Government of Rajasthan
Asian Development Bank

Technical Assistance

Project Number: 40031

India: Rajasthan Urban Sector Development Investment Program (RUSDIP)

INITIAL ENVIRONMENTAL EXAMINATION (DRAFT)

JHALAWAR AND JHALRAPATAN: URBAN DRAINAGE SUBPROJECT

FEBRUARY 2007

CONTENTS

TABLES

FIGURES

PHOTOGRAPHS

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 will be implemented over a five year period beginning in late 2007, 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. Alwar, Jaisalmer and Jhalawar/Jhalrapatan are the towns chosen to benefit from the first tranche of RUSDIP investment.

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, 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 for the first tranche of funding were assessed by 13 Initial Environmental Examination (IEE) Reports and 3 Environmental Reviews, prepared according to ADB Environment Policy (2002) and Environmental Assessment Guidelines (2003). This document is the IEE report for the Jhalawar and Jhalrapatan Urban Drainage Subproject.

B. Extent of 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 that 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 classed this program as Category B and following normal procedure for MFF loans has determined that one IEE 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. Category A projects require EC from the national Ministry of Environment and Forests (MoEF). The proponent is required to provide preliminary details of the project in the form of a Notification, after which an Expert Appraisal Committee (EAC) of the MoEF prepares comprehensive Terms of Reference (ToR) for the EIA study, which are finalized within 60 days. On completion of the study and review of the report by the EAC, MoEF considers the recommendation of the EAC and provides the EC if appropriate.

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

11. The only type of infrastructure provided by the RUSDIP that is specified in the EIA Notification is solid waste management, where EC is required for all Common Municipal Solid Waste Management Facilities (facilities that are shared by more than one town)[1]. EC is thus not required for the drainage sub-project that is the subject of this IEE.

3. Review and Approval Procedure

12. For Category B projects the Draft IEE 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 for the Jhalawar and Jhalrapatan Urban Drainage Subproject. It discusses the environmental impacts and mitigation measures relating to the location, design, construction and operation of all physical works proposed under this subproject. It is one of 18 documents describing the environmental impacts and mitigation of all subprojects proposed in Tranche 1. These documents were prepared in January and February 2007 by one International and one Domestic Environmental Specialist via inputs of two and three months respectively.

II. DESCRIPTION OF THE PROJECT

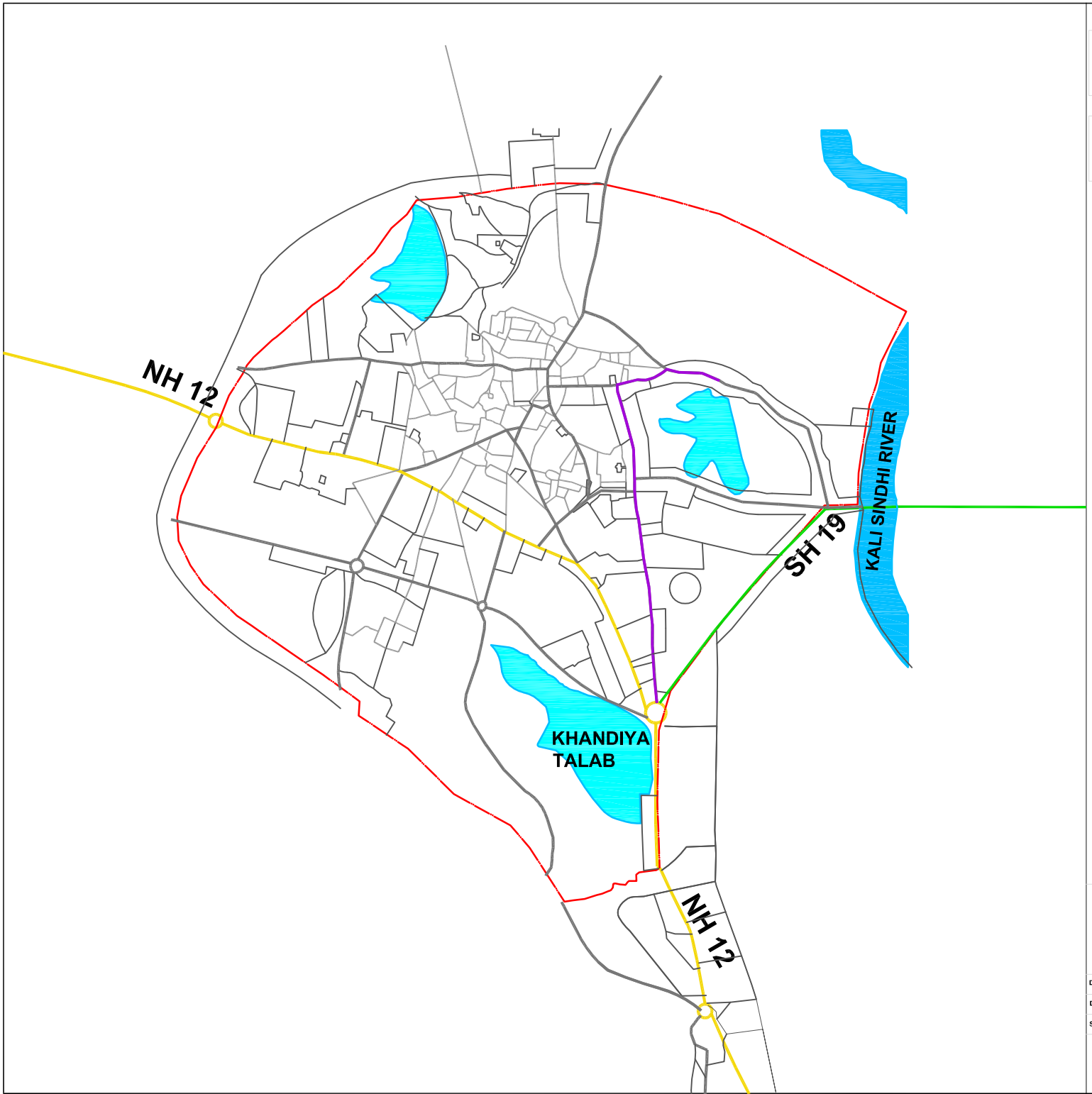
A. Type, Category and Need

14. This is an urban 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 in the two towns, but most are blocked and overflowing, and in many areas there are no drains, so water collects in low-lying areas during rainfall. 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 Jhalawar, Jhalrapatan 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 the two neighbouring towns of Jhalawar and Jhalrapatan, in Jhalawar District, in the south-east of Rajasthan in north-western India (Figure 1). The infrastructure will involve providing approximately 5 km of new concrete drains alongside various roads in the two towns (Figures 2 and 3; Photos 1 and 2).

[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 (February 2007)



RAJASTHAN URBAN SECTOR DEVELOPMENT INVESTMENT PROGRAM
(ADB TA 4814 - IND)

JHALAWAR
Proposed Drainage Network

LEGEND:

- Municipal Limit
- Water Bodies
- National Highway
- State Highway
- River

OVERLAY LEGEND:

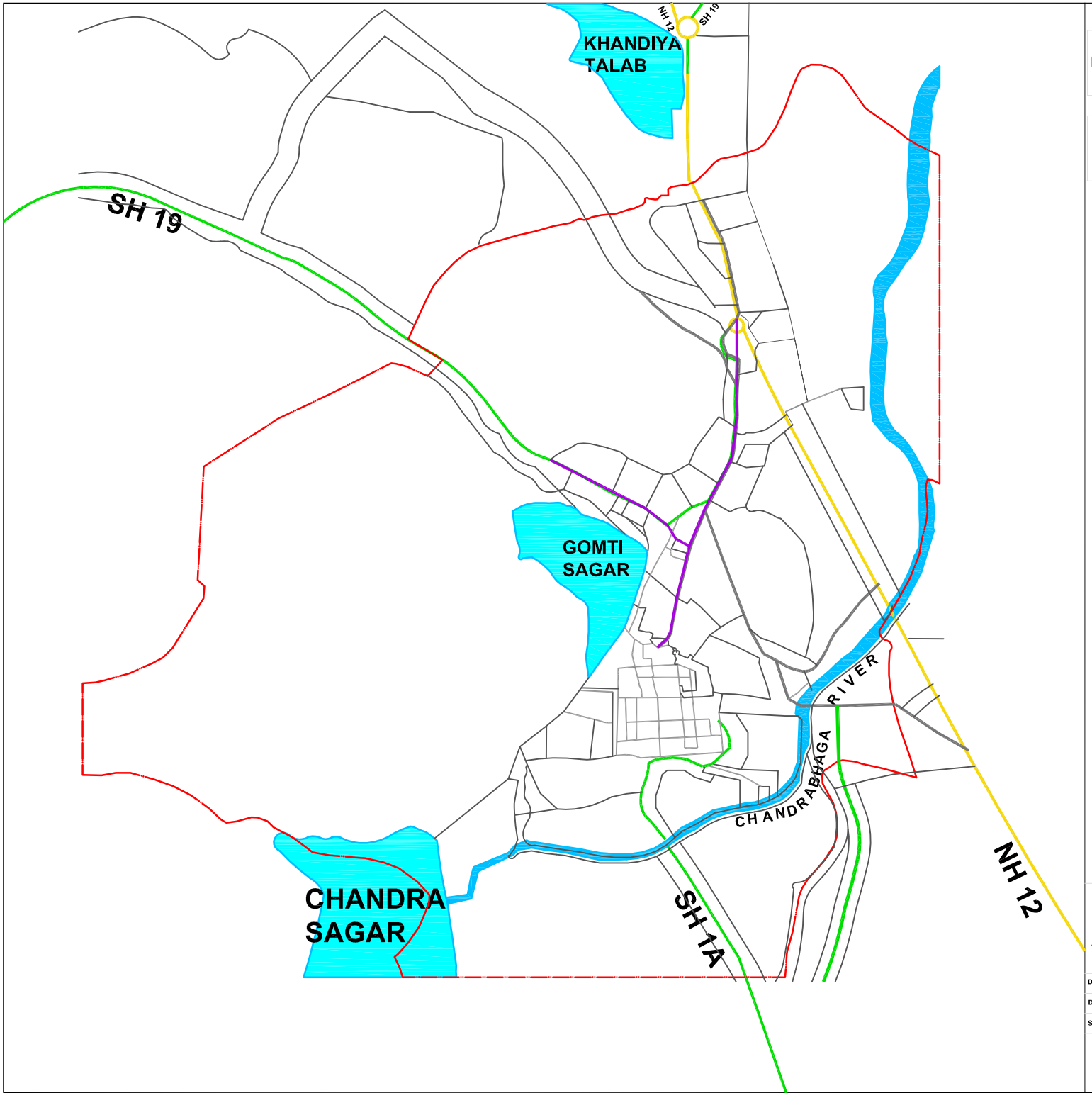
- Arterial Roads
- Sub Arterial Roads
- Other Roads
- Proposed Drain network

GOVT. OF RAJASTHAN

ASIAN DEVELOPMENT BANK

DRAWN:	CHECKED:
DATE:	APPROVED:
SCALE:	

N



RAJASTHAN URBAN SECTOR DEVELOPMENT INVESTMENT PROGRAM
(ADB TA 4814 - IND)

JHALRAPATAN
Proposed Drainage Network

LEGEND:

- Municipal Limit
- Water Bodies
- National Highway
- State Highway
- River

OVERLAY LEGEND:

- Arterial Roads
- Sub Arterial Roads
- Other Roads
- Proposed Drain network

GOVT. OF RAJASTHAN

ASIAN DEVELOPMENT BANK

DRAWN:	CHECKED:
DATE:	APPROVED:
SCALE:	

N

16. Detailed design will begin in the middle of 2007 and should be completed by the end of the year, after which construction will take six months, so all work should be completed by the middle of 2008.

C. Description of the Sub-project

17. Table 1 shows the nature and size of the various components of the subproject. There are two elements: providing new roadside drains in Jhalawar; and providing new roadside drains in Jhalrapatan (and covering an existing *nallah*). The descriptions shown in Table 1 are based on the present proposals to the extent that they are known at this stage. The details are expected to be substantially correct, although some may change as development of the subproject progresses, particularly in the detailed design stage. It should also be noted that at this stage the infrastructure has been designed in outline only, to determine overall feasibility and budget costs, so certain aspects (such as the exact length and width of each drain) have not yet been finalised.

18. The subproject will provide new storm water drains alongside the edge of certain existing roads in each town (Figures 2 and 3). The drains will be approximately 1 m wide and 1.5 m deep, with brick sides, faced with concrete, U-shaped in cross section, open at the surface. All construction will be within the Right of Way (RoW) of the road. Pre-fabricated concrete slabs will also be placed over an existing *nallah* (open concrete main drain) in Jhalrapatan to cover the drain.

III. DESCRIPTION OF THE ENVIRONMENT

A. Physical Resources

1. Location

19. Jhalawar District is located in the south-east of Rajasthan, between the longitudes of 75° 27’ 35” to 76° 56’ 48” East and latitudes of 23° 45’ 20” to 24° 52’ 17” North, adjoining the neighbouring state of Madhya Pradesh (Figure 1). Jhalawar Town is the district headquarters and lies towards the centre, with the smaller Jhalrapatan 20 km to the south-east. The two towns share a single municipal boundary, which is why they are considered jointly by RUSDIP. The municipality is an average of 316 m above Mean Sea Level, and the State capital Jaipur lies 330 km to the north and the town of Kota is 85 km to the north-west.

2. Topography, soil and geology

20. Both towns are located in the Jhalawar Plain, which is bounded in the north, south and east by the Mukunda hills. This is a fertile plain of mainly alluvial soil and is crossed by the Kalisindhi and Ahu rivers and a number of smaller streams. North-east of Jhalawar, between two ridges of hills, lies a long valley containing the artificial lakes of Kadila and Manasarowar.

21. Jhalawar District is at the edge of the Malawa plateau on Vindhyan strata at the northern edge of the great spread of basaltic rocks known as the Deccan trap formation. There are vast deposits of sandstone lying in horizontal strata around Jhalawar and Jhalrapatan, below which is a hard black rock stratum. Soil is mainly dark in colour, produced by weathering of the underlying rock, and is generally high in organic matter but low in nitrogen. The influence of the sandstone is also seen in places, where soil is looser and granular, with a more sandy texture.

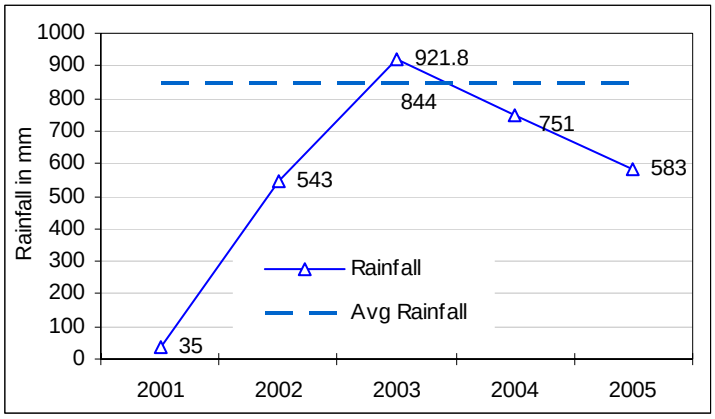
Table 1: Improvements in drainage infrastructure proposed in Jhalawar and Jhalrapatan

Infrastructure	Function	Description	Location
Drains in Jhalawar	Remove storm water runoff from alongside roads	2.8 km of new open CC drains, approximately 1 m wide and 1.5 m deep, alongside the edge of the existing road.	Road between Khandiya motor garage and Kali Sindh
Drains in Jhalrapatan	Remove storm water runoff from alongside roads	New open CC drains, approximately 1 m wide and 1.5 m deep, alongside the edge of existing roads.	1. Police Station to NH 12 Gindaur (750 m) 2. Police Station to B/mandi Chauraha 3. Krishi Upazmandi gate to B/mandi road (600 m) 4. B/mandi Charaha to Bus stand
	Cover existing concrete *nallah* (drainage channel)	New concrete slabs placed on the top of an existing concrete *nallah*	

22. According to the Vulnerability Atlas of India, Jhalawar District is in an area of low earthquake risk (Zone II), characterised by old and geologically stable rock formations. Rajasthan has not experienced a major earthquake in the recent past, but there have been 37 events with a magnitude of 5-7 since 1720. The most recent occurred in 2001 and measured 6.9 on the Richter Scale, but because the epicentre was in neighbouring Gujarat, there was only limited damage in Rajasthan, and none reported in Jhalawar or Jhalrapatan.

3. Climate

23. Like most of Rajasthan the climate of Jhalawar and Jhalrapatan is mainly dry, with significant rainfall only during the monsoon season. Winter extends from November to March, and the coolest period occurs in January when daytime temperatures average around 25 °C and often fall below 10 °C at night. Temperatures begin to rise in March and peak in May-June, when daytime values sometimes reach 48 °C. The south-west monsoon arrives in June, causing a sudden drop in temperature and increase in humidity. The long-term average rainfall is 844 mm, of which over 90% falls in the monsoon period. However, like the rest of Rajasthan rainfall has been relatively low in the past few years, and was above average only in 2003 (Figure 4). The monsoon ends in mid-September and air temperatures rise briefly, only to fall again a few weeks later with the onset of winter. Winds are generally light and northerly or north-easterly in winter and moderate to strong from the west and south-west in the monsoon.



Source: Agriculture Dept 2007

Figure 4: Average Annual Rainfall in Jhalawar 2001-2005

4. Air Quality

24. There are no data on ambient air quality in Jhalawar or Jhalrapatan, but there is a station monitored by the Rajasthan State Pollution Control Board (RPCB) at Kota, which should be representative of the general area. Data from 2004 (Table 2) shows that suspended matter is high because of the dry atmosphere and dusty roads, and Respirable Suspended Particulate Matter (RSPM: <10μm) and Suspended Particulate Matter (SPM) frequently exceed National Ambient Air Quality Standards (NAAQS). In contrast, levels of chemical pollutants (oxides of sulphur and nitrogen) are relatively low because of the limited heavy industry, which is also the case in both Jhalawar and Jhalrapatan.

Table 2: Ambient Air Quality in Kota (Annual Average, 2004; units in μg/m^3)

M. Station	Land use	SOx	NOx	RSPM	SPM
Municipal Office	Residential	6	24	90	256
Samcore Glass	Residential	6	24	99	237
NAAQ Standard	*Residential*	*60*	*60*	*60*	*140*
RSPCB Office	Industrial	7	25	98	279
NAAQ Standard	*Industrial*	*80*	*80*	*120*	*360*

RSPM: Respirable Suspended Particulate Matter; SPM: Suspended Particulate Matter
Source: Central Pollution Control Board (CPCB) 2004

5. Surface Water

25. Jhalawar District receives the most rainfall in Rajasthan and is relatively well provided with surface water as a result. All of the rivers and streams are part of the Chambal system, which is the only perennial river in the state. Kalisindhi and Ahu are the main rivers (Photo 3 and 4), and both originate in Madhya Pradesh and flow north through Jhalawar into Kota District. All of the rivers and streams are full and swiftly flowing in the monsoon, but most are dry throughout the rest of the year, except for the Kalisindhi and Ahu, which retain water in depressions known locally as *deh*. These areas were the main source of water supply for Jhalawar and Jhalrapatan until recently, when two weirs were constructed in the Kalisindhi to provide a more secure supply, at Manpur 4 km northeast of Jhalawar (2001), and at Bhawrasa 6 km southeast of Jhalrapatan (2004).

26. The Public Health Engineering Department (PHED) monitors the quality of water from the Kalisindhi River at the intakes for the Jhalawar and Jhalrapatan water supply systems, and recent data (Table 3) shows that the quality is relatively good.

Table 3: Water Quality in the Kalisindhi River, December 2006

Parameter	Units	Monitoring Location		BIS Drinking Water Standard	
		Manpura	Bhawrasa	Desirable Level	Acceptable Level
pH	-	8.3	8.1	6.5-9.0	NR
Turbidity	NTU	70	130	Unobjectionable	
Total Alkalinity	μg/m^3	80	120	NS	NS
Chloride	μg/m^3	10	15	250	1000
Sulphate	μg/m^3	ND	ND	200	400
Total Dissolved Solids	μg/m^3	104	258	500	2000
Nitrate	μg/m^3	7.5	12.5	45	100
Total Hardness	μg/m^3	70	140	300	600
Fluoride	μg/m^3	0.40	0.34	1.0	1.5

Source: PHED; BIS = Bureau of Indian Standards

27. There are no natural lakes in Jhalawar district, but there are a number of artificial lakes and tanks in and around both towns, the water from which is mainly used for irrigation. These include Chandra Sarovar, Khandia Tank, Durgapura Tank and Naya Talab in Jhalawar, and Gomti Sagar and Mundliakheri (formed by damming the Chandrabhaga River) in Jhalrapatan.

6. Groundwater

28. Jhalawar and Jhalrapatan are in the south-eastern plateau region of Rajasthan, where groundwater is mainly found in layers of basalt, sandstone and shale, intercalated with sandstone. The groundwater resource of the Jhalrapatan block covers over 1300 km^2, but is heavily exploited, mainly by abstraction for agricultural use (Table 4). The water table varies from 7 m to 15 m below ground level, and rises to 2-7 m after the monsoon.

Table 4: Groundwater Resources in Jhalawar and Jhalrapatan (2003-04)

Description	Basalt Strata	Sandstone and Shale Strata
Net annual groundwater availability	58.6219 MCM	34.4722 MCM
Annual irrigation extractions	57.8988 MCM	27.6108 MCM
Domestic extractions	2.8489 MCM	1.6859 MCM
Groundwater development stage	107 %	85 %
Category	Over exploited	Critical

Source: GoR Groundwater Department

B. Ecological Resources

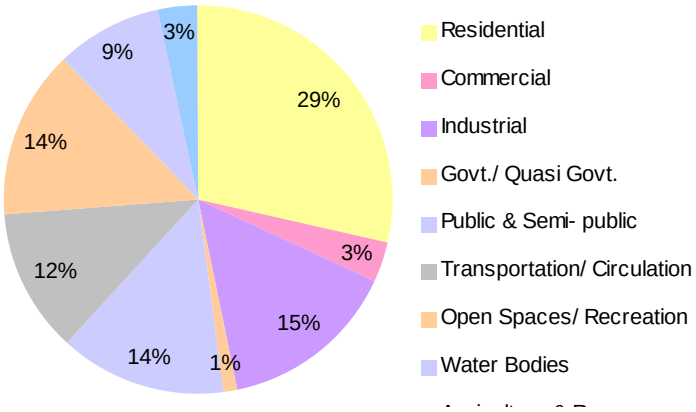
29. Jhalawar and Jhalrapatan are both urban areas surrounded by land that was converted for agricultural use many years ago (Photo 5). There is no remaining natural habitat in either town, where the flora is limited to artificially planted trees and shrubs, and the fauna comprises domesticated animals (cows, goats, pigs and chickens), plus other species able to live close to man (urban birds, rodents and some insects).

30. There are reserve forest areas in the north and north-east of Jhalawar and the north-west and south-east of Jhalrapatan, and although protected from building and most other types of activity, these contain little of ecological interest. Vegetation is sparse and comprises mainly domesticated species (Photo 6), and the fauna is also very limited. There are fish in most of the rivers and tanks outside the towns, but no aquatic areas are protected; rahu (*Labeo rihita*) and sanwal are the most common fish species.

C. Economic Development

1. Land use

31. Jhalawar Local Planning Area covers 33.09 km^2 and includes both Jhalawar (12.94 km^2) and Jhalrapatan (20.95 $km^{2)}$. According to the Master Plan for 1991-2011 (Figure 5) the main land use is residential (29%) and there are also relatively large areas of industry (15%), public land (14%), transportation (12%) and open space (14%).



Source: Jaisalmer Urban Improvement Trust

Figure 5: Land use in Jhalawar and Jhalrapatan

2. Industry and Agriculture

32. Both Jhalawar and Jhalrapatan are emerging as growing centres of commerce and industry. There are three industrial estates in Jhalawar and two in Jhalrapatan, which cover a total of 59 ha; and Rajasthan Industrial Infrastructure Corporation (RIICO) has also developed an industrial growth centre, which is currently partially occupied. Stone cutting and polishing is one of the main industries because of the large amounts of sandstone and other decorative materials quarried in surrounding hillsides, and also because of the proximity to Kota, which is famous for its stonework. There is also a large textile mill and various units related to fabrication, including PVC, agricultural accessories and handicrafts.

33. Agriculture is also important, because of the fertile plains and reasonably good rainfall, and Jhalawar District is the largest producer of coriander in the country and the second largest producer of oranges. Jhalawar and Jhalrapatan produce significant quantities of both of these crops, together with soya bean, wheat and opium. Many areas practice double cropping, and the main seasons are *kharif* (April-September: cotton, *jowar*, maize and groundnut) and *rabi* (October-March: wheat, gram, coriander, linseed, opium and sugarcane).

3. Infrastructure

34. PHED provides a piped municipal water supply to both towns (Photo 7), which is extracted from the Kalisindhi River via two separate intakes, at a rate of 6 MLD (Jhalawar) and 3.5 MLD (Jhalrapatan). In the dry season water is trapped in natural depressions in the riverbed, and also by means of the two man-made weirs at Manpur and Bhawrasa mentioned above. Water is treated by chlorination at a Water Treatment Plant in each town, and the piped distribution system reaches 90% of the population. However because of system losses (estimated at 40%), water is available for only 1-2 hours per day, and only on alternate days in the summer.

35. There is no sewerage system in Jhalawar or Jhalrapatan, and although around one third of houses have individual sanitation facilities (septic tanks or pit latrines), the rest of the population uses community toilets provided by the Municipal Boards, illegal connections from latrines to storm water drains, or practice open defecation.

36. There are roadside drains in many areas (Photo 8), alongside 30% of the roads in Jhalawar and 75% of the roads in Jhalrapatan. This includes both earth and concrete drains, but these are often poorly designed with inadequate gradients, and are frequently clogged with solid waste and polluted by sewage. There is also no drainage outfall, and water discharges onto areas of low-lying land in the town.

37. There is no proper solid waste management system in the towns, and although the Municipal Boards have designated 25 open collection points in Jhalawar and 15 in Jhalrapatan, refuse is mainly discarded in the streets and drains, and dumped on vacant plots of land. Jhalawar generates around 16 tons of solid waste per day and Jhalrapatan 9 tons, of which around 60% is collected, by manual street sweepers and irregular municipal collections by truck. Collected waste is transported on open vehicles to the outskirts of each town, where it is dumped on open ground (Photos 9 and 10).

38. Thermal power is the main source of energy in Rajasthan, contributing 89% of the electricity, compared to hydropower, which produces the remainder. State-level companies (Rajya Vidyut Utpadan Nigam Ltd, RVUN; and Rajya Vidyut Prasaran Nigam Ltd, RVPN) are responsible for power generation and transmission respectively, and distribution is provided by a regional company, the Jaipur Vidyut Vitran Nigyam Ltd (JVVNL). Power is supplied from the central grid by overhead cables carried on metal and concrete poles, mainly located in public areas alongside roads. The power supply is erratic and there are frequent outages in warmer months, and large fluctuations in voltage.

4. Transportation

39. In both towns roads are very narrow and congested in the older central areas, and as these house most of the commercial activity, there is considerable pedestrian and vehicular traffic (Photo 11). There are 53 km of roads in Jhalawar and 19 km in Jhalrapatan, of which around 30-40% are surfaced with bitumen/tar, 20-40% are concrete, < 3% are WBM (Water-borne Macadam) and the remainder (20-30%) are unpaved earth roads. All roads in Jhalrapatan and 90% of the roads in Jhalawar are maintained by the Municipal Board, and the rest are maintained by the Public Works Department (PWD). The condition of the roads is generally poor, and many are in need of repairs and resurfacing.

40. Transport in the towns is mainly by personal vehicles (mostly motorcycles and bicycles) and auto- and bicycle-rickshaws. The towns are connected to each other and to neighbouring areas by a good road network. National Highway 12 (NH 12) passes through both towns and runs north through Kota to the state capital Jaipur, and also runs south to Bhopal, the capital of Madhya Pradesh. The nearest railway station is at Ramganj Mandi, 25 km north of Jhalawar, and the nearest airport is at Jaipur, 300 km away.

D. Social and Cultural Resources

1. Demography

41. According to the national census the population of Jhalawar was 38,671 in 1991 and 48,054 in 2001, an annual growth of 2.3% over the decade; whereas in Jhalrapatan there were 23,067 people in 1991 and 30,103 in 2001, a growth of 2.9%. With a combined total of 78,157 people in a municipal area of 33.12 km^2, the population density in 2001 was 2,360 persons per km^2.

42. Overall literacy is reported at 82.1% in Jhalawar (90.5% for males and 72.8% for females) and 80.4% in Jhalrapatan (90% for males and 70.2% for females). These are both considerably better than literacy in the state as a whole, which is 60.4% overall, and 75.7% for males and 44.0% for females. The sex ratio is however significantly below the natural 1:1 ratio, with 901 and 909 females per 1000 males in the two towns, which is higher than the state average (879) but lower than the national figure (929).

43. According to the census, in 2001 only 29% of the total population of the two towns was in paid employment, significantly lower than both the state and national averages (42.1 and 39.1% respectively). This indicates that most of the townspeople are engaged in the informal sector, earning a living where they can, from small trading, casual labour, etc. Of those that are employed, almost all (92%) are involved in the service and industrial sectors, with the remainder being mostly engaged in agricultural activities.

44. Over 90% of the people are Hindus, and the remainder are mainly Muslims and Jains. The main local language is Rajasthani, the principal dialect of the state, and almost all people also speak the national language of Hindi. Other languages spoken include Gujarati, Punjabi and Kanjari. About 3.5% of the population are from Scheduled Tribes (ST), but these are part of the mainstream population; around 12.5% of the population belong to scheduled castes (SC).

2. Health and educational facilities

45. There are good basic educational facilities in Jhalawar and Jhalrapatan, which serve both townspeople and inhabitants of surrounding villages and towns in the hinterland. There are 31 primary schools, 52 secondary schools and 18 higher secondary schools in the twin towns, plus two general degree colleges and a professional training institute. The towns also benefit from the proximity of Kota city, which is one of the most important educational centres in Rajasthan.

46. As the district headquarters town, Jhalawar is the main centre for health facilities in the area. There are four hospitals (including the district hospital that is presently being upgraded to 300 bed capacity), plus a special TB hospital, two dispensaries, a mother and child welfare centre, two family welfare centres and three homeopathic hospitals.

3. History, culture and tourism

47. Jhalawar was named after its founder, Jhala Zalim Singh (I), who was the Dewan of Kota State and established the town in 1796 as a cantonment (administrative and military area) near the existing Jhalrapatan Fort. Jhalawar state separated from Kota state in 1838 under the rule of Jhala Madan Singh (grandson of Jhala Zalim Singh), who built the famous Garh Palace in 1840-1845.

48. Interlinked over the centuries, the two towns have a rich cultural heritage which includes a number of sites that are of interest both historically and more recently to tourists. These include:

- The Garh Palace (otherwise known as Jhalawar Fort), which currently houses the district collectorate and other government administrative offices (Photo 12);

- The 14th century Gagron Fort, 12 km north of Jhalawar is in a spectacular location on a remote hillside overlooking the Kalisindhi River, and is visible from the municipal water supply intakes (Photo 13);

- The ruins of the old city of Chandravati, which was largely demolished during the Muslim period, is on the left bank of the Chandrabagha River just south of Jhalrapatan;

- The 10th century Surya temple in the centre of Jhalrapatan, which contains one of the country's best preserved Surya (sun god) idols (Photo 14); the 11th century Shantinath Jain Temple; and the 14th century Chandrabhaga Temple (Photo 15), also in Jhalrapatan;

- There are also many events and festivals that attract visitors, of which the Kartik Fair held in Jhalrapatan in October and November is one of the most prominent, featuring earthen statues depicting the Hindu Ramayana epic (Photo 16).

IV. ENVIRONMENTAL IMPACTS AND MITIGATION: INFRASTRUCTURE CONSTRUCTION

A. Screening out areas of no significant impact

49. From the descriptions given in Section II.C it is clear that implementation of the subproject will cause some disruption of traffic and other activities (shops, businesses) in areas where drains are built, but that construction will be relatively small in scale and will involve generally straightforward methods.

50. Because of this there are several aspects of the environment that are not expected to be affected by the construction process and these factors can be screened out of the assessment at this stage as required by ADB procedure. These are shown in Table 5, with an explanation of the reasoning in each case.

51. These environmental factors have thus been screened out and will not be mentioned further in assessing the impacts of the construction process.

Table 5: 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 either town
Coastal resources	Jhalawar and Jhalrapatan are not located in a coastal area
Development of agriculture and minerals	There are none of these developments near sites of these works
Population and communities	Construction will not affect population numbers, location or composition

B. Roadside Drains

1. Construction method

52. As explained above, this subproject will involve the following:

- Construction of approximately 5 km of storm-water drains alongside various roads in the two towns;
- Covering part of an existing concrete *nallah* in Jhalrapatan with concrete slabs.

53. Trenches for each drain will be excavated by backhoe diggers (Photo 18), and soil will be loaded onto trucks for disposal. Once a cavity approximately 1 m wide and 1.5 m deep has been created, a mix of aggregate and concrete will be poured in to a depth of around 10-15 mm to form the foundations of the drain. A single skin of bricks will then be applied to each side by hand to form the walls of the drain, and after drying, the top and inside surface of each wall will be finished with a mortar covering.

54. Pre-fabricated concrete slabs will be brought to the *nallah* on a truck and offloaded and placed into position over the top of the drain by hand.

55. The operation will be conducted by small teams of 10-15 men, comprising masons, labourers, backhoe and truck drivers, surveyors and supervisors. Each team will construct the drains along a short length of road (approximately 10-20 m) before moving on to the adjacent length.

2. Physical Resources

56. This work will involve straightforward construction, alongside relatively short lengths of road, so if appropriate precautions are taken, physical impacts should not be greatly significant.

57. Construction of 5 km of drains that are 1 x 1.5 m in cross section will require the excavation of around 7,500 m^3 of soil, which will need to be removed and disposed of. Although this is a relatively small quantity compared to the amounts of waste produced by other subprojects, it is still large enough to cause physical impacts (on air quality, topography, soil quality, etc) at both construction and disposal sites. In addition, because this work will almost certainly be conducted in the dry season, some dust will be produced during excavation, and this could be increased by the importation of building materials (bricks, sand and cement) to construct the drains.

58. It would be advisable therefore to apply the same kind of mitigation as adopted in other subprojects to reduce physical impacts at both construction and disposal sites, by controlling dust and reducing the amount of material to be dumped. The Contractor should therefore:

- 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 dust by removing waste material as soon as it is produced (by loading directly onto trucks);
- Use tarpaulins to cover sand and soil when transported to and from the site by truck;

- Plan the work carefully so that sand is only brought to site when needed;
- Cover or spray stockpiles of loose material stored on site to reduce dust during dry and windy weather.

59. The other physical impact that is often associated with excavation is the effect on drainage and the local water table if groundwater and surface water collect in dug areas. However, this should not be a problem in this case, given the low rainfall in this part of the country and the relatively deep water table (10-15 m), plus the fact that, as noted above, excavation will probably be conducted in the dry season.

60. Physical impacts will be further reduced by the method of working, because as noted above construction teams will work on a relatively short length of drain (approximately 10-20 m) at a time, before moving onto the next similar length when completed. This will mean that physical (and other) impacts will be localised and relatively short in duration, lasting for a maximum of around one to two weeks at any one site. Because of this and the mitigation measures proposed above, impacts on the physical environment should not be of major significance.

3. Ecological Resources

61. There are no areas in or around Jhalawar or Jhalrapatan that are protected for nature conservation purposes, and no known areas of ecological interest, so the drain construction should have no ecological impacts. There are however, mature trees alongside roads in places, and these should not be removed to construct drains unless it cannot be avoided. If any trees are removed the Contractor should be required to plant and maintain two trees of the same species for every one that is cut down.

4. Economic Development

62. All of this work will be conducted within the RoW of existing roads, so there should be no need to acquire land from private owners, and there should therefore be no direct impacts on the income or assets of landowners or the livelihoods of tenants.

63. There are however some structures encroaching into the RoW in places (shop fronts, boundary walls of houses, Photo 17), 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 if income-generating structures have to be 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 RoW 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.

64. Shops and other businesses located alongside roads where drains are built will also experience economic impacts as the presence of trenches, excavated material, workers and vehicles may discourage customers from visiting shops when work is in their vicinity. Although

the resulting losses of income will be relatively short-lived they could still be significant, particularly for small traders and other businesses that exist on low profit margins. These impacts will therefore need to be reduced by:

- Compensating shopkeepers and other affected businesses for lost income (through mechanisms established by the Resettlement Framework);
- Leaving spaces for access between mounds of excavated soil and other stored materials and machinery;
- Providing footbridges for pedestrians and metal sheets for vehicles to maintain access across trenches where required;
- Maximising the workforce and optimising working methods to ensure that work at each site is completed as quickly as possible;
- Consulting affected businesspeople and informing them in advance when work will occur near their premises.

65. Traffic could 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 roads wherever possible;
- Where there is not enough space alongside the road for this to be achieved, conduct the work during periods when traffic is light, for example on a Sunday;
- Liaise with the town police to ensure that warning signs and traffic diversions are provided when work will restrict movement of vehicles;
- Increase the workforce in such areas to ensure that work is completed quickly;
- Schedule deliveries of materials for periods of low traffic volume.

66. Traffic and other economic activities could be disrupted elsewhere in the town by heavy vehicles bringing equipment and materials to the site, and trucks removing waste soil for disposal. There is also a risk that vibration from such vehicles could damage fragile buildings. The Contractor should therefore adopt the following additional precautions:

- Plan transportation routes with the Municipal Boards to avoid sensitive areas as far as possible, including narrow streets, congested roads, important or fragile buildings and key sites of religious, cultural and tourism importance;
- Schedule the transportation of waste and delivery of materials to avoid peak traffic periods, the main tourism season, and other important times.

67. Excavation could also damage existing infrastructure, in particular water supply 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 the Municipal Boards of the nature and location of all infrastructure, and planning drain alignments carefully to avoid any conflict or damage;
- Integrating construction of the various infrastructure projects conducted in Jhalawar and Jhalrapatan (in particular water supply, drainage and sewerage) so that:

- Different infrastructure is located on opposite sides of the road where feasible;
- Roads and inhabitants are not subject to repeated disturbance by construction in the same area at different times for different purposes;

5. Social and Cultural Resources

68. Rajasthan is an area with a rich and varied cultural heritage that includes many forts and palaces from the Rajput and Mughal periods, and large numbers of temples and other religious sites, so there is a risk that any work involving ground disturbance could uncover and damage archaeological and historical remains. In this case the excavation will occur alongside several long-established roadways in towns that have been inhabited for many centuries, so there could be a significant risk of such discoveries. 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 historical and archaeological authorities at both national and state level to obtain an expert assessment of the archaeological potential of all proposed drain sites;
- Considering alternative drain routes if any locations are of medium or high risk;
- Including state and local archaeological, cultural and historical authorities and interest groups in consultation forums as project stakeholders so that their expertise can be made available to the project;
- Developing a protocol for use by the Contractor in conducting any excavation work, to ensure that any chance finds are recognised and measures are taken to ensure they are protected and conserved. This should involve:
  - Having excavation observed by a person with archaeological field training;
  - Stopping work immediately to allow further investigation if any finds are suspected;
  - Calling in the state archaeological authority if a find is suspected, and taking any action they require to ensure its removal or protection in situ.

69. There are also certain modern-day social and cultural resources in the vicinity of these sites, including schools, clinics, temples and sites of tourism importance. These could also be affected by the work, in particular by noise, dust, interrupted access, and vibration from heavy vehicles and machinery. Given the historical importance of these towns, any such damage or disruption could be significant. Mitigation will therefore 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 already recommended above, including:

- Consulting the town authorities to identify any buildings at risk from vibration damage and planning transportation routes to avoid heavy traffic passing nearby;
- Limiting production of dust by removing waste quickly, covering and watering stockpiles, importing sand only when needed, and covering soil and sand when transported;
- 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 the Municipal Boards, 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 or cultural festivals;

70. There is invariably a safety risk when construction 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.

71. 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 infrastructure will be planned to avoid locations of existing AC pipes so AC pipes should not be discovered accidentally.

72. 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:
    - o Removal of all persons to a safe distance;
    - o Usage of appropriate breathing apparatus and protective equipment by persons delegated to deal with the AC material;
    - o Procedures for the safe removal and long-term disposal of all asbestos-containing material encountered.

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

73. 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.

V. ENVIRONMENTAL IMPACTS AND MITIGATION: OPERATION AND MAINTENANCE

A. Screening out areas of no significant impact

74. 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 sectors which should be unaffected once the system begins to function. These are identified in Table 6 below, with an explanation of the reasoning in each case. These factors are thus screened out of the impact assessment and will not be mentioned further.

Table 6: Fields in which operation and maintenance of the completed infrastructure 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 in or outside either town
Coastal resources	Jhalawar and Jhalrapatan are not located in a coastal area

B. Operation and maintenance of the improved drainage system

75. Open drains need regular maintenance because, as shown by the existing system, they can rapidly become blocked by garbage and other material, causing overflows and damaging the drains and other infrastructure. It will be very important therefore that the Government Agency (GA) responsible for operating the drainage network establishes a system of regular inspection and maintenance to ensure that the infrastructure does not deteriorate and fall into disrepair, replicating the problems of the present system. This should involve:

- A programme of regular visual inspection of the drains and their contents and functioning to enable the early identification of remedial action;
- Prompt remedial action, including clearing any solid waste and other material that could cause blockages, and conducting any required physical repairs to prevent leaks.

76. RUSDIP will provide training and funding to enable the GA to fulfil these functions, and it will also provide equipment to assist in the maintenance of drains, including shovels, buckets, winches, pumps and a tanker. Any repairs to the drains should then 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

1. Physical Resources

77. 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 storm water during rainfall and avoiding some of the flooding of roads and adjacent areas that occurs during the monsoon.

78. If the drains 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.

79. There could be adverse physical impacts however if blockages in drains are dealt with according to current practice, whereby removed silt and other material is simply piled on the surface alongside the drain. Not only is this unhygienic, it is also inefficient, as much of the material inevitably returns to the drain, where it may cause further blockage. It will be very important for the Municipal Boards to end this practice by ensuring that persons employed to clean drains are provided with suitable equipment (which can be as simple as shovels and wheelbarrows) and are instructed that all removed material must be deposited in the municipal waste storage bins, provided under the Solid Waste Management Subproject.

80. Given the low reserves of groundwater in and around both towns, there would be some small benefit if water from the new drains was directed into the aquifer, through purpose-drilled recharging boreholes, or by simply being allowed to collect in an unused area of pervious ground. Consideration should therefore be given to including this additional design feature in this subproject.

2. Ecological Resources

81. As there are no significant ecological resources in or around either town, the operation of the drains and any routine maintenance and repair work should have no ecological impacts.

3. Economic Development

82. The new drains will improve the infrastructure of the towns by removing surface water runoff and preventing some of the flooding and associated damage that occurs during the monsoon. There will therefore be economic benefits for people and businesses who would otherwise suffer flood damage to their goods and property. The improvements in the appearance and hygiene of the towns provided by this and other subprojects should also make the area more attractive to tourists, which could bring further economic benefits in the future.

83. The small scale of any repairs should allow work to be conducted without significantly disrupting traffic or other activities, and because such work will be infrequent and short in duration, there should be no economic or other implications. To maintain the safety of workers and road-users, any repairs should be coordinated with the local police department so that adequate warning signs and traffic diversions can be set up when necessary.

4. Social and Cultural Resources

84. Repairs to the drains should not involve new excavation, so there will be no need for precautions to protect undiscovered archaeological or historical material. The small scale and infrequent nature of the work should also mean that it will not disrupt activities in or around any schools, hospitals, temples, tourist sites or other social or cultural resources in the vicinity. Contractors should however be required to operate the same kind of Health and Safety procedures as in the construction phase, to protect workers and citizens.

85. The people of the town will benefit from the new drains because the provision of better quality infrastructure will improve the functioning and overall environment of the towns in which they live. There could also be socio-economic benefits if these improvements attract more visitors, as suggested above.

VI. ENVIRONMENTAL IMPACTS AND MITIGATION: LOCATION AND DESIGN

86. 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.

87. In many environmental assessments there are certain effects that, although they will occur during either the construction or operation stage, should be considered as impacts primarily of the location or design of the project, as they would not occur if an alternative location or design was chosen. For example, if a drain with an inadequate gradient becomes blocked and ineffective, this is clearly an impact of the design as it would not occur if a drain with a greater slope had been provided.

88. However in the case of this subproject it is not considered that there are any impacts that are a result of the design or location. This is because:

- The subproject is relatively small in scale and involves straightforward construction and low-maintenance operation, so it is unlikely that there will be major impacts;
- Most of the predicted impacts are associated with the construction phase and will occur because that process is invasive, involving the creation of trenches. However, the routine nature of the impacts means that most can be mitigated relatively easily;
- In one of the major fields where there could be significant impacts (archaeology), the impacts are clearly a result of the construction process rather than the project design or location as they would not occur if there was no trenching.

VII. INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MONITORING PLAN

A. Summary of environmental impacts and mitigation measures

89. Table 7 lists the potential adverse impacts of the Jhalawar and Jhalrapatan Urban 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

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

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

The Implementing Agency (IA) is the Project Management Unit of the ongoing RUIDP, which will be expanded to include a broader range of skills and representation from the Urban Local Bodies (ULB, the local government in each town). Assigned as the RUSDIP Investment Program Management Unit (IPMU), this body will coordinate construction of subprojects across all towns, and ensure consistency of approach and performance.

The IPMU will be assisted by Investment Program Management Consultants (IPMC) who will manage the program and assure technical quality of design and construction; and Design and Supervision Consultants (DSC), who will design the infrastructure, manage tendering of Contractors and supervise the construction process.

Investment Program Implementation Units (IPIU) will be established in seven zones across the State to manage implementation of subprojects in their area. IPIUs will be staffed by professionals seconded from government departments (PHED, PWD), ULBs, and other agencies, and will be assisted by consultants from the IPMC and DSC as necessary.

The IPMU will appoint Construction Contractors (CC) to build elements of the infrastructure in a particular town. The CCs will be managed by the IPIU, and construction will be supervised by the DSC.

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

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

Table 7: Environmental impacts and mitigation for the Jhalawar and Jhalrapatan Urban Drainage Subproject (Black = continuous activity; Grey = intermittent)

Potential Negative Impacts	Sig	Dur	Mitigation Activities and Method	Respon sibility	Location	07	2008				09	
Construction: Road surface and drains						D	1	2	3	4	Op	[3]
Excavation of drains will produce a fairly large amount of waste	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
Some roadside trees may need to be removed	M	P	Only remove trees if it cannot be avoided	Contractor	All sites							0
			Plant and maintain two 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 maintain access for people & vehicles	Contractor								0
			Optimise workforce and approach to finish work quickly	Contractor								0
			Consult businesspeople and inform of work in advance	LSGD								0
Traffic may be disrupted by soil and vehicles on road	M	T	Keep soil, vehicles, machinery off roads where possible	Contractor	All sites							0
			If work will affect road, conduct when traffic is light									0
			Ensure police provide signs and diversions when needed									0
			Schedule delivery of material for times when traffic is light									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 and tourism sites	Contractor	All sites							0
			Plan work to avoid peak traffic and main tourism season									0
Trenching could damage other infrastructure	S	P	Confirm location of infrastructure and avoid these sites	DSC	All sites							0
			Locate different infrastructure on opposite sides of road									0
Roads/people may be disturbed by repeated trenching	M	T	Integrate subprojects to conduct trenching at same time	DSC/LGD	All sites							0
Ground disturbance could damage archaeological and historical remains	S	P	Request state and local archaeological authorities to assess archaeological potential of the site	DSC	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

			Select alternatives 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) may be disturbed by noise, dust, vibration and impeded access	M	T	Identify buildings at risk from vibration damage. Plan work and transport routes to avoid 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
			- Ensure that workers use Personal Protective Equipment										0
			- Provide Health & Safety Training for all personnel;										0
			- Follow documented procedures for all site activities;										0
			- Keep accident reports and records.										0
Existing water supply system uses AC pipes, a material that can be carcinogenic if inhaled as dust particles	S	T	Design infrastructure to avoid known locations of AC pipes	DSC	Network								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	Network sites								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 work site	Contractor	All sites								+
Operation and Maintenance													
Appearance and 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	Drains								0
Water from drains could help to recharge groundwater	M	P	Discharge drain water into boreholes or porous ground	DSC	Drains								+
Any repairs carry some risk to H&S of workers & citizens	M	T	Operate same H&S procedures as used in construction	OMC	All sites								0

91. 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.

92. Environmental issues will be coordinated by an Environmental Specialist within the IPMU, 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

93. Table 6 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.

94. 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].

95. Table 7 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.

96. Table 8 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

[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)

Table 8: Environmental Monitoring Plan

Mitigation Activities and Method	Location	Responsible for Mitigation	Monitoring Method	Monitoring Frequency	Responsible for Monitoring
CONSTRUCTION					
Find beneficial uses for waste soil (construction, land raising, infill)	All sites	Contractor	Site observations; CC records	Monthly	EMS
Remove waste soil as soon as it is excavated	All sites	Contractor	Site observations	Weekly	EMS
Use tarpaulins to cover dry soil and sand when carried on trucks	All sites	Contractor	Observations on and off site	Weekly	EMS
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 and vehicles to cross trenches	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 and off site; CC records	Monthly	EMS
Realign drain routes to avoid encroaching structures if possible	All sites	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[5]
*Compensate businesses for lost income	Where required	LSGD	Shopkeeper survey; LSGD record	As needed	IMA
Maximise workforce and optimise approach to finish work quickly	All sites	Contractor	Site observations; CC records	Monthly	EMS
Inform businesspeople and residents of work in advance	All sites	LSGD	Resident surveys; LSGD record	Monthly	EMS
Keep soil, vehicles, machinery off roads where possible	All sites	Contractor	Site observations	Weekly	EMS
Ensure police provide traffic signs and diversions when necessary	All sites	Contractor	Site observations; CC records	Monthly	EMS
If work will affect road, conduct when traffic is light	All sites	Contractor	Site observations; CC records	As needed	EMS
Schedule delivery of materials for times when traffic is light	All sites	Contractor	Site observations; CC records	Weekly	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
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

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

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	LSGD records; meeting records	As needed	EMS
Develop and apply archaeological protocol to protect chance finds	All sites	DSC/CC	DSC and CC records; site observations	Weekly	EMS
Identify fragile buildings and avoid heavy vehicle use nearby	All sites	Contractor	Observations on and off site; CC records	Weekly	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
Use modern vehicles and machinery and maintain as specified	All sites	Contractor	Site observations; CC records	Monthly	EMS
Prepare and implement a site H&S Plan (safety of workers/public)	All sites	Contractor	Site observations; CC records	Monthly	EMS
Exclude public from the site	All sites	Contractor	Site observations; CC records	Monthly	EMS
Ensure that workers wear Personal Protective Equipment	All sites	Contractor	Site observations; CC records	Monthly	EMS
Provide Health and Safety training for all personnel	All sites	Contractor	CC records; worker interviews	Monthly	EMS
Follow documented procedures for all site activities	All sites	Contractor	Site observations; CC records	Monthly	EMS
Keep accident reports and records	All sites	Contractor	CC records	Monthly	EMS
Design infrastructure to avoid known locations of AC pipes	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
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	From drains	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	

measures shown in Table 7 have been consolidated to avoid repetition, and there has been some re-ordering to present together those measures that relate to the same activity or site. The EMP describes: (i) mitigation measures, (ii) location, (iii) measurement method, (iv) frequency of monitoring and (v) responsibility (for both mitigation and monitoring). It does not show specific parameters to be measured because as indicated above, most measures will be checked by simple observation, by checking of records, or by interviews with residents or workers.

D. Environmental management and monitoring costs

97. 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) are calculated separately in the budgets for the Resettlement Framework and Resettlement Plans so are also excluded from this analysis.

98. 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 9. The figures show that the total cost of environmental management and monitoring for this subproject as a whole (covering design and construction) is INR 0.4 million, ie US$ 9,000.

Table 9: 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	100,000[6]	300,000	
Survey Expenses	Sum	100,000	100,000	400,000
TOTAL				400,000

VIII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Project stakeholders

99. Most of the main stakeholders have already been identified and consulted during preparation of this IEE, and any others 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 in the vicinity of the construction sites;
- Custodians and users of socially and culturally important buildings in the area;
- State and municipal highways and drainage authorities;

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

- State and local authorities responsible for the protection and conservation of archaeological relics and historical sites and artefacts;
- State and local tourism authorities.

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, etc);
- NGOs and CBOs working in affected communities;
- Other community representatives (prominent citizens and businesspeople, religious leaders, elders, women's groups);
- The beneficiary community in general; and
- The ADB.

B. Consultation and disclosure to date

100. Two forms of public consultation have been used during preparation of the IEE, to discuss the project and involve the community in planning the mitigation measures and develop the Environmental Monitoring Plan. These are:

- A public meeting was held in Jhalawar/Jhalrapatan in March 2007, to which representatives of primary and secondary stakeholders were invited. Attendees were informed about the aim of the various subprojects and the benefits they would bring, together with their likely impacts and the ways in which they would be mitigated. Participants were invited to discuss their views and concerns, which were then incorporated into the IEE. Appendix 1 contains a summary of the meeting;
- *Ad hoc* discussions were also held on site with people and communities who could be affected by the subprojects, so that views could be expressed in a less formal setting. These were also considered in preparing the IEE.

This IEE will be disclosed to the public by making it available on the ADB website, together with the IEEs prepared for the other subprojects and the summary IEE (SIEE) describing the impacts and mitigation of all subprojects.

C. Future consultation and disclosure

101. LSGD will extend and expand the consultation and disclosure process significantly during implementation of RUISDP. 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:

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

Consultation during construction:

- Public meetings with affected communities to discuss and plan work programmes and allow issues to be raised and addressed once construction has started;
- Smaller-scale meetings to discuss and plan construction work with individual communities to reduce disturbance and other impacts, and provide a mechanism through which stakeholders can participate in subproject monitoring and evaluation;

Project disclosure:

- Public information campaigns (via newspaper, TV and radio) to explain the project to the wider city population and prepare them for disruption they may experience once the construction programme is underway;
- Public disclosure meetings at key project stages to inform the public of progress and future plans, and to provide copies of summary documents in Hindi;
- Formal disclosure of completed project reports by making copies available at convenient locations in the study towns, informing the public of their availability, and providing a mechanism through which comments can be made.

IX. FINDINGS AND RECOMMENDATIONS

A. Findings

102. The process described in this document has assessed the environmental impacts of the infrastructure proposed under the Jhalawar and Jhalrapatan 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 one important measure was included in the outline designs for the infrastructure. This was to:

- Construct all drains within the RoW of the existing roads, to avoid the need to acquire land or relocate people;

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

103. Regardless of this and other action taken during the IEE process and in developing the subproject, there will still be impacts on the environment during the construction process and when the new drains are operating. This is mainly because of the invasive nature of trenching

work; because it will occur 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.

104. During the construction phase, impacts mainly arise from the need to dispose of waste soil and import sand and other building materials; and because construction of drains will inevitably cause some disruption of traffic and activities on and alongside the road. These are common impacts of construction in urban areas, and there are well developed methods for their mitigation. These include:

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

105. Although there will be no need to acquire land or relocate people, some structures (such as shop fronts) that are encroaching into the RoW 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:

- Drain alignments will be amended to avoid the removal of structures where possible;
- Where this cannot be achieved, owners will be compensated at replacement cost for any structures that have to be removed;
- Cash compensation will also be provided for any loss of business income.

106. One field in which impacts are much less routine is archaeology, and here a series of specific measures have been developed to avoid damaging important remains. These include:

- Assessing the archaeological potential of each the site, and considering an alternative drain alignment if locations are considered to be of medium or high risk;
- Including archaeological, cultural and historical authorities and interest groups as project stakeholders to benefit from their expertise;
- Developing a protocol for use in conducting all excavation to ensure that any chance finds are recognised, protected and conserved.

107. 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 encountered accidentally during excavation work. These are to:

- Avoid all known sites of AC pipes when the locations of new infrastructure are planned in the detailed design stage;
- Train all construction personnel to raise awareness of the dangers of AC and enable early recognition of such pipes if encountered;
- 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).

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

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

109. These and the other mitigation and enhancement measures are summarised in Table 7, which also shows the location of the impact, the body responsible for the mitigation, and the programme for its implementation.

110. Once the drains are operating they will need regular maintenance to avoid replicating the problems of the existing drains, which are blocked with garbage, overflowing and leaking. The responsible agency should therefore:

- Establish a program for the regular visual inspection of the condition and functioning of the drains;
- Ensure that blockages are cleared and repairs are conducted promptly and effectively.

111. If this is done, 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.

112. When they are operating the new drains will remove surface water runoff and prevent some of the flooding of roads and adjacent areas that occurs during the monsoon. This will provide economic benefits to people and businesses whose property and goods would otherwise be damaged. The new drains will also contribute with other subprojects to improving the quality of the infrastructure and overall environment of the towns, which might bring further economic benefits in the future by attracting more visitors.

113. Table 7 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).

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

115. Finally, stakeholders were involved in developing the IEE through both face-to-face discussions on site and a large public meeting held in each town, after which views expressed were incorporated into the IEE and the planning and development of the project. The IEE will be made available at public locations in the towns and will be disclosed to a wider audience via the ADB website. The consultation process will be continued and expanded during project implementation, when a nationally-recognised NGO will be appointed to handle this key element

to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation.

B. Recommendations

116. There are two straightforward but essential recommendations that need to be followed to ensure that the environmental impacts of the project are successfully mitigated. These are that LSGD should ensure that:

- All mitigation, compensation and enhancement measures proposed in this IEE report (Table 7) and in the Resettlement Framework for the RUSDIP are implemented in full, as described in these two documents;
- The Environmental Monitoring Plan proposed in Section VI.C of this report and the internal and external monitoring proposed in the Resettlement Framework are also implemented in full.

X. CONCLUSIONS

117. The environmental impacts of the infrastructure improvements proposed by the Jhalawar and Jhalrapatan Urban Drainage Subproject have been assessed by the Initial Environmental Examination reported in this document, conducted according to ADB guidelines. Issues related to Involuntary Resettlement were assessed by a parallel process of resettlement planning and will be compensated by measures set out in detail in the Resettlement Framework for the subproject. These measures were integrated into the IEE and are summarised in this report.

118. The overall conclusion of both processes is that providing 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 improvements in the overall environment of the town once the scheme is in operation.

119. There are no uncertainties in the analysis, and no additional work is required to comply with ADB procedure or national law. There is thus no need for further study or Environmental Assessment.

Photo 1: Proposed drain alignment, Jhalawar

Photo 2: Proposed drain alignment, Jhalrapatan

Photo 3: Kalisindh River

Photo 4: Ahu River

Photo 5: Agriculture land in the outskirts

Photo 6: Domesticated bushes and shrubs

Photo 7: Piped water supply in Jhalrapatan

Photo 10: Open dumping of solid waste

Photo 8: Roadside drains in Jhalawar

Photo 11: Heavy vehicle & pedestrian traffic

Photo 9: Open dumping/buring of solid waste

Photo 12: Garh Palace

Photo 13: Gagroan fort

Photo 16: Earthen statues in Jalrapatan

Photo 14: Chndrabagha temple, Jhalrapatan

Photo 17: Encroachment onto drains

Photo 15: Surya temple, Jhalrapatan

Photo 18: Backhoe digger for trenching