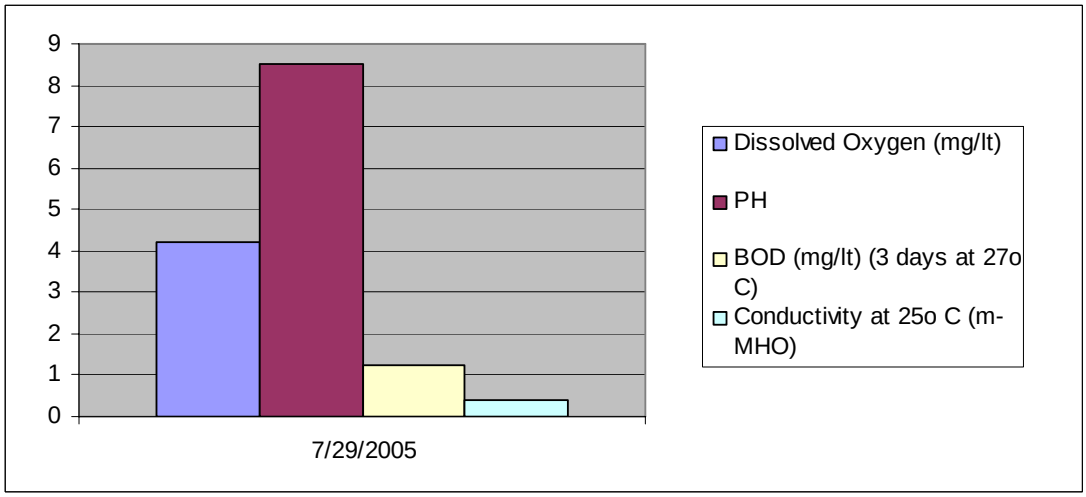


Figure 3.8: Variation of water quality parameters: Ghagar Nadi , Hanumangarh, down stream



7. Geohydrology and Groundwater

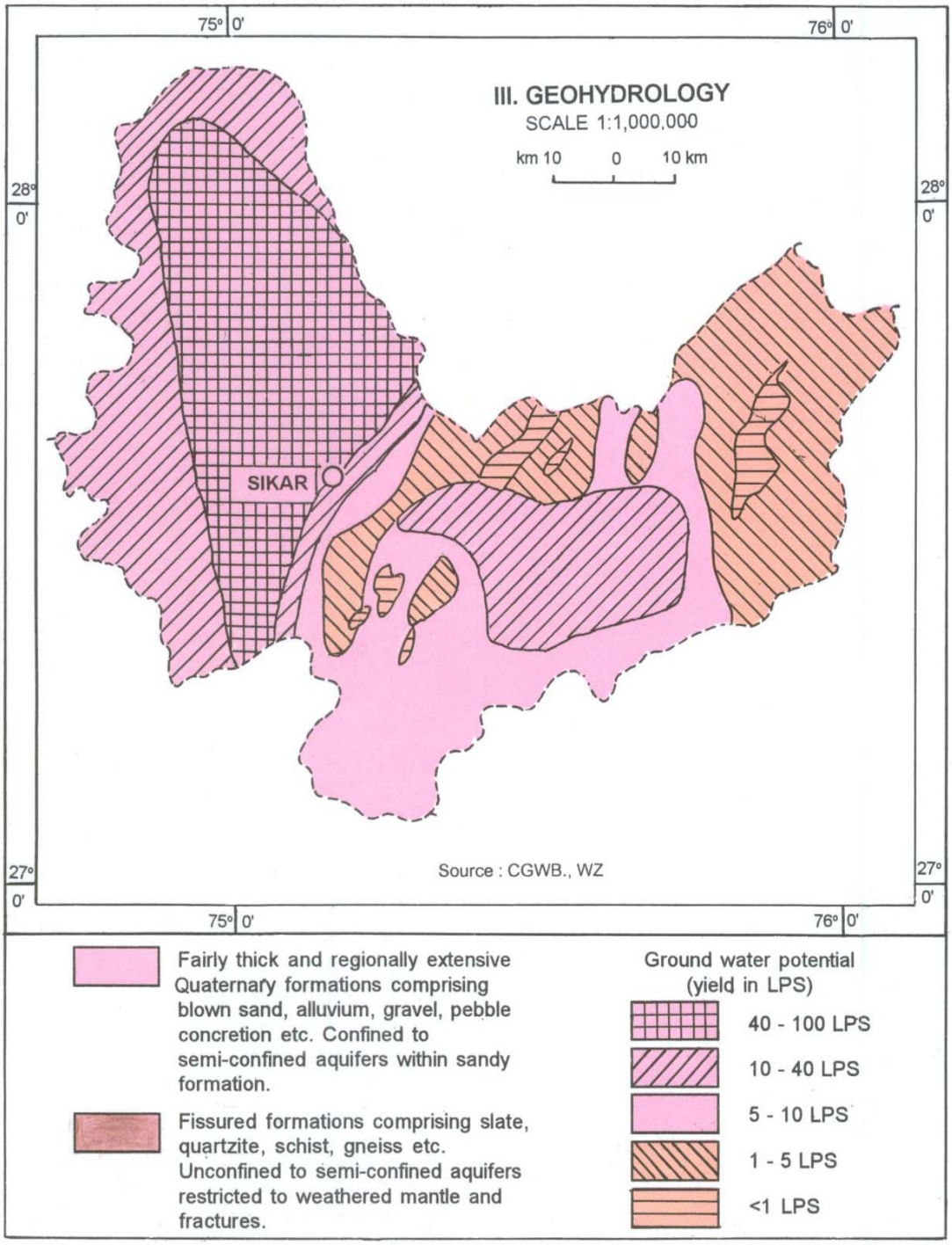
42. Geohydrological map of the Sikar district is shown in **Figure 3.9.** For broadly grouping geological formations from ground water occurrence and movement considerations, the various lithological units have been classified into two groups on the basis of their degree of consolidation and related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

- Fairly thick regionally extensive quaternary formations

- Fissured formations – consolidated protereozoic formations.

43. On an average 70 % of the district area covered with Fissured formations.

Figure 3.9: Geohydrological map of Sikar (Source- GSI Resource map)



44. Groundwater in Sikar generally occurs under confined to semi confined conditions. The principal aquifers of the district are quartzite, Schist, Phyllites, Limestone and Dolomite Limestone constitute important water bearing formation in the district. The average depth of ground water in the Sikar district varies from 4.59 m below land surface to 64.50 m below land surface. Town is located in Piprali Block of District. The depth of water in piprali block varies from 8.30 m to 54.65 m below ground level. The average yield of wells in this zone is

80,000 litres per day with pump and 30,000 litres per day without pump. The average discharge of water from tubewells is $11M^3$ / hr.in general the ground water quality is potable. This whole block is catogorised as “OVEREXPLOITED” therefore it has been recommended for future ground water development.

Table 3.5: Ground Water Potential of Piprali Block Sikar as on 31.03.2004

(Estimation of Ground Water Recharge in Monsoon period by Water Table Fluctuation Method)

Sl. No	Description	Year				
		1999	2000	2001	2002	2003
1	Zone Area (Sq. km)	51.59	51.59	51.59	51.59	51.59
2	Water Level Fluctuation	-0.96	0.30	-0.59	1.69	1.87
3	Monsoon Recharge from Ground water Irrigation Rgw (mcm)	0.0086	0.0063	0.0093	0.0108	0.0123
4	Rainfall Recharge (mcm)	-	0.5540	-	1.7414	1.9115
5	Gross Agricultural Draft (mcm)	0.6890	0.5048	0.7440	0.8636	0.9833
6	Gross Domestic Draft (mcm0	0.6197	0.6260	0.6675	0.6883	0.7090
7	Normal Monsoon Rainfall (m)	0.4055	0.4034	0.4052	0.4023	0.4036
8	Monsoon Rainfall (m)	0.0000	0.2010	0.0000	0.1090	0.5360
9	Rainfall Monsoon	0.0000	0.0404	0.0000	0.0119	0.2873
10	Rainfall Monsoon Recharge	0.0000	0.1114	0.0000	0.1898	10246

Source – Ground Water Board ,Sikar August 2006

Table 3.6: Ground Water Potential of Piprali Block Sikar as on 31.03.2004

(Water Recharge, Extraction & Stages of Ground Water Department)

Sl No.	Description	Unit
1	Block Area (Sq km)	807.66
2	Water Bearing Formation	Potential Zone Ao
3	Potential Zone Area (Sq km)	674.59
4	Net Ground Water Availability (mcm)	35.12
5	Existing Gross Ground Water Draft for Irrigation (mcm)	44.0
6	Existing Gross Ground Water Draft for Domestic & Industrial (mcm)	6.6
7	Existing Gross Ground Water Draft for all uses (mcm)	50.74
8	Allocation for Domestic & Industrial Requirement for year 2025 (mcm0	17.5
9	Net Ground Water Availability for future Irrigation Development (mcm)	-26.4
10	Stage of Ground Water Development (%)	144.4
11	Whether Significant Decline in Pre-Monsoon Water Level	Yes
12	Whether Significant Decline in Post-Monsoon Water Level	Yes
13	Category	Over Exploited

Source –Ground Water Board Sikar , August 2006

45. There are number of National Hydrographic monitoring stations of Central Ground Water Board in and around Sikar. Fluctuation of ground water level is shown in **Table 3.7.** In most of the cases ground water table ranged between 20 -60 m bgl.

Table 3.7: Number and Percentage of National Hydograph Network Stations at Sikar 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	20	3.56	63.5	0	0	1	3.57	0	0	3	10.71	22	78.57	2	7.14
Nov-05	28	2.7	62.24	0	0	1	3.57	0	0	3	10.71	23	82.14	1	3.57
Aug-05	28	2.85	66.46	0	0	1	3.57	0	0	3	10.71	21	75	3	10.71
May-05	31	4.98	61.48	0	0	1	3.23	0	0	4	12.9	25	80.65	1	3.23

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

46. The Central Ground Water Board carried out chemical testing of tube well water seasonally. The average concentrations of major constituents are shown in **Table 3.8**.

Table 3.8: Ground Water Quality in and around Sikar

Parameters	Maximum Level	Minimum Level	Standard of Drinking water (IS: 10500: 1991)	
			Desirable limit (mg/l)	Maximum Permissible limit (mg/l)
pH	8.7	7.56		
EC (micro mhos/cm at 25°C)	4900	560		
Cl (mg/l)	1250	7	250	1000
SO_4(mg/l)	300	10	200	400 (if Mg does not exceeds 30 ppm)
NO_3(mg/l)	610	7.7	-	100
PO_4(mg/l)	1.82	0.07		
Total Hardness(mg/l)	620	60	300	600
Ca(mg/l)	72	8	75	200
Mg(mg/l)	114	10	30	100
Na(mg/l)	863	8	-	-
K(mg/l)	55	0.78	-	-
F(mg/l)	2.78	0.17	1.0	1.5
Fe(mg/l)	6.52	0.05	0.3	1.0
SiO_2(mg/l)	30	5		
TDS (mg/l)	3185	364	500	2000

Note: Total – 15 nos. samples

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

47. Supply water quality as measured by Public Health dept. is shown below. It is noted that ground water contains high level of total dissolved solid and nitrate.

Table 3.9: Present supply water quality at Sikar

Total supply per day (lac liter)	Type of Sources Surface / Ground	Ground	Surface	No. of CWR	No. of SR	F^- Min	F^- Max	TDS Min	TDS Max	NO_3^- Min	NO_3^- Max
214.8	Ground	100	0	10	10	0.1	0.9	460	1390	Trace	185

B. Ecological Resources

48. FLORA: The flora of the district consists of a considerable variety. In 1972, 73, 1.46 per cent of the total area of the district was classified as forests. The forest area in Sikar district may be broadly divided into four botanical divisions, some details of which are as follows.

- *Anogeissus pendula* Type: In this type *Anogeissus pendula* (Dhok) usually occurs as pure stands. Its common associates are *Acacia senega* (Kumtha), *Dischrostachys cinerea* (Buiya).

- *Anogeissus pendula* Degraded Type: The *Anogeissus pendula* degraded type is most commonly found on the hill slopes. Due to continuous biotic interferences, this has been reduced to a spreading and creeping form.

- Throny Type: These forests are found on the marginal lands, foothills and consolidated sandy plains or sand-dunes and ravine lands.

- Tree Savannah Type: This type of botany is found in plains which are sandy or which contain sandy loam soils. The specie is specially managed for grass production. The tree layer is composed of *Acacia leucophloe* (Ronjh) and *Acacia Senegal* (Kumtha) etc.

49. FAUNA: The common mongoose and the hedge hog are seen in the entire area of the district due to their adaptability to varied surroundings. Besides, domesticated animals such as cows, oxen, horses, buffaloes and camels are found everywhere in the district. Birds commonly found in the district may be listed as house sparrow, house crow, jungle crow, blue rock common teal and brahminy duck.

50. There is no protected area, forest nearby the sub-project site.

C. Economic Development

51. Economic base of a town reflects its prosperity. Sikar being district headquarter, has been functioning as administrative city with sustained growth in tertiary economic activities. The major economic activities are trade and commerce, thus it offers a number of wholesale and retail markets which act as a distribution center for near by towns and villages. Tourism income contributes very less towards economic generation of the town on the contrary household industries play a big role in providing employment and income generation. As per the master plan new town centers and community centers have been proposed .This section focuses on number of workers, their category, and occupational pattern of the town in general. Also .attempt has been made to define the market centers and industrial activities of the town .The town has look of business-hub indicating fast growth.

52. The workforce participation .rate of the city was about 25.2 percent of the total population as per 2001 census. The following table shows that out of this total workforce only about 3.5percent were employed in the primary sector (Agriculture, mining and

quarrying etc) followed by 6.7 percent in secondary sector (industry and construction).It is observed that tertiary sector including commercial activities, trade and commerce and related activities dominate with about 89.7 percent workers engaged in the sector. The workforce participation ratio in Sikar (UA) and Sikar (MA) is 25.2 as per 2001 census (**Table 3.10**).

Table 3.10: Number of Workers, Work Force Participation Ratio and percentage of workers in Sikar Town

Economic Profile	Total Workers	WPR	Primary Workers	Primary Workers %	Secondary Workers	Secondary Workers %	Tertiary Workers	Tertiary Workers %
Sikar (MCL)	46690	25.2	1647	3.5	3149	6.7	41894	89.7
Sikar (MCL+OG)	46845	25.2	1661	3.5	3153	6.7	42031	89.7

Source: Census of India 2001

53. Rajasthan's strong economic performance during the 80's and the early 90's reflected well in Sikar, However although at present Industrial Sector in Sikar is not so strong as compare to other economic sector like services, trade and commerce, construction, etc yet the recent trend have shown fast development in Industrial activities.

54. Sikar falls on the National Highway No.11 connecting Jaipur to Bikaner and has been most important trade center on this route. Sikar will therefore continue to grow as principal commercial and Distribution center. A continuous rise is expected in number of workers and this will increase population. It is therefore desirable that Industries are distributed rationally in conformity with the Infrastructure Developments of the Town .In summary to the aforementioned the following issues can be mentioned;

- All commercial nodes are too congested and overcrowded.
- Industrial sector in Sikar is deteriorating day by day.
- Most of the Industries that were established in beginning are declared sick today.
- Effective Planning strategy in locating various Industrial units is needed to decongest the present position.
- Proper internal roads for industries need to be planned.
- As there is no demarcated site for disposal of Industrial waste, all Industrial waste is being dumped on the Forest land without any treatment.
- Continuous disposal of Granite slurry on forest land, in Debipura block near RIICO industrial complex, is destroying vegetation / plantation on one hand and breathing problem among residents in nearby colonies on the other hand thus has become a major threat to environment in the city.
- Artesian / Household industry is creating noise, water and air pollution in the core residential area of the town.

- Tourism Industry is very much neglected and underdeveloped.
- Lack of Tourism Infrastructure.

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

Table 3.11: Consumption of Electricity in Million Kwh (2003-04)

District	Domestic	Non-Domestic (Commercial)	Industrial	Public Lighting	Public Water Works	District	Domestic
			Small	Medium	Large		
Sikar	91.943	20.978	14.51	7.879	9.821	2.053	29.916

1. Land use

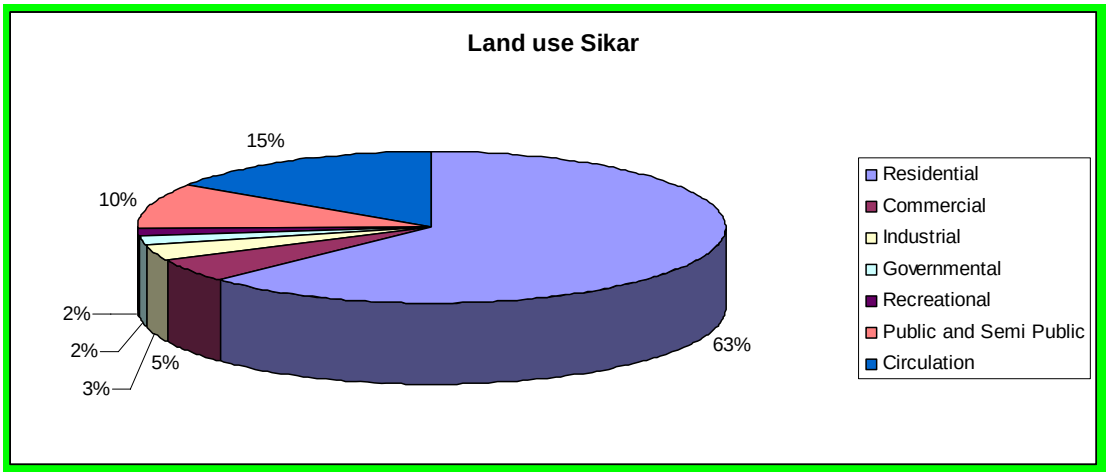
56. The Municipal council of Sikar is implementing a Master Plan which has been notified by the Government of Rajasthan on 07.03.1999. This plan is aimed at integrated and balanced development of entire notified urban area and provides guidelines for future growth of the town. It has been kept in proportion with socioeconomic need of the citizens and financial resources of the state. As per land use survey conducted in 1985 the Municipal limit of Sikar encompassed and area of about 9800 acres out of which 2680 acres was urbanized as per Master Plan 1985 -2011. The remaining land was vacant comprising of sandy area with fair cultivation. About 63% of developed urban area is under residential use, which is high in comparison to other towns in the region. This is due to lack of industrial area, parks and open spaces and other community facilities. The percentage of recreational use is only 1.6% against 3-7 percent normal in other towns. The table below shows land use area based on the survey conducted in 1985 (**Table 3.12**).

Table 3.12 Existing Land Use Sikar-1985

Sl No.	Landuse	Area in Acres	Percentage of Developed area	Percentage of urban area
1	Residential	1580	62.70	58.98
2	Commercial	130	5.16	4.85
3	Industrial	80	3.17	2.98
4	Governmental	50	1.98	1.86
5	Recreational	40	1.60	1.49
6	Public and Semi Public	250	9.92	9.32
7	Circulation	390	15.47	14.55
Total Developed Area		**2520**	**100**	-
8	Government Reserved	30	-	1.12
9	Agricultural	40	-	1.49
10	Vacant land	90	-	3.36
Urban Area		**2680**	-	**100**

Source – Master Plan of Sikar

Figure 3.10: Land use percentage- Sikar Urban developed area



2. Commerce, Industry and Agriculture

57. The state Government of Rajasthan Industrial Investment Corporation is providing various incentive and facilities for promoting Industrial activities. There is no large scale Industry in Sikar. Only small scale industries such as Granite industry, plywood industry, dal and oil mill industry, cattle feed industry, PVC pipe industry and Electric Transformers industry are functioning with very little workforce.(**Table 3.13**).

Table 3.13: Type and Number of Industrial Units

Sl No.	Type of Industry	No. of Units
1	Granite	40
2	Plywood	8
3	Dal and Oil Mill	8
4	Cattle Feed	10
5	PVC pipe	6
6	Electric Transformers	9

Source: DIC- Sikar August 2006

58. Artesian /Household Industry provides for employment to a large no. of people These Industries are mainly Tie and Dyeing of cloth and leather tanning chemicals. These Industries are causing a lot of Noise Pollution, nuisance, traffic hazards and problem of waste disposal in Residential zones.(**Table 3.14**)

Table 3.14: Type and Number of Artesian/Household Industries

Sl No.	Type of Household Industry	No. of Units	Location (ward No.)
1	Leather	200	2,6,7
2	Tie and Die	200	2,6,7
3	Bangles	200	Ajmer Bus Stand (near Suraj Pole Gate)

Source: DIC- Sikar August 2006

59. In and around the Sikar city area there are about 50-60% of lands used for agricultural purpose. Crop production statistics as depicted in **Table 3.15** indicates that crop production is slightly more in Kharif season in compared to Rabi season.

Table 3.15: Crop production in around Sikar

Type of Crops	Under Rabi Crops 2003-04 (Prod in Tonnes)	Under Kharif Crops 2003-04 (Prod in Tonnes)
Cereals	285673	351984
Pulses	49763	40013
Food Grains	335409	391997
Oilseeds	42157	29316
Others	44135	39782
Total	**421701**	**461095**

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

3. Infrastructure

60. *Water supply*: Water supply of Sikar is wholly drawn from local tube wells, which are situated in almost whole city i.e. around the water work compound on Harsh Road and Udaipurwati Road. Ground water is the only source of water supply in Sikar. The water supply in the town is intermittent during morning and evening only. The per capita water supply of the town is about 89 lpcd, which is merely adequate and as per the recently sanction reorganization water supply scheme of Sikar, which is under execution it would be upgraded to 135 lpcd. Tube wells are largest sources of water supply in the town. The average depth of water table in Sikar is about 54.65 mt. The supply timing is one hour i.e. morning 6-7 a.m. All the wards in the town are connected either partially or fully by piped water network. The Sikar town is firstly growing important town and its water supply projects are to be based on reliable sources of water supply. Therefore it is necessary to propose surface water sources which are perennial sources. The present water supply sources are Tube wells (146 Nos.) and open wells (34 Nos.).

61. *Sewerage System:* Sikar town does not have underground sewerage system. Out of the occupied residential houses only about 55% have some kind of latrines. Most of the houses have adopted the practice of providing onsite disposal by constructing water seal / bore hole latrines or by providing septic tank with effluent discharge into soak pits or open surface drains. Economically weaker section generally defecates into the open field. No sewerage treatment facility is there in the town and the drains having combined drainage and sewage are having outfall discharge in open fields towards west of the town on forest land. In the absence of any sewerage facility, the major mode of disposal is through individual septic tanks and low cost sanitation.

62. The city has around five thousands population as floating population that depends of public or community toilets. In core city area, market areas there are very few public toilet for men, but there is no public toilet for females. PHED division Sikar has recently prepared a Sewerage scheme for Sikar town. Components covered in it are as follows. As per topography of the Sikar town whole area is divided into following two zones based on the ground level and feasibility of laying of sewer at required depth and are denoted as-

A North-East zone

- Area surrounding Nawalgadh Road
- Area surrounding Udaipurwati Road up to railway line
- Area surrounding Fathepur Road
- Area surrounding Bajaj Road, Bakra mandi and Kabristan

B South-West zone

- Area surrounding Jaipur Road
- Area surrounding Fathepur Bye- Pass Road

63. *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.

64. *Drainage*: The existing drainage system in Sikar is piecemeal construction of open *Nallah* as per local and temporary requirements without proper whole to part designs. The town has mainly open drains. The waste water along with sewage is discharged into the fields towards west of the town through open drains. Storm water drainage is expressed in terms of its coverage with respect to the total road length. Ideally length of the storm water drain should be twice that of the total road length. The open drain system in the town is irregular and mismanaged. The improper construction and maintenance of open drains cause spillage of rain water mixed with sewage and gets collected in local depressions at following core places of the town and requires pumping for several days.

65. *Industrial Effluents.* Small industries exist in under RIICO, which is outside 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.

66. *Solid Waste:* Sikar town spreads over 9800 acres of which 4600 acres is developed. The total waste generation in the town is about 200 T / day. Considering a population of 185,925 persons in year 2001 census, the per capita generation of waste generation is 0.92 kg / day. It is important to note that no initiatives has been taken till now in terms of door to door collection of solid waste in Sikar. Presently most of the city wastes are simply dumped without any treatment in depressions, ditches or by the sides of the road flank in an unscientific manner. This practice may lead to air and water pollution, releases foul smell and this situation may cause major threat to the public health. 20 Primarily, the sweeping is done by municipal staffs and collection and disposal is performed by the contractor. The garbage is collected and stored in a common point in every ward and the transportation is done by the tractor. There are 157 open points within the town demarcated by Sikar municipal council for garbage disposal in the wards. The average number of trips performed by vehicles ranges from 3-5 trips per vehicle per day and the average collection performance of 70 percent for Sikar Municipal Council, the vaccum emptier is used for gutter cleaning. Municipal Council of Sikar charges about Rs. 600 / household for cleaning the gutter per nos.

4. Transportation

67. Sikar is well connected with all the important towns of the state. It is situated on the National Highway No.11 running from Bikaner to Agra at the junction of State Highway No.20 and State Highway No.8 connecting Sikar to Salasar and Jhunjhnu respectively. It is also connected to Delhi via Jhunjhnu and Neem Ka Thana.

68. As per the Master Plan 13.80% area (755 acres) has been reserved as roads and circulation area. The road in the walled city consists of narrow road on Grid iron pattern. In

the absence of ring road, these roads have become overcrowded and outdated. Mahatma Gandhi road and Jamnalal Bajaj road are two main roads, which caters most of the traffic of the town. The width of the Mahatma Gandhi road varies from 80 ft to 100 ft .while the width of Jamnalal Bajaj road is 20ft to 55ft. There are large number of road crossings on these roads, which have not been planned at all and subject to congestion and accidents. Most of the other roads are not been metalled. The type of construction of roads within Sikar Municipality is shown in **Table 3.16.**

Table 3.16: Roads based on type of Surface

Sl No.	Type of Surface	Length of Roads (KM)
1	Concrete Road	60
2	Black Topped / Bituminous	75
3	Water Bound Macadam	5
4	Earthen	0
Total		**140**

Source Sikar Municipality August 2006

D. Social and Cultural Resources

1. Demography

69. According to Census 2001, the population of (Sikar Municipal Council is 185323) Sikar Urban Agglomeration is 185,925 and spreads over Sikar Municipal Council` (organized into 45 wards). The total spread of the Urban Agglomeration is approximately 39.00 sq. km, Municipal Council. The UA supports an average density of 4767 persons per sq. km. Of the total population the males constitute 96,379 and females 88,944 with sex ratio of 923 females per 1000 males. The number of Schedule Castesin Sikar Municipal Area and Sikar Urban Area is 17207 & 17377 respectively. Whereas The number of Schedule Tribes in Sikar Municipal area and Sikar urban area are 1413 and 1418 respectively. Thus the percentage of vulnerable population to the total population is 10%. The UA witnessed a high growth between 1971 and 1981 on account of induced industrial development, the growth rate fell during the last decade i.e. 1991-2001..this remarkable growth can be ascribed to various reasons, which includes increase due to natural growth, concentration of developmental activities like establishments of more government offices ,trade and commerce ,services and other activities , colleges and residential colonies (**Table 3.17**). Population projection of Sikar town is shown in **Table 3.18.**

Table 3.17: Population Growth in Sikar town

Year	Population
	Sikar town
1961	50,636
1971	70,987
1981	102,970
1991	143,900
2001	185,925
2011	240,783
2021	311,749
2031	403,811
2041	523,840

Source: Census of India, 2001.

Table 3.18: Population Projection of Sikar

Year / Stage	Census Population	Recommended Projected Population
1961	50,636	
1971	70,987	
1981	102,970	
1991	143,900	
2001	185,925	
2007		217,136
2011		240,783
2021		311,749
2026		354,765
2041		523,840

2. Health and educational facilities

70. There are good educational facilities in Sikar district, which serve both townspeople and inhabitants of surrounding villages and towns in the hinterland. There are 1695 primary schools, 299 higher secondary schools, plus 13 general degree colleges.

Table 3.19: Educational facility of Sikar District

	(Nos.)
Colleges	13
Professional Colleges	2
Higher Secondary Schools	299
Middle Schools	843
Primary School	1695

(Source: Rajdarpan, the official web portal of Rajasthan government)

71. As the district headquarters town, Sikar is the main centre for health facilities in the area and there is a 1 district general hospital, 1 primary health center in the Sikar town. The detail of the health facilities given in **Table 3.20.**

Table 3.20: Health facility Sikar Urban 2003- 04

S.No.	Facilities	Number
1	Hospital	1
2	Primary Health Center and Maternity Center	1
3	TB Hospital	1
4	Mother and Child Care Center	1
5	Total	4

(Source: District Statistical Hand Book 2005)

3. History, culture and tourism

72. Sikar has rich heritage sites. A detailed inventory of some important religious and tourist spots in Sikar are given below-

- 17^{th} century a Fort

- The Painted Biyani, Murarka
- Bawri (Step Well)
- Digamber Jain Temple
- Somani Havelis
- Sagarmal Sodhani Havelis
- Madho Niwas Kothi
- The Jubilee Hall
- Devi Singh Cenotaph
- Temple of Gopinath
- Laxman Singh Cenotaph
- Raghunath Temple
- Madan Mohan ji Temple
- Shekhawati Museum
- Bara Talab Madhave Sagar

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

IV. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES: LOCATION AND DESIGN

74. 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 IV and V above and no other impacts are expected.

75. 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.

76. However in the case of this subproject there are no considerable 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

77. From the descriptions given in Section III.C, it is clear that implementation of the project should not have major environmental impacts because the drains will be built in a relatively small area, and the construction work will be quite straightforward.

78. 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
Coastal resources	Sikar is not located in a coastal area
Population and communities	Construction will not affect population numbers, location or composition

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

80. Rapid Environmental Impact Assessment checklist is attached as **Appendix – 2**

B. Main Drains

1. Construction method

81. As explained in Section II.C the total length of the new drain will be constructed in Random Rubble (RR) masonry channel with cement concrete bed increasing the velocity of water in the drain which will consequently increase the water carrying capacity of particular section. Each will be located alongside main roads, on government land on which a Right of Way (ROW) has been granted for this work.

82. Trenches for each drain will be dug by backhoe digger, supplemented by manual digging where necessary. Excavated soil will be placed nearby, and once the 4 x 5 m cavity has been created with the required gradient, RR stone masonry side walls in drain and 62mm RCC Flooring will be constructed. To attain better flow condition inside plastering of RR Masonry wall will be done. Loose soil will then be shoveled in to fill any space remaining between the wall and the edge of the trench.

2. Physical Resources

83. Although construction of drains involves quite simple techniques, the invasive nature of excavation, and in this case the relatively large size and length of the drains, means that

there will be quite a lot of physical disturbance, in areas where there are a variety of human activities.

84. There is generation of waste soil for construction of drain. There will therefore be quite large physical changes where the drains are built, and this quantity of waste could not be dumped without causing further physical impacts (on air quality, topography, soil quality, etc) at the disposal site. The work will almost certainly be conducted in the dry season, so there is a lot of potential for the creation of dust, and this will be increased by the need to import quite large quantities of building material, in particular sand, as well as bricks and cement.

85. 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;

- Reduce the generation of dust by removing waste soil as soon as it is excavated (by loading directly into trucks);

- Plan the work carefully so that sand is only brought to site when needed;

- Cover or damp down sand and soil stockpiled on site to reduce dust in windy weather;

- Use tarpaulins to cover loose material when transported to and from the site by truck.

86. The other important 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 in this area, and the fact that excavation will be conducted in the dry season.

87. Physical impacts will also be reduced by the method of working, whereby the drains will probably be constructed by small teams working on short lengths at a time, so impacts will be mainly localised and short in duration. Because of this and the mitigation measures proposed above, impacts on the physical environment are not expected to be of major significance.

3. Ecological Resources

88. There are no significant ecological resources in or outside the town (protected areas or rare or important species or habitats), so construction of the drains should have no ecological impacts. However, 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 two new trees (of the same species) for each one that is removed.

4. Economic Development

89. All of this work will be conducted within an easement granted for creation of the drains, so there will be no need to acquire land, and thus there should be no direct effect on the income or assets of landowners, or the livelihoods of tenants. The proposed alignment is

however encroached by structures in places (shop-fronts, boundary walls of houses), some of which may need to be removed. ADB policy on Involuntary Resettlement requires that no-one should be worse off as a result of an ADB-funded project, so where income-generating structures are removed (eg portions of shops or business premises), some form of compensation will need to be provided. A separate Resettlement Plan and Resettlement Framework have been prepared to examine these and related issues and provide appropriate mitigation. This establishes that:

- Drain alignments will be amended to avoid the removal of structures where this can be achieved within the existing easement and without compromising the functioning of the drain;
- Where this cannot be done and income-generating structures have to be removed, the owners will be compensated for the loss at the replacement cost of the structure.

90. Shops and other businesses located alongside the proposed drain routes will also experience economic impacts, as it is inevitable that the presence of trenches, excavated material, workers, vehicles and machinery will discourage customers from visiting certain premises whilst work is in the vicinity. Business income will therefore decrease for a short period, and although losses will be relatively small they 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 between mounds of excavated soil and providing footbridges for pedestrians and metal sheets for vehicles to maintain access across trenches where required;
- Increasing the workforce in these areas to complete the work quickly;
- Consulting affected businesspeople and informing them in advance when work will occur.

91. Excavation could damage existing infrastructure, in particular water pipes and electricity pylons, which are mainly located alongside roads. 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 Sikar Municipal Board (SMB) of the nature and location of all infrastructure, and planning the drain routes to avoid any conflict or damage;
- Integrating construction of the various Sikar subprojects (in particular water supply, drainage and sewerage) so that:
- Different infrastructure is located on opposite sides of the road wherever feasible;
- Roads and inhabitants are not subject to repeated disturbance by construction in the same area at different times for different purposes.

92. Transport is another type of infrastructure that may be affected by some of the work, particularly if excavated soil is placed on adjacent roads, and if construction vehicles are not used and parked with due consideration to other road users. These impacts should however be relatively easy to avoid, and the Contractor should be required to:

- Keep excavated soil, and vehicles and machinery off adjacent roads wherever possible;
- Where there is not enough space alongside the road for this to be accomplished, conduct the work during periods when traffic is light;
- Contact the town police to ensure that warning signs and traffic diversions are provided when necessary;
- Increase the workforce in any such areas so that work is completed quickly.

93. Taffic and other activities will also be disrupted by the increase in the number of heavy vehicles in the town (in particular trucks removing waste and delivering materials), and this might also damage fragile buildings if vibration is excessive. These impacts should therefore 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 and other materials to avoid peak traffic periods, the main tourism season, and other important times.

5. Social and Cultural Resources

94. 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/or historical remains, or even unknown sites. In this case excavation will be conducted in Sikar town, which has been inhabited for a long period, and where there could therefore be a significant risk of artefacts being discovered. This should be ascertained by consulting the appropriate authorities, and steps should be taken according to the nature of the risk. This should involve:

- 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 by the Contractor in conducting all 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.

95. Drain construction 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, interrupted access for pedestrians and vehicles, and vibration from heavy vehicles and machinery. Given the historical importance of Sikar, any such damage or disruption could be highly significant, so 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 SMB to identify any buildings at risk from vibration damage and avoiding any use of heavy vehicles in the vicinity;
- Limiting dust by removing waste soil quickly, covering and watering stockpiles, importing sand only when needed, 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.

In addition the Executing Agency and Contractor should:

- Consult SMB, 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;

96. 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.

97. An additional, particularly acute health risk 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 is that:

- The locations of all new infrastructures will be planned to avoid locations of existing AC pipes so AC pipes should not be discovered accidentally.

98. Given the dangerous nature of this material for both workers and citizens, additional precautions should be taken to protect the health of all parties in the event (however unlikely) that AC pipes are encountered. The design consultant should therefore 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.

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

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

A. Screening out areas of no significant impact

100. Although the drains will need regular maintenance when they are operating, with a few simple precautions this can be conducted without major environmental impacts (see below). There are therefore several environmental factors which should be unaffected by this system when it to function. These are identified in **Table 6.1** below, with an explanation

[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

of the reasoning in each case. These factors are thus screened out of the impact assessment and will not be discussed further.

Table 6.1: Fields in which operation and maintenance of the completed drains is not expected to have significant impacts

Field	Rationale
Climate, topography, geology, seismology	Because of the low population and low rainfall, the drainage system will not carry enough water to significantly affect these factors.
Fisheries & aquatic biology	No natural surface water bodies will be affected by operation of the drainage system
Wildlife, forests, rare species, protected areas	There are none of these features around the proposed project site
Coastal resources	Sikar is not located in a coastal area

B. Operation and maintenance of the improved drainage system

101. The new drains will improve the removal of surface and storm water runoff in the town, by extending existing concrete *nallahs* and providing a new main drain to serve the outskirts. The main problems with the existing system are that the drains were poorly designed and built with ineffective gradients, and have been inadequately maintained over the years. As a result many are blocked with discarded garbage and are overflowing and leaking, and there are large areas of unsightly and unhygienic standing water around the town. The new drains will be designed to Indian specifications so gradients should be sufficient to keep water flowing and the provision of a municipal solid waste management system under the solid waste management subproject to help reduce the blockage of drains by discarded refuse.

102. It will be imperative however that the Government Agency (GA) responsible for operating the drainage network establishes a system to regularly inspect and maintain the drains, so that the infrastructure does not deteriorate and fall into disrepair, replicating the present problems. SMB and other GAs will thus be provided with a range of training, capacity building and support by present subprojects and future tranches of investment, to enable them to fulfil their management responsibilities. In the case of the urban drainage subproject the main requirements are to:

- Establish a programme of regular visual inspection of the drains and their contents and functioning to provide for the early identification of remedial action;

- Ensure that all remedial action is implemented promptly, including clearing any solid waste and other material that could cause blockages, and conducting any required physical repairs to the fabric of the drains to prevent leaks.

103. The subproject will also provide maintenance equipment, including shovels, buckets, winches, pumps and tankers, so that blockages can be dealt with. Any repairs to the *nallahs* should be small-scale, involving manual replacement of bricks and mortar, and will be carried out in the dry season to avoid the need to divert the water in the drains. If these are conducted when necessary there should be no need for major repairs during the 30-year design life of the drains.

C. Environmental impacts and benefits of the operating system

1. Physical Resources

104. As noted above, once the new drains are functioning they should contribute to an improvement in the physical appearance and condition of the town by helping to remove the large and unsightly pools of wastewater that are an almost permanent feature of the city. In combination with the repair of leaks in the water supply system under water supply subproject, the new *nallahs* should also help to ensure that similar pools do not re-form in the future. With these projects implemented the quality of the town environment would then improve significantly.

105. If the *nallahs* are inspected and repaired regularly as outlined above, repairs should be small in scale and carried out manually by small teams of men, and should thus not produce noticeable physical impacts.

106. However the removal of blockages in the *nallahs* and other drains would have adverse impacts on the appearance and environment of the area if, as is current practice, drains are unblocked by removing garbage, silt and other material, and this is simply piled alongside. Not only is this unhygienic, but it is also inefficient, as much of this material inevitably returns to the drains, where it may cause further blockage. It will be very important for SMB to end this practice by ensuring that persons employed to clean drains are provided with suitable equipment (such as shovels and wheelbarrows) and are instructed to ensure that all removed material must be deposited in the municipal waste storage bins, provided under the solid waste management subproject.

107. Water from the new drains will be discharged into a natural *nallah*. Given the relatively poor reserves of groundwater in the area, there would be some additional benefit if water from the drains was directed into the aquifer, through purpose-drilled recharging boreholes, or by simply being allowed to collect in an area of pervious ground. The water may have to be treated before directing into boreholes otherwise it might contaminate a scarce resource. However, consideration should therefore be given to including this additional design feature in this subproject.

2. Ecological Resources

108. Although the new drains will improve the environment of the town, there are unlikely to be significant ecological benefits as there are no natural habitats or rare or important species. If water from the drains was discharged into the *nallah* near the STP there could be some small ecological benefits if there was enough water to allow colonisation by marsh plants and animals. However the benefits of helping to recharge the aquifer would be more significant, so it would be more appropriate to forego the very minor ecological gain in favour of the enhancement suggested above.

3. Economic Development

109. Maintenance and repair of the *nallahs* will be small in scale and infrequent, and if carried out as described above, should have no effects on business, traffic or other economic activities. The overall improvements in the appearance and hygiene of the town provided by this and other subprojects should make the area more attractive to tourists, and in time this should bring financial benefits by helping the economy of the town to grow.

4. Social and Cultural Resources

110. Repairs to the *nallahs* should require no new excavation, in which case there should be no need for precautions to protect undiscovered archaeological or historical material. Repair work will be small in scale and conducted from inside the *nallah* so there should also be no disturbance of activities in or around any schools, hospitals, temples, tourist sites or other social or cultural resources in the vicinity. Contractors employed to conduct any repair

work should be required to operate the same kinds of Health and Safety procedures as used in the construction phase to protect workers and the public.

111. The citizens of the town will be the major beneficiaries of the improved drainage system, as the unsightly and unhygienic pools of standing wastewater will gradually disappear and should not recur in future. This should then improve the appearance and environment of the town, as well as protecting the ancient buildings and sites from the water damage they are exposed to at present. If, as expected, this ultimately brings more tourists into the town, then the citizens could benefit socio-economically from the related growth in the economy.

VII. INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MONITORING PLAN

A. Summary of environmental impacts and mitigation measures

112. **Table 7.1** lists the potential adverse impacts of the Sikar drainage 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

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

o LSGD is the Executing Agency (EA) responsible for management, coordination and execution of all activities funded under the loan.

o 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.

o 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

o Supervision Consultants (DSC), who will design the infrastructure, manage tendering of Contractors and supervise the construction process.

o 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.

o 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.

o 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.

o 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.

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

Figure 7.1: Institutional Responsibility- RUSDIP

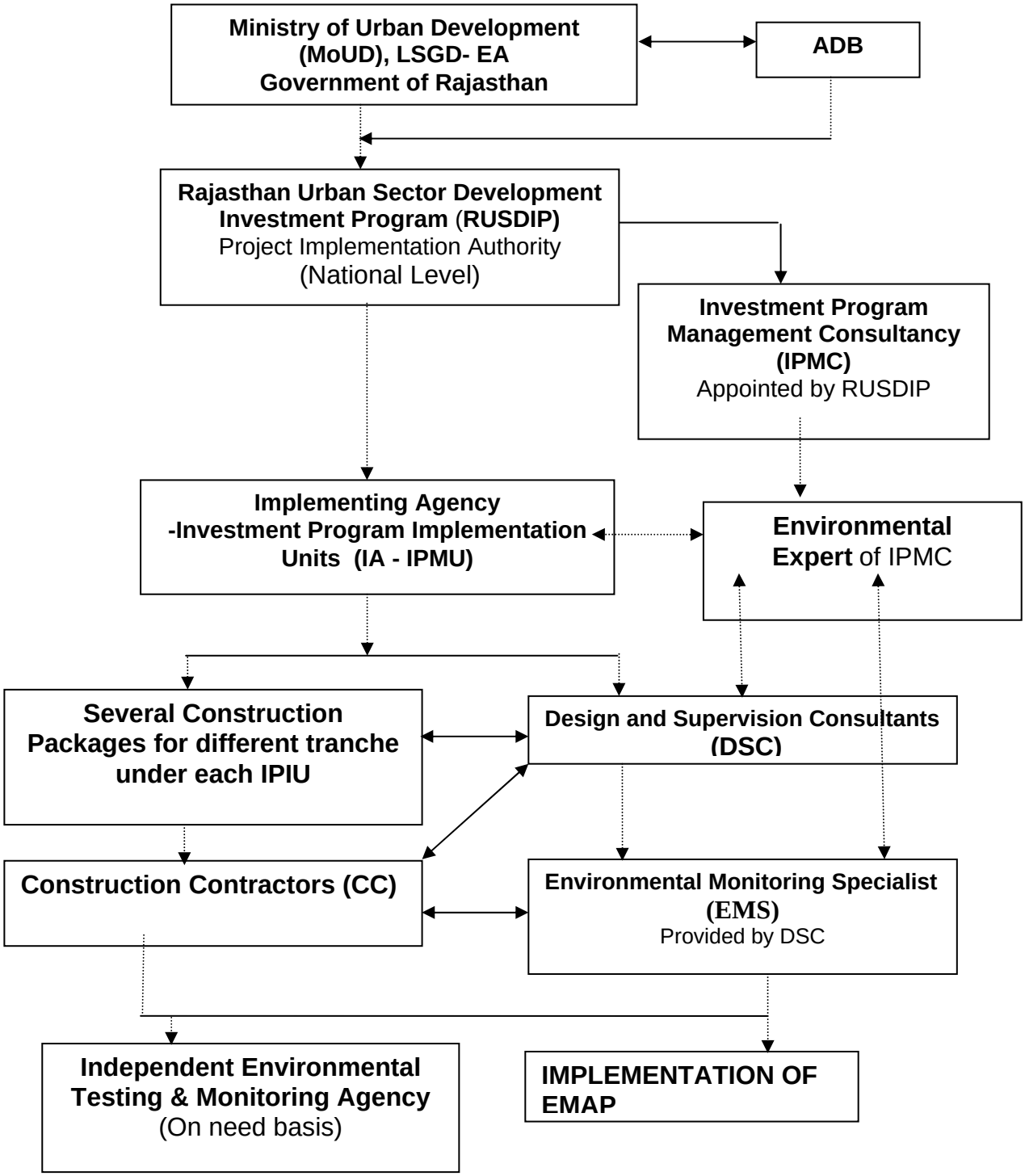


Table 7.1: Environmental impacts and mitigation for the Sikar Drainage Subproject (Black = continuous activity; Grey = intermittent)

Potential Negative Impacts	Sig	Dur	Mitigation Activities and Method	Responsibility	Location	08	2009				
Construction						D	1	2	3	Op	[3]
Excavation of trenches will produce large amounts of waste soil	M	P	Find beneficial uses for waste soil in construction, land raising and infilling of excavated areas	Contractor	All sites						+
Excavation and removal of waste soil and importation and storage of sand and other material could produce dust	M	T	Remove waste soil as soon as it is excavated	Contractor	All sites						0
			Cover soil & sand with tarpaulins when carried on trucks								0
			Only bring sand to site when needed								0
			Cover or spray stockpiles of loose material stored on site								0
Trees may be removed along drain routes	M	P	Only remove trees if it cannot be avoided	Contractor	All sites						0
			Plant and maintain three trees for every one removed								0
Some structures in ROW may need to be removed	M	P	Realign drain routes to avoid structures where possible	DSC	All sites						0
			*Compensate owners of lost structures: replacement cost	LSGD							0
Businesses may lose income if customers' access is impeded	M	T	*Compensate businesses for lost income	LSGD	All 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
			Consult businesspeople and inform of work in advance	LSGD							0
Excavation could damage other infrastructure	S	P	Determine location of water pipes, electricity pylons, etc and design scheme to avoid damage	DSC	All sites						0
			Locate different infrastructure on opposite sides of road	DSC							0
Residents may be disturbed by repeated trenching	M	T	Integrate subprojects to conduct trenching at same time	EDC/LGD	All sites						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, see Section VII.B

Potential Negative Impacts	Sig	Dur	Mitigation Activities and Method	Responsibility	Location	08	2009				
Construction						D	1	2	3	Op	3
Traffic may be disrupted by soil & vehicles on road	M	T	Keep soil, vehicles, machinery off road when possible	Contractor	All sites						0
			If work will affect road, conduct when traffic is light								0
			Ensure police provide warning signs/diversions if needed								0
			As above: increase workforce to finish this work quickly								0
Traffic in town could be disrupted by vehicles en route to and from site, delivering materials or removing waste	M	T	Plan routes to avoid narrow streets, congested roads, important/fragile buildings, key religious & tourism sites	Contractor	All sites						0
			Plan work to avoid peak traffic and main tourism season								0
Ground disturbance could damage archaeological and historical remains	S	P	Request state and local archaeological authorities to assess archaeological potential of proposed site	DSC	All sites						0
			Select alternative if site has 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							+
Sites of social/cultural importance (schools, hospitals, temples, tourism sites) may be disturbed by noise, dust, vibration and impeded access	M	T	Identify buildings at risk from vibration damage and avoid using heavy vehicles nearby	Contractor	All sites						0
			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								0
			Consult relevant authorities, custodians of buildings, local people to address issues & avoid work at sensitive times								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 site;								0

Potential Negative Impacts	Sig	Dur	Mitigation Activities and Method	Responsibility	Location	08	2009				
Construction						**D**	**1**	**2**	**3**	**Op**	3
			- Ensure that workers use Personal Protective Equipment								0
			- Provide Health & Safety Training (including process of transmission of HIV/AIDS) 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	Network 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 if local people are employed in Contractor's workforce	M	T	Contractor should employ at least 50% of workforce from communities in vicinity of construction sites	Contractor	All sites						+
Operation and Maintenance											
Appearance & environment will deteriorate if material from unblocked drains is piled on adjacent land	S	P	Drain cleaners must deposit material from blocked drains in municipal waste storage bins	GA	All drain sites						0
Water from drains could help to recharge groundwater Untreated drainage water can damage ground water resource	M	P	Discharge drain water into boreholes or porous ground Proper treatment to be done for drainage water before recharging ground water	DSC	From *nallahs*						+
Health & Safety of workers and the public could be at risk during repair work	M	T	Prepare and operate H&S Plan with same measures as used in construction phase	OMC	All sites						0

115. Resettlement issues will be coordinated centrally by a Resettlement Specialist within the IPMU, 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.

116. 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

117. **Table 7.1** shows that most mitigation activities are the responsibility of the Construction Contractors (CC) employed to build the infrastructure during the construction stage, or the O&M Contractors employed to conduct maintenance or repair work when the system is operating. Responsibility for the relevant measures will be assigned to the Contractors via the contracts through which they are appointed (prepared by the DSC during the detailed design stage), so they will be legally required to take the necessary action. There are also some actions that need to be taken by LSGD in their role as project proponent, and some actions related to the design that will be implemented by the DSC.

118. 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[4].

119. **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.

120. **Table 7.3** 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,

[4] 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)

(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.

D. Environmental management and monitoring costs

121. 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 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 compensating shopkeepers for loss of structures and/or business income (**Table 7.1)** are calculated separately in the budgets for the Resettlement Framework and Resettlement Plans so are also excluded from this analysis.

122. The remaining actions in the Environmental Management Plan are the various environmental monitoring activities to be conducted by the EMS. These have not been budgeted elsewhere, and their costs are shown in **Table 7.2.** The figures show that the total cost of environmental management and monitoring for this subproject as a whole (covering design and construction) is INR 0.69 million, ie US$ 16046.

Table 7.2: 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[5]	390,000	
Survey Expenses	Lump Sum	200,000	200,000	590,000
2. Environmental mitigation measures specially tree plantation	Lump sum	100,000	100,000	100,000
TOTAL				690,000

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

Table 7.3: 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 soil and sand when transported on trucks	All sites	Contractor	Observations on and off site	Weekly	EMS
Only bring sand to site when needed	All sites	Contractor	Site observations; CC records	Weekly	EMS
Cover or damp down soil and sand stockpiled on site	All sites	Contractor	Site observations	Weekly	EMS
Leave spaces for access between mounds of soil	All sites	Contractor	Site observations	Weekly	EMS
Provide bridges to allow people & vehicles to cross open trenches	All sites	Contractor	Site observation; resident survey	Weekly	EMS
Keep soil, vehicles, machinery off road when possible	All sites	Contractor	Site observations	Weekly	EMS
Only remove trees if it cannot be avoided	All sites	Contractor	Site observations	Weekly	EMS
Plant and maintain two trees for every one removed	All sites	Contractor	Observations on/off site; CC records	Monthly	EMS
Realign drain routes to avoid encroaching structures if possible	Where required	DSC	Site observation; design reports	Monthly	EMS
*Compensate owners (at replacement cost) for lost structures	Where required	LSGD	Owner survey; LSGD record	As needed	IMA[6]
*Compensate businesses for lost income	Where required	LSGD	Shopkeeper survey; LSGD record	As needed	IMA
Increase workforce in inhabited areas to finish work quickly	All sites	Contractor	Site observations; CC records	Monthly	EMS
Inform shopkeepers and residents of work in advance	All sites	LSGD	Resident survey; LSGD records	Monthly	EMS
Confirm location of existing infrastructure and avoid these sites	All sites	DSC	Site observation; design reports	Monthly	EMS
Locate different infrastructure on opposite sides of roads	All sites	DSC	Site observation; design reports	Monthly	EMS
Integrate subprojects to conduct trenching at same time	All sites	DSC/LSGD	Site observation; design reports	Monthly	EMS
If work will affect road, conduct when traffic is light	All sites	Contractor	Site observations; CC records	Monthly	EMS
Ensure police provide traffic diversions when required	All sites	Contractor	Site observations; CC records	Monthly	EMS
Plan transport routes to avoid narrow streets, important or fragile buildings, religious and tourism 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	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 heavy vehicles near fragile buildings	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	All sites	Contractor	Site observations; CC records; resident surveys	Monthly	EMS
Prepare and implement a site H&S Plan including personal protection from transmission of HIV/AIDS (safety of	All sites	Contractor	Site observations; CC records	Monthly	EMS

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

workers/public)					
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
Design infrastructure to avoid known locations of AC pipes	All 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
Keep accident reports and records	All sites	Contractor	CC records	Monthly	EMS
Employ at least 50% of workforce from communities near sites	All sites	Contractor	CC records; worker interviews	Monthly	EMS
OPERATION AND MAINTENANCE					
Deposit material from blocked drains in town waste storage bins	All drain sites	GA	Site observations	Monthly	
Discharge drain water into recharge boreholes or porous ground Treatment of drain water before recharging boreholes in a must to avoid contamination of groundwater resources.	From *nallahs*	DSC	Site observation; design reports	As needed	EMS
Prepare and operate H&S plan to protect workers and citizens	All sites	OM Contractor	Site observations; OMC records	Monthly	

VIII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Project stakeholders

123. Most of the main stakeholders have already been identified preliminary. 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.

124. 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, and the Government of India, Ministry of Finance

B. Consultation and disclosure to date

125. 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 animal near project site

126. Local populations are very much interested on the project and they will help project authorities in all aspects. But mitigation measures should be applied at project sites to minimise the impact on environment.

127. The public Consultation and group discussion meeting were conduct by RUIDP on Date 31 May, 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 Sikar, the environmental and social impacts of the proposed subprojects under Tranche 2 in Sikar were discussed.

128. 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 Sikar; and discussed the Government and ADB's Environment policies acts and potential environment impacts of the sub-projects in Sikar. 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.

Major Issues discussed during Public consultation are

(i) Proposed Storm Water Drain sub project is to ensure to proper dispose of rain water from the busy roads of city and it should not disturb aesthetic value of town during rainy seasons;

(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 cover the drains properly to avoid accidents;

(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 storm water drain proposal of the government and they have ensured that they will cooperate with the Executing Agency during project implementation.

C. Future consultation and disclosure

129. 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:

- Consultation during detailed design:

o 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;

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

- Consultation during construction:

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

o 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:

o 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;

o 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;

o 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

130. 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.

131. 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.

132. The process described in this document has assessed the environmental impacts of the infrastructure proposed under the Sikar Urban Drainage 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:

o Selecting routes for the proposed drains that are located entirely on government land, to avoid the need to acquire land or relocate people;

o Selecting drain dimensions to ensure that all construction can be conducted within the width of an existing easement, to avoid the need to acquire additional land.

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

134. Regardless of these and various other actions taken during the IEE process and in developing the subproject, 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 work; because the drains are located in an area where there are shops and other businesses; 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, and the cultural heritage.

135. During the construction phase, impacts mainly arise from the need to dispose of large quantities of waste soil and import sand and other building materials; and from the potential disturbance of 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:

o Finding beneficial uses for waste material;

o Covering soil and sand during transportation and when stored on site;

o Providing temporary structures to maintain access across trenches;

o Planning work to minimise disruption of traffic, business and communities.

136. Although there will be no need to acquire land or relocate people, some structures (such as shop fronts) that are encroaching into the easement may have to be removed, and roadside businesses may lose some income as access will be difficult for customers when work is in their vicinity. ADB policy requires that no-one should be worse off as a result of an ADB-funded project, so a Resettlement Plan and Framework have been prepared to deal with these and related issues. This establishes that:

o Drain alignments will be amended to avoid the removal of structures where possible;

o Where this cannot be achieved, owners will be compensated at replacement cost for any structures that have to be removed;

o Cash compensation will also be provided for any loss of business income.

137. 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:

o Assessing the archaeological potential of all proposed construction sites, and selecting alternative routes or sites to avoid any areas of medium or high risk;

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

o Developing a protocol for use in conducting all excavation to ensure that any chance finds are recognised, protected and conserved.

138. Special measures were also developed to protect workers and the public from exposure to carcinogenic asbestos fibres in the event that Asbestos Cement pipes used in the existing water supply system are uncovered accidentally during excavation work. These are to:

o Avoid all known sites of AC pipes when the locations of new infrastructure are planned in the detailed design stage;

o Train all construction personnel to raise awareness of the dangers of AC and enable early recognition of such pipes if encountered;

o Develop and apply a protocol 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).

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

o Employ in the workforce people who live in the vicinity of construction sites to provide them with a short-term economic gain;

o Consider directing water from the drains onto porous ground or into purpose-made boreholes to make a small contribution to improving groundwater reserves in the area.

140. 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 programme for its implementation.

141. Once the drains are completed it is important that they are properly maintained to prevent the infrastructure falling into disrepair and replicating the problems of the present system. The responsible agency should therefore:

o Establish a programme for the regular visual inspection of the condition and functioning of the drains;

o Ensure that blockages are cleared and repairs are conducted promptly and effectively.

142. If this is done any repairs should be small-scale and infrequent, involving the manual replacement of small areas of brick and concrete, which can be done from within the drain area and should therefore not have significant environmental impacts.

143. The main impact of the new *nallahs* will be beneficial as the unhygienic pools of wastewater that are an unsightly feature of the town at present should gradually drain away; and the improved drainage and repair of leaks in the water supply system provided by the water supply subproject should ensure that similar pools do not re-form in the future. This will improve the appearance and environment of the town, as well as protecting the ancient buildings and sites from the water damage which is an important concern at the moment. If, as expected, this attracts more tourists to the area, then there could be economic benefits for the town and its citizens.

144. **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 benefits provided by the operating scheme).

145. 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 PIU.

B. Recommendations

146. 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:

o All mitigation, compensation and enhancement measures proposed in this report (**Table 7.1**) and in the Resettlement Framework for the RUSDIP are implemented in full, as described in these two documents;

o The Environmental Monitoring Plan proposed in Section VII.C of this report and the internal and external monitoring proposed in the Resettlement Framework are also implemented in full.

X. CONCLUSIONS

147. The environmental status of the proposed improvements in urban drainage system of Sikar Town has been assessed. Issues related to Involuntary Resettlement were assessed by a process of resettlement planning and will be compensated by measures set out in detail in the Resettlement Framework for the subproject.

148. The overall conclusion of the 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.

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

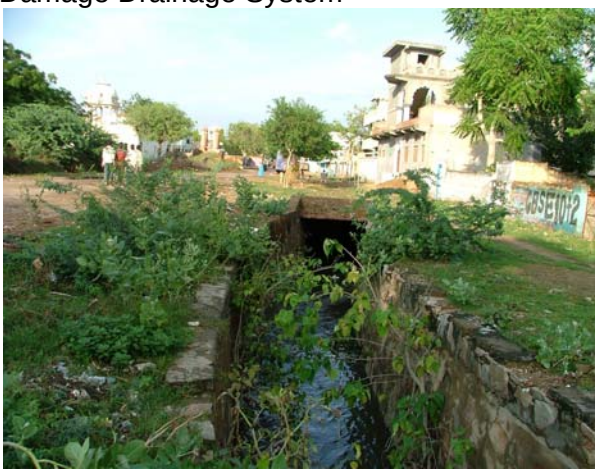
Appendix 1,

Photo gallery Sikar Drainage

Water logging Due To Insufficient Drains

Damage Drainage System

Damage Drains



Drains Chocked by Vegetations

Out fall Drain

Drains encroached by Shopkeepers

APPENDIX – 2

RAPID ENVIRONMENTAL ASSESSMENT (REA) CHECKLIST

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

Sub-Project: Drainage sub project in Sikar.

SCREENING QUESTIONS	Yes	No	REMARKS
A. Project Siting Is The Project Area…			There are six drainage sites in Sikar and all of these are passing through build up areas.
▪ Densely Populated?	Yes		
▪ Heavy with Development Activities?	Yes		
▪ Adjacent to or Within Any Environmentally Sensitive Areas?	Yes		
• 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…			
▪ impacts on the sustainability of associated sanitation and solid waste disposal systems and their interactions with other urban services.		No	No such impact is anticipated.

SCREENING QUESTIONS	Yes	No	REMARKS
▪ deterioration of surrounding environmental conditions due to rapid urban population growth, commercial and industrial activity, and increased waste generation to the point that both manmade and natural systems are overloaded and the capacities to manage these systems are overwhelmed?		No	This is only renovation work of existing facility which will make surrounding environmental condition better then existing conditions.
▪ degradation of land and ecosystems (e.g. loss of wetlands and wild lands, coastal zones, watersheds and forests)?		No	Outfall location for all these drainage lines are in natural drainage or it has been joined with STP outfall point.
▪ dislocation or involuntary resettlement of people		No	No involuntary resettlement is required for this project.
▪ degradation of cultural property, and loss of cultural heritage and tourism revenues?		No	These are already existing drainage lines and most of this is renovation work.
▪ occupation of low-lying lands, floodplains and steep hillsides by squatters and low-income groups, and their exposure to increased health hazards and risks due to pollutive industries?		No	These are already existing drainage lines and most of this is renovation work.
▪ water resource problems (e.g. depletion/degradation of available water supply, deterioration for surface and ground water quality, and pollution of receiving waters?		No	There is no surface and ground water resource in this area which may get adversely affected by the proposed project.
▪ air pollution due to urban emissions?		No	These are already existing drainage lines and most of this is renovation work.
▪ social conflicts between construction workers from other areas and local workers?		No	Mostly local labour shall be employed during construction. Therefore, no conflict situation is expected.
▪ road blocking and temporary flooding due to land excavation during rainy season?	Yes		There will be some temporary road congestion during construction phase of project.
▪ noise and dust from construction activities?	Yes		Little increase in noise levels and dust emission is anticipated from construction activities and shall be reduced by taking proper mitigation measures as and when required.
▪ traffic disturbances due to construction material transport and wastes?	Yes		Temporary disturbance in movement of traffic during construction phase of project.

SCREENING QUESTIONS	Yes	No	REMARKS
▪ temporary silt runoff due to construction?		No	Not applicable. This is only renovation work of existing facility.
▪ hazards to public health due to ambient, household and occupational pollution, thermal inversion, and smog formation?		No	Not applicable. This is only renovation work of existing facility.
▪ water depletion and/or degradation?		No	Not applicable.
▪ overdrawing of ground water, leading to land subsidence, lowered ground water table, and increase in salinity?		No	Not applicable. As there is no withdrawal of any ground water.
▪ contamination of surface and ground waters due to improper waste disposal?		No	No surface and ground water resources in this area.
▪ pollution of receiving waters resulting in amenity losses, fisheries and marine resource depletion, and health problems?		No	Not applicable. There is no surface water resource in this area and this is only renovation work of existing facility.