Government of Rajasthan
Asian Development Bank

Technical Assistance

Project Number: 40031

India: Rajasthan Urban Sector Development Investment Program (RUSDIP)

INITIAL ENVIRONMENTAL EXAMINATION (DRAFT)

ALWAR: URBAN TRANSPORT AND ROADS SUBPROJECT

FEBRUARY 2007

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I. INTRODUCTION

A. Purpose of the report

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

2. RUSDIP 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 Jahalawar/Jalarpatan 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 Alwar Urban Transport and Roads 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 transportation 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 Alwar Urban Transport and Roads 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 a transportation sub-project, and as explained above it has been classified by ADB as Category B, because it is not expected to have major negative environmental impacts. Under ADB procedures such projects require an IEE to identify and mitigate the impacts, and to determine whether further study or a more detailed EIA may be required. The sub-project is needed to help alleviate road congestion in the town, where the capacity of the network has not expanded to cope with increased traffic demand. It will provide a road over bridge (flyover) to replace one of the five level crossings over the Delhi-Jaipur and Alwar-Mathura railway through the centre of the town, which currently have to be closed for an average of around one third of each day to allow the passage of trains. 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 Alwar 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 Alwar, the headquarters town of Alwar district, in the north-east of Rajasthan in north-western India (Figure 1). The infrastructure will consist of an 8 m high

[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)

and 800 m long flyover (including two 350 m approach ramps), which will be built at the site of the existing Iterana level crossing (Figure 3 and Photo 1).

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 18 months, so all work should be completed by the middle of 2009.

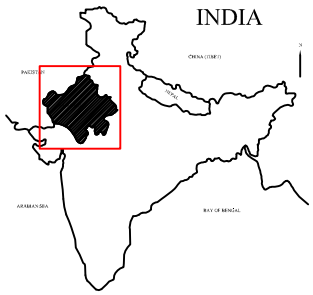
C. Description of the Sub-project

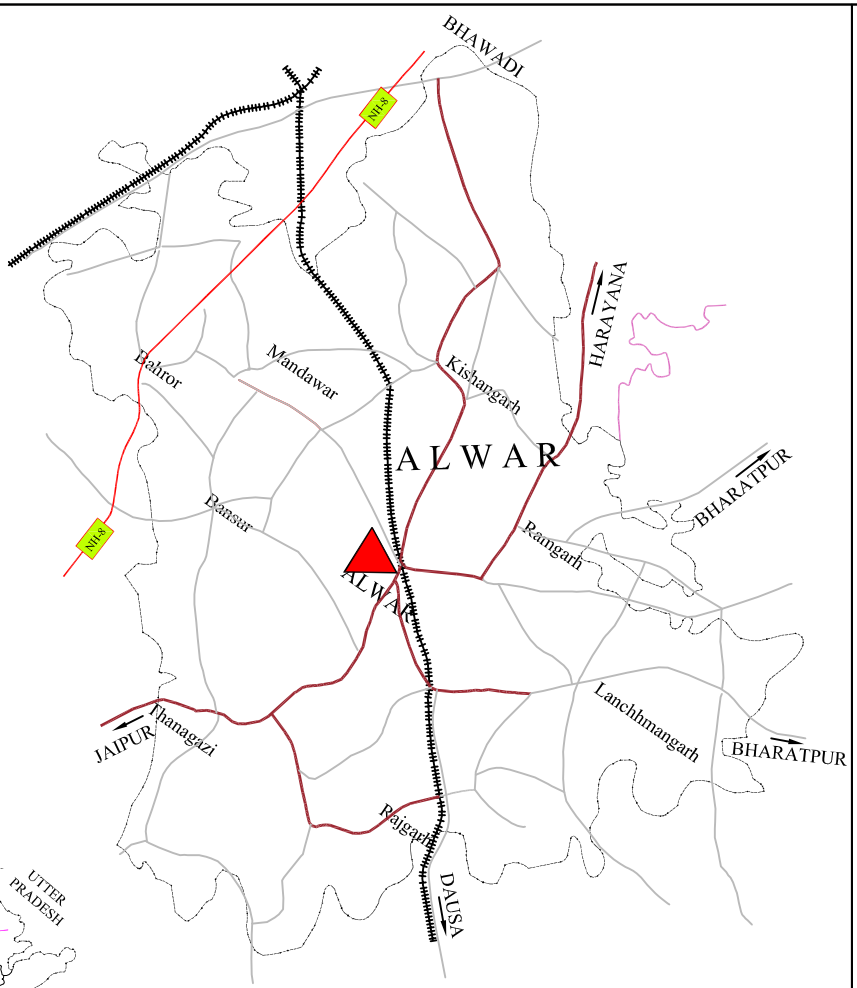
17. Table 1 shows the nature and size of the various components of the subproject. There are three main elements: construction of the flyover above the railway crossing, access ramps to raise the level of the approach roads, and improvements to the existing roads. The descriptions shown in Table 1 are based on the present proposals, which are expected to be substantially correct, although certain details may change as development of the subproject progresses, 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 number of piers required to support the ROB and the length of each approach road to be widened and improved) have not yet been finalised.

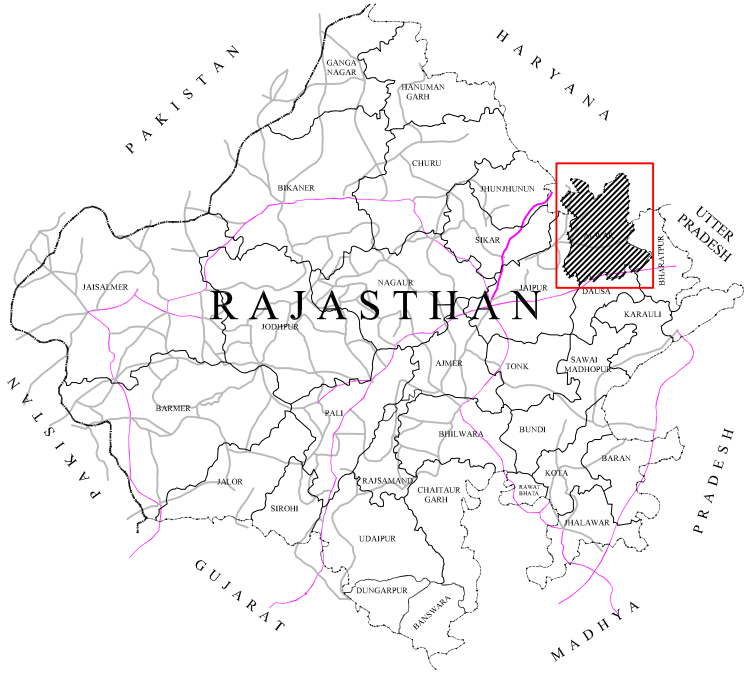
18. The main structure of the ROB will be constructed from pre-fabricated blocks of reinforced cement concrete (RCC), each around 10 x 10 x 1 m, supported 8 m above ground level on a series of RCC pillars, located beneath each block unit. The completed structure will be approximately 50 m in length, and will form a right-angled bend, joining Station Road (which runs parallel with the rail line) with Iterana Road (perpendicular to the railway, Figure 3).

19. The approach roads will be raised to the level of the ROB on two sloping embankments (350 m long and 10 m wide), to be constructed over the existing roadways. The embankments will be formed from a series of RCC box units, around 10 m wide and 30 m long, with gradually increasing heights to raise the road from ground level to the 8 m height of the RoB. The RCC upper surface will be covered with layers of Macadam to form the road, and RCC safety barriers will be fitted at the sides. There will however be no footpath, to prevent access onto the bridge by pedestrians.

20. Beyond the embankments the existing roads will be resurfaced over a length of a few hundred metres, and Iterana Road will be widened by adding a 1-2 m wide layer of Macadam at the sides, plus an additional 1 m paved footpath.







Rajasthan Urban Sector
Development Investment Program
ADB TA 4814-IND

Alwar
Regional Setting Map

LEGEND:-

- International Boundary
- State Boundary
- District Boundary
- National Highway (NH)
- Other road
- Railway
- District Headquarter \Program Town

OVERLAY LEGEND:-

GOVT. OF RAJASTHAN

ASIAN DEVELOPMENT BANK

DRAWN :-	CHECKED :-
DATE :-	APPROVED :-
SCALE :-	

Figure :-

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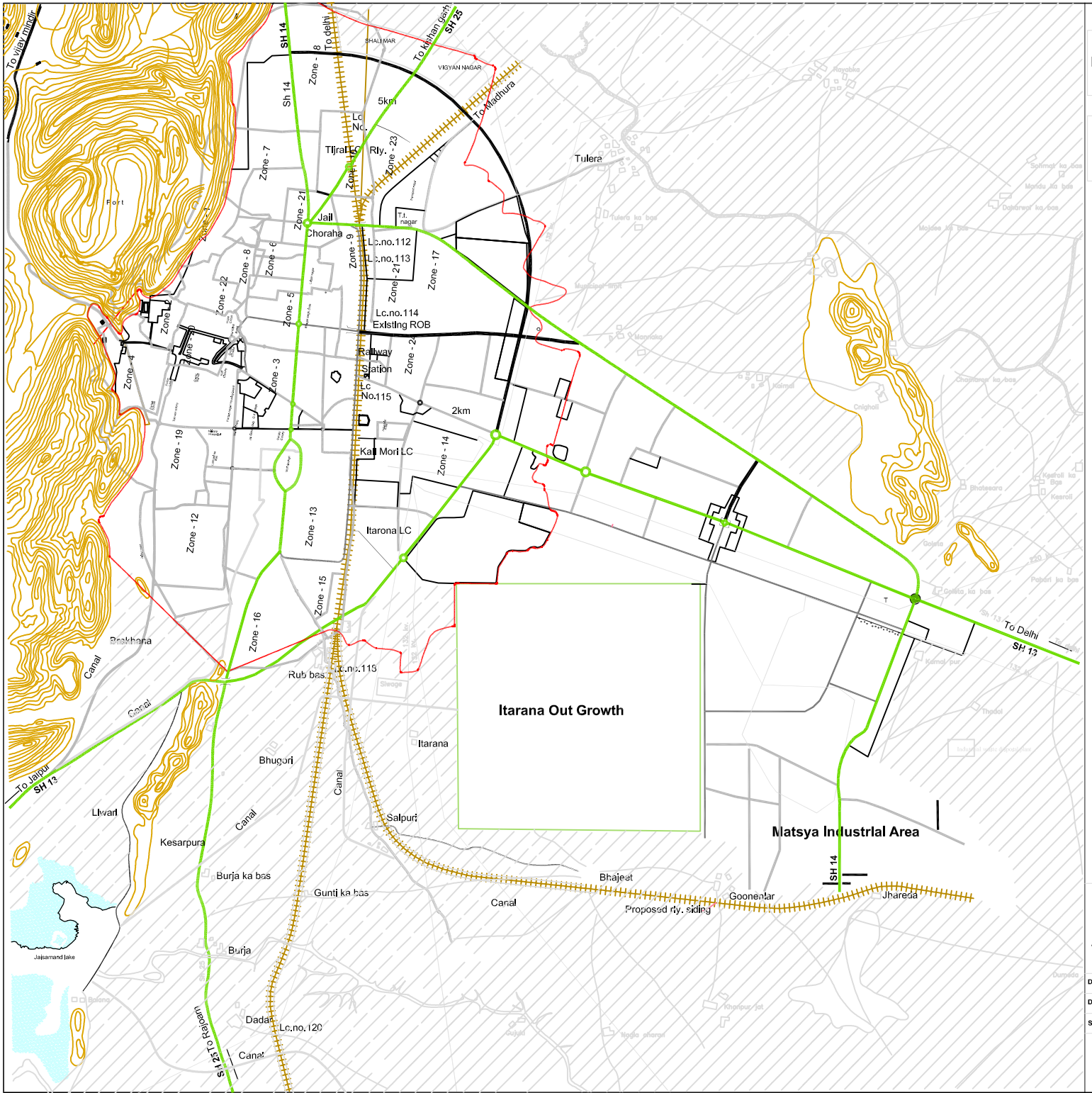
Table 1: Improvements in transportation infrastructure proposed in Alwar

Infrastructure	Function	Description	Location
Road Over Bridge (ROB)	Provide a continuous road connection between Station Road and Iterana Road to replace the existing level crossing, which is currently closed for 35 times per day to allow the passage of 44 trains	2-lane flyover without footpaths, approximately 8 m high and 10 m wide, consisting of 50 m of joined pre-cast RCC elements, supported on a series of RCC piers	The flyover will be located above the present Iterana level crossing, forming a right-angled curve linking Station Road, which runs alongside the rail line, with Iterana Road, which runs at right angles to the rail line.
Approach Ramps	Raise the road from ground level via a gradual incline to the 8m height of the flyover	Two 375 m long embankments, formed from a series of RCC boxes (ca 10 m wide and 30 m long), laid side-by side, filled with sand and stone.	At opposite ends of the flyover, one embankment will run along Station Road parallel with the rail line and the other will run at right angles along Iterana Road.
Widening of Iterana Road	Widen the approach road to width of the ROB.	Addition of a strip of tarmac road, approximately 1-2 m wide on either side of Iterana Road, plus a 1 m paved footpath	Widening will be conducted along both sides of the existing Iterana Road, over a length of a few hundred metres.
Improvement of ground level road surface	Improve the quality of the approach roads to that of the new ROB	A new layer of Macadam will be added to the surface of the existing road	Along a few hundred metres of the existing road



RAJASTHAN URBAN SECTOR DEVELOPMENT INVESTMENT PROGRAM

(ADB TA 4814 - IND)

ALWAR

Road Network

LEGEND:

- Municipal Boundary
- Physical Barrier
- State Highway
- Major Roads
- Railway Track

OVERLAY LEGEND:

- MInor/Other Roads

GOVT. OF RAJASTHAN

ASIAN DEVELOPMENT BANK

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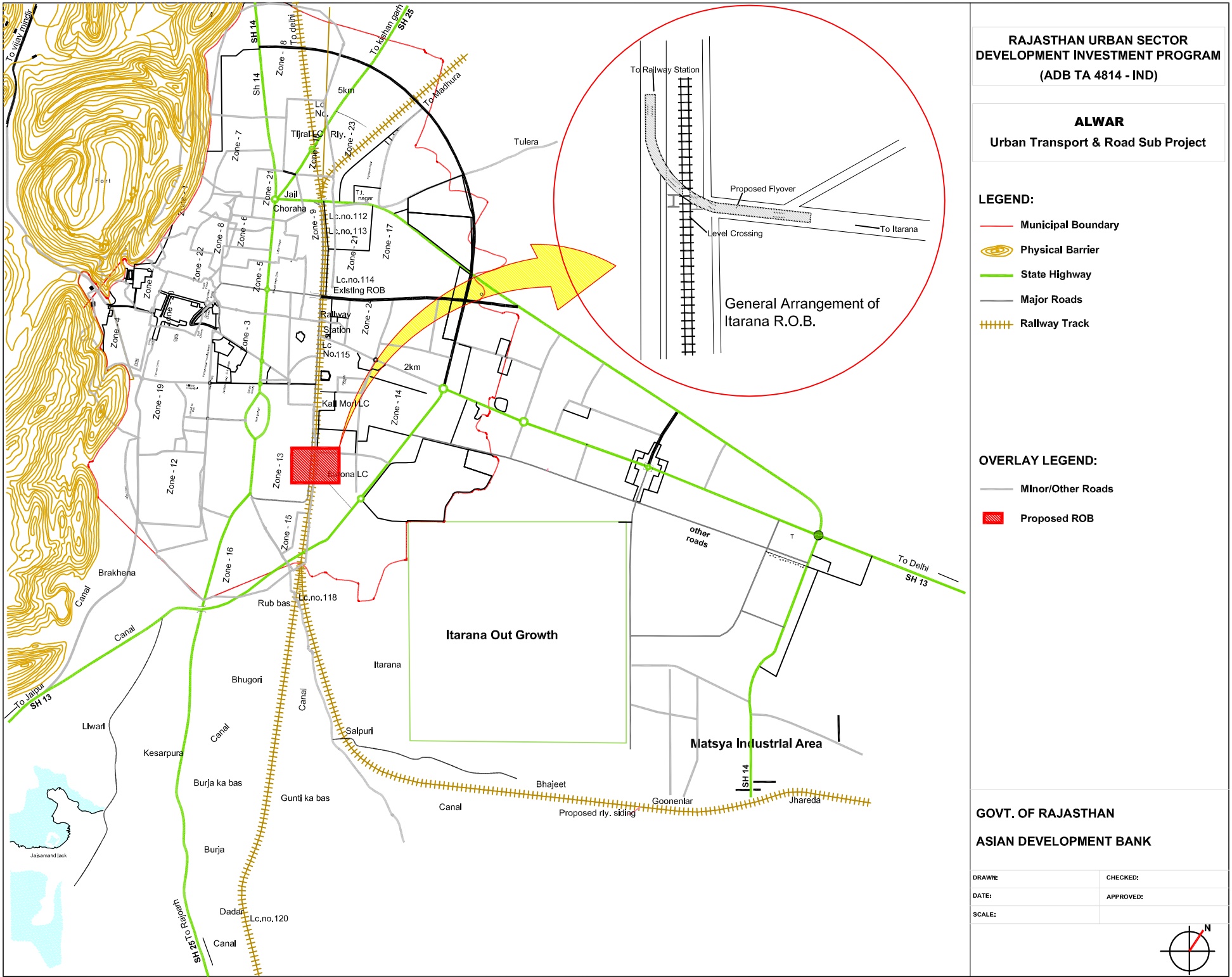

RAJASTHAN URBAN SECTOR DEVELOPMENT INVESTMENT PROGRAM

(ADB TA 4814 - IND)

ALWAR

Urban Transport & Road Sub Project

LEGEND:

- Municipal Boundary
- Physical Barrier
- State Highway
- Major Roads
- Railway Track

OVERLAY LEGEND:

- MInor/Other Roads
- Proposed ROB

GOVT. OF RAJASTHAN

ASIAN DEVELOPMENT BANK

DRAWN:	CHECKED:
DATE:	APPROVED:
SCALE:	

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III. DESCRIPTION OF THE ENVIRONMENT

A. Physical Resources

1. Location

21. Alwar is located in the north-eastern part of Rajasthan, between the longitudes of 76° 35' to 76° 40' East, and latitudes of 27° 30' 20" to 27° 36' 30" North (Figure 1). The town is in the foothills of the Aravali Mountain range, at an altitude of 268 m above sea level, and is 160 km south of the national capital Delhi and 150 km north-east of the state capital Jaipur. Alwar is one of the fastest growing towns in Rajasthan, and is an important trading centre, with good road and rail links. The municipal area covers 49.3 km^2, and the population is 260,000.

2. Topography, soil and geology

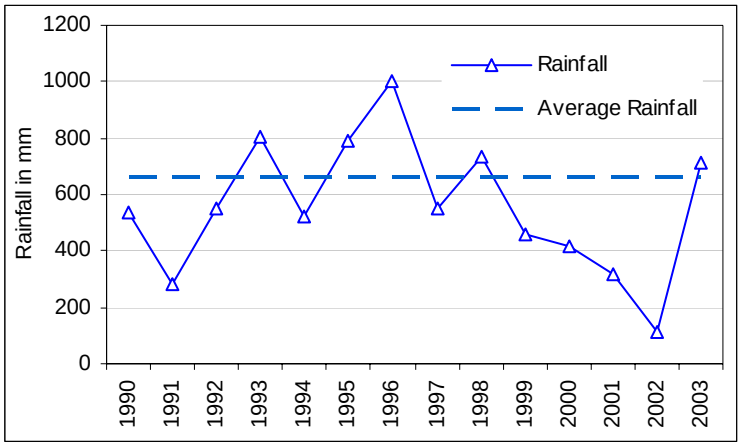
22. Alwar township is relatively flat, located in the alluvial plain beneath the Arvali Mountains in the west. The soil is mainly alluvial and non-calcareous, semi-consolidated to consolidated, brown in colour, and loamy sand to sandy loam in texture. Exposed rocks belong to the Delhi Super-group of lower proterozoic age, consisting of schist, quartzites, slates and gneisses. Sub-surface layers of unconsolidated quaternary formations form the principal aquifer system.

23. According to the Vulnerability Atlas of India, part of Alwar District, including Alwar Town, is in an area of high earthquake risk (Zone IV). Although Rajasthan has not experienced a major earthquake in the recent past, there have been 37 events with a magnitude of 5-7 since 1720, with the most recent occurring in 2001. This measured 6.9 on the Richter Scale, but because the epicentre was in neighbouring Gujarat, no major damage was reported in Alwar.

3. Climate

24. The climate is semi-arid and mostly dry, with a hot summer period in April to July, followed by a short monsoon in July to September, and a cool dry winter period between October and March. Average daily temperatures peak at around 41 °C in June (when the minimum is 28 °C at night), and in January the temperature falls to an average of 23 °C during the day and 8 °C at night. The long term average annual rainfall is 638 mm, of which around 85% falls during the monsoon. However rainfall is highly variable, and has been generally low in most recent years (Figure 4).

25. Relative humidity is around 70% during the monsoon, but is much lower throughout the rest of the year, falling to 20-25% in the summer. Winds are generally light and variable during the cool winter period, and mainly from the north and north-west, and the strongest winds are the south-westerlies that bring the monsoon in June and July.



Source: Agriculture Dept 2007

Figure 4: Average Annual Rainfall in Alwar 1990-2004

4. Air Quality

26. The Rajasthan State Pollution Control Board (RPCB) monitors air quality at three stations in Alwar town, two in industrial areas and one in a residential quarter. Data shows that particulate matter is high because of the dry atmosphere, dusty roads and surrounding land, and Respirable Suspended Particulate Matter (RSPM: particles < 10μm) and Suspended Particulate Matter (SPM) frequently exceed National Ambient Air Quality Standards (NAAQS, Table 2). In contrast, levels of chemical pollutants (oxides of sulphur and nitrogen) are below national standards, presumably because of the limited development of heavy industry.

Table 2: Ambient Air Quality in Alwar (Annual Average 2005; units in μg/m^3)

Monitoring Station	Land use	RSPM		SPM		SO_x		NO_x	
		Ave	Max	Ave	Max	Ave	Max	Ave	Max
RPCB Office	Residential	161	668	285	1153	7.4	16.9	10.0	18.8
NAAQ Standard	*Residential*	*60*		*140*		*60*		*60*	
RIICO Pump House	Industrial	91	408	160	515	7.1	16.7	9.2	17.1
Gaurav Solvex	Industrial	99	320	173	509	7.9	18.3	9.8	20.3
NAAQ Standard	*Industrial*	*120*		*360*		*80*		*80*	

RSPM: Respirable Suspended Particulate Matter; SPM: Suspended Particulate Matter
Source: Rajasthan State Pollution Control Board (RPCB) 2005

5. Surface Water

27. The State of Rajasthan is predominantly dry, except for some parts of the south and south-east, and Chambal is the only perennial river. There are certain seasonal rivers in Alwar District, including the Ruparel, Sabi, Chuhar, Sidh and Landoha, which carry monsoon drainage from upland areas. Several of these have been impounded, to provide water for irrigation. Ruparel is the nearest seasonal river to Alwar, and passes through the Sariska Tiger Reserve

and the village of Bara 19 km south of Alwar. This feeds Jaysamandh Lake through an 8 km long manmade feeder canal from Bara Weir.

28. There are no natural lakes in Alwar District, although there are a number of artificial lakes formed from water retained by manmade bunds, of which Jaysamandh and Siliserh are the largest. Jaysamandh Dam is 6 km south of the town between the villages of Ballana and Liwari, and is an earth and concrete structure built in 1910 (Photo 2). The lake has a maximum capacity of 34 ML, but rarely fills to that level. Siliserh Lake is 13 km south-west of the town and is retained behind an earth embankment and masonry wall built in 1845 across a tributary of the Ruparel (Photo 3). The capacity of the lake is 14 ML, and water for irrigation feeds into two masonry canals running from the dam (Photo 4).

29. Hans Sarovar is another small lake 5 km south-east of the town, near Agyara village. It is formed behind an earth embankment built in 1910, and the water is used for pumped irrigation in nearby farms, although as the lake rarely fills to capacity, such usage is limited. The lake receives untreated and partially treated effluent from the nearby Matsya Industrial Area (MIA), where there are several chemical plants and other industries. In December 2006 the water was very low in volume and bright pink in colour (Photo 5), presumably from the discharge of dye and/or other chemicals.

6. Groundwater

30. The main aquifer around Alwar is contained within unconsolidated quaternary formations of silt, sand kankar and boulder, and is reported to have a potential yield of 20-30 m^3/h. According to the GoI Central Ground Water Board (CGWB 2006[2]), groundwater occurs under unconfined conditions at shallow depth (18-28 m below ground level) and in a semi-confined condition at deeper levels (around 65 m), and is tapped by a number of tube-wells, which discharge at a rate of between 25 and 68 m^3/h.

31. Seasonally the aquifer declines between November and May and recharge begins with the monsoon rains in mid-June. However there has been an alarming decline over the past 20 years from over-extraction and low rainfall, and CGWB reports that the water table in Alwar town has fallen from 9 m in 1984 to 27 m in 2004, at an average rate of 0.91 m per year. Agriculture accounts for more than 80% of the use, and major reductions occur during *Rabi* crop irrigation in October-April.

32. Groundwater quality has also declined as a result of urbanization, disposal of untreated domestic and industrial wastewater and excessive usage of fertilizers. Recent analyses by the Public Health Engineering Dept (PHED) shows high levels of nitrate and iron in water from existing tube-wells (Table 3).

[2] CGWB Western Region, Micro Level Studies, Ground Water Scenario, Alwar Urban Area, July 2006.

Table 3: Groundwater quality in Alwar, 2004-2005

Parameter	Monitoring Location								BIS Drinking Water Standard	
	Sivaji Park		Police Lane		Kala Kuva		Samola			
	May 04	Jan 05	May 04	Jan 05	May 04	Jan 05	May 04	Jan 05	Desirable	Acceptable
pH	7.75	8.16	7.62	8.29	8.12	7.84	7.1	8.68	6.5-9.0	NR
EC	1195	1140	580	650	700	1150	1900	1980	NLP	NLP
Co_3	Nil	Nil	Nil	Tr	Nil	Nil	Nil	120	NLP	NLP
HCO_3	183	256	207	220	146	451	659	793	NLP	NLP
Cl	213	234	43	92	107	121	149	57	250	1000
SO_4	125	11	28	20	45	30	110	142	200	400
NO_3	61	65	32	39	46	67	130	11	45	100
Total Hardness	300	360	160	210	150	250	160	140	300	600
Ca	32	44	36	40	24	92	12	36	75	200
Mg	54	61	17	27	22	4.9	32	12	30	100
Na	155	112	58	68	90	168	378	437	NLP	NLP
K	4.2	3.3	2.6	4.1	11	9.8	1.2	1	NLP	NLP
F	0	0.33	0	0.55	0	0.79	0	1.5	1.0	1.5
Zn	-	0.620	-	4.180	-	0.653	-	1.000	5.000	15.000
Cu	-	0.032	-	0.172	-	0.014	-	0.014	0.050	1.500
Ni	-	0.001	-	BDL	-	0.005	-	BDL	NLP	NLP
Mn	-	0.020	-	0.015	-	0.044	-	0.021	0.100	0.300
Fe	-	1.915	-	0.029	-	7.390	-	0.532	0.300	1.000
Pb	-	BDL	-	BDL	-	0.025	-	0.013	0.050	NR

Source: CGWB (2006). All units are mg/l except EC in μmhos/cm. BIS = Bureau of Indian Standards
NLP-No Limit Prescribed; NR-No Relaxation; BDL-Below Detectable Level; Tr-Trace

B. Ecological Resources

33. Alwar Town is an urban area surrounded by land that was converted for agricultural use many years ago (Photo 6). There is no remaining natural habitat in the town, and 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). There are three Reserved Forests (RF) to the west of the city (Bhurasid RF, Alwar RF and Dholdhup RF) where hillslopes feature scrub vegetation and mixed dry deciduous forest. Although there are no rare species or important timber trees, the vegetation is reported to be important for soil conservation.

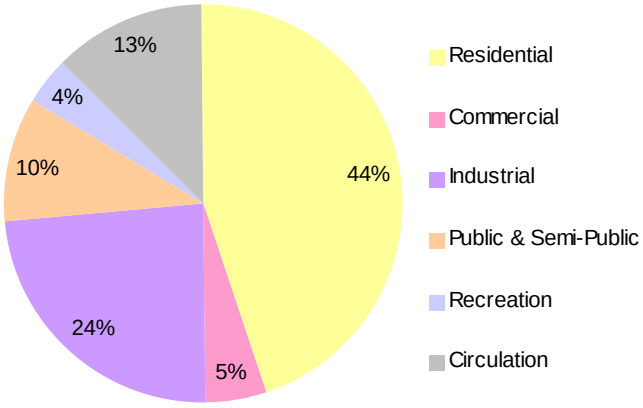
34. The closest protected area to Alwar is the Sariska Tiger Reserve, 40 km to the southwest, which was designated as a sanctuary in 1955 and a tiger reserve in 1979. The reserve covers 900 km^2 of forested hills and plateaux, although habitat has been degraded by agriculture and the fauna depleted by poaching, and there are reportedly now no tigers remaining.

C. Economic Development

1. Land use

35. Located close to the national capital, Alwar was traditionally a services and administrative town, with little industrial development. However as Delhi has grown, so Alwar has benefited from its trade, infrastructure and prosperity, and has experienced rapid economic growth over the past 20 years. Alwar was recently selected as a regional town under the National Capital Plan for integrated development of the area around Delhi. The urban area of

Alwar covers 49 km^2, and although almost half of this is in residential use there is also a significant amount of industry, occupying 24% of the total land (Figure 5).



Source: Alwar Urban Improvement Trust

Figure 5: Current land use in Alwar Town

2. Industry and Agriculture

36. There are two industrial areas: the Old Industrial Area covers 88 ha and houses 42 units, mostly small-scale engineering such as stone polishing because of the ready availability of decorative stone from quarries in the surrounding hillsides. The Matsya Industrial Area (MIA) was established more recently by the Rajasthan Industrial Infrastructure Corporation (RIICO) and covers over 1,000 ha in the west of the town. Currently there are 213 operating industries in MIA, mostly mineral-based (88 units) and chemical (61). Of these, 28 operations are of large or medium scale and the remainder are small-scale.

37. There are also many households engaged in handicrafts in the town, such as the manufacture of cotton and wool products, and there are large numbers of small shops and businesses alongside the roads, particularly in the centre of the town (Photo 7).

38. Agriculture is easily the most important industry, both in Alwar District (where 65% of the total area is cultivated) and outside the headquarters town. Over 80% of the cultivated area is irrigated, mostly by groundwater. Many areas practice double cropping and the main seasons are *Kharif* (April-September: maize, cotton, etc) and *Rabi* (October-March: wheat, barley, mustard, etc).

3. Infrastructure

39. PHED provides a piped municipal water supply to the whole city (Photo 8), which is entirely groundwater-based because of the lack of a dependable surface water source. The present usage is 26.8 MLD, extracted by 170 tube-wells located in and around the town. However water is only available for 1-2 hours per day, mainly because of system losses (estimated at 40%) and low and unequal network pressure.

40. Only two newly developed colonies (Shivaji Park and Ambedkar Colony, housing 10,000 people each) have an underground piped sewerage system, and as there is no treatment facility, raw sewage is discharged into natural drainage channels. Most households depend on pit

latrines and septic tanks, and some have made illegal connections through which sewage enters open storm water drains, polluting both surface and ground water.

41. There are 51 km of concrete storm water drains in the main city area (Photo 9) but these cover only 13% of the total road network and the contents (which frequently include raw sewage) are discharged untreated into a *nallah* (natural or man-made drainage channel).

42. There is no proper solid waste management system in the town, and although the Municipal Council (AMC) has provided dustbins in a few areas, in the rest of the town garbage is dumped in the streets and drains, and on vacant plots of land. Alwar generates an estimated 90 tons of solid waste per day and AMC collects around 57 tons from its manual street sweeping operation (conducted in the main city only), and removes other waste from open dumpsites irregularly. This is transported on open vehicles to the outskirts of the town, where it is dumped on open ground as there is no landfill.

43. 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

44. Alwar is provided with a relatively good transportation system, particularly in the outer parts of the town, where streets are wide and not heavily utilised by traffic (Photo 10). The situation is different in the centre of the town however where roads are narrower and more congested (with both traffic and pedestrians), and the smaller roads are surfaced with concrete (Photo 11). The total road network is 421km in length, of which 70% are surfaced with bitumen/tar, 23% are concrete and 7% are WBM (Water-borne Macadam). The majority of roads (48%) are maintained by UIT, 38% by the Public Works Department (PWD) and 24% by AMC, and the condition is generally poor, with many roads in need of repairs and resurfacing.

45. Transport in the town is mainly by personal vehicles (bicycles and motor cycles) or auto- and bicycle-rickshaws, and privately owned mini-vans provide a form of intermediate public transport system. There are good road links between Alwar and surrounding towns, and a good quality road to the State capital Jaipur in the south-west and the national capital Delhi in the north-east (Figure 1). The national railway also runs through Alwar, and there are daily services through Rewari and Delhi in the north and Dausa and Jaipur in the south. The nearest airports are at Jaipur (150 km away) and Delhi (160 km).

D. Social and Cultural Resources

1. Demography

46. According to the national census the population of Alwar was 0.2 million in 1991 and 0.27 million in 2001, which shows an annual increase of 3.5% over the decade. The local authority however estimates that there are now 350,000 people in the town, which is occupied at an average population density of 6420 persons per km^2.

47. Overall literacy is 82.8%, reported at 91.4% for males and 72.9% for females, which is 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, being 853 females per 1000 males, lower than both the state and national averages (879 and 929 respectively).

48. According to the census, in 2001 only 28.8% of the population 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 (98%) are involved in the service and industrial sectors, with the remainder being engaged in agricultural activities.

49. Between 85-90% of people are Hindus and the remainder are mainly Muslims, Sikhs and Jains. The main local languages are Khariboli and Mewati, although almost all people speak the national language of Hindi and a few also speak English. Other languages spoken include Sindhi, Punjabi and Urdu, because Rajasthan borders Pakistan. About 3% of the population are from Scheduled Tribes (ST), but these are all part of the mainstream population; around 16% of the population belong to scheduled castes (SC).

2. Health and educational facilities

50. There are good educational facilities in Alwar, which serve both townspeople and inhabitants of surrounding villages and towns. There are 71 primary schools, 189 secondary schools and 43 higher secondary schools, plus six general degree colleges and nine professional educational institutes.

51. As the district headquarters town, Alwar is the main centre for health facilities in the area and there are six hospitals, plus a special TB hospital, 42 clinics, two family welfare centres, and three homeopathic hospitals in the city.

3. History, culture and tourism

52. Legend suggests that the town of Alwar was founded in 1049 by Maharaja Alaghraj. In the mediaeval period it was ruled by the Yadu dynasty in the 11th century, Shamsuddin Altamash the Sultan of Delhi in the 12th century, the Chauhans in the 13th century, followed by Mewatis, Mughals, Marathas and Jats, until finally it was captured by the Kachhwaha Rajputs in the late 1600's.

53. Alwar Fort, known locally as Bala Quila, was built in 1550 by Hasan Khan Mewati, and is one of the few forts in Rajasthan to pre-date the rise of the Mughals. It stands on a hill and rises 330 m above the city (Photo 12), and measures 5 km by 1.5 km. There are six entrances to the fort and 5 km of ramparts.

54. Tourism has risen in importance in Alwar over the past 20 years, and in 2005 there were 85,000 visitors, 90% from within India and 10% from abroad. Alwar Fort and Sariska Tiger Reserve 40 km away are the main attractions, but there are other interesting locations in and around the town including:

- The City Palace complex, which lies immediately below the fort, and was once the home of the maharajah. It has an impressive architecture (Photo 13), with many intricate ghats (staircases) and pavilions. The palace now houses government offices, and there is a museum and a large ornate pond (known as Sagar), surrounded by 12 chhatries or cenotaphs of red marble;

- Siliserh Lake, provides a dam, lake and four-storey palace dating from the mid-19th century, which has now been converted to a hotel and restaurant. The lake is both functional and attractive, set amongst low wooded hills, and attracts tourists from Alwar and beyond;

- Jaisamandh Dam is in a more remote location and reached by a narrow rural road, and its architecture and the surrounding landscape (Photo 2) make it a further attraction for increasing numbers of tourists.

IV. ENVIRONMENTAL IMPACTS AND MITIGATION: INFRASTRUCTURE CONSTRUCTION

A. Screening out areas of no significant impact

55. From the descriptions given in Section II.C it is clear that implementation of the subproject should not have major negative impacts because it will affect only one site, at which all construction will be conducted within a relatively small area, measuring around 1 km by 25 m.

56. Because of this there are several aspects of the environment that are not expected to be affected by the construction process and these can be screened out of the assessment at this stage as required by ADB procedure. These are shown in Table 4, with an explanation of the reasoning in each case.

Table 4: Fields in which construction is not expected to have significant impacts

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

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

B. Road over Bridge (RoB)

1. Construction method

58. As explained above, this subproject will involve construction of the following elements at the site of the Iterana level crossing:

- A flyover, 8 m high, 10 m wide and 50 m long, supported on a series of RCC piers, forming an elevated right-angled bend between Station and Iterana roads;
- Two 375 m ramps (with a tarmac surface and side safety barriers) to raise the level of the two approach roads;
- Resurfacing of both roads beyond the ramps, and widening of Iterana Road by adding a 1-2 m wide strip of tarmac and a paved footpath on each side.

59. Construction will begin with the removal of the existing road surface by backhoe diggers and bulldozers along 375 m of each approach road. A series of RCC box-sections (10 m wide and around 30 m long) will then be built, each slightly higher than the preceding one, to form the approach ramps. Foundations will be dug to about 1 m depth, and metal reinforcing bars will be added to form the floor and sides of each box. Portions of these will be encased in wooden shuttering, and concrete (mixed on site) will be poured in and allowed to set. This will be repeated to gradually create each RCC box, which will then be filled with sand and stone, imported on trucks and tipped into each structure. Once each is filled a layer of RCC will be added to the top, with a slight incline, so that the upper surface rises gradually to the 8 m height of the RoB.

60. At the same time the foundations for the bridge piers will be excavated by backhoe diggers (Photo 14), and deeper portions will be dug by a drilling machine. Heavy-duty metal reinforcing rods will be placed into the voids, followed by a concrete and aggregate mix. The reinforcing rods will extend out of the foundations to create the structure of each pier, and these will then be encased in shuttering, into which more concrete will be poured to form each pillar. The pre-cast RCC bridge sections will then be brought in from the manufacturing plant on large vehicles, placed into position by cranes and attached to the piers by heavy-duty bolts and concrete. The pre-cast safety barriers will also be positioned by crane at the edges of the bridge and ramps, after which the tarmac surface will be applied by road-laying machine and roller vehicles, with gravel layers tipped out from trucks.

61. The road laying will then be extended beyond each embankment to refurbish and level the surface of the approach roads, and an additional 1-2 m strip will be added along each side of Iterana Road to widen the carriageway. The edge of the road will be formed by hand-placed kerbstones, and another kerb will be placed 2 m away to form the inner edge of the footpath. Concrete and sand will be poured in to raise the level towards the top of the kerb and paving slabs will be added by hand at the surface. Finally the road markings and roadside signs will be added.

62. The operation will be conducted by a team of around one hundred men, roughly 50% unskilled labour and 50% with various skills including truck drivers, vehicle and machine operatives, surveyors, foremen and supervisors, etc. The operation should be completed in around 18 months.

2. Physical Resources

63. Although all work will be conducted at a single, relatively small site, construction will involve a great deal of excavation and earth moving over a period of approximately six months, so physical impacts could be quite considerable.

64. When completed, each ramp will rise to 8 m over a horizontal distance of 375 m, and will measure 10 m across the top and base. The volume of each will thus be 15,000 m^3, and if 10% of each structure consists of the outer casing of the RCC box-units, a total of around 27,000 m^3 of sand and stone will be imported. This is a great deal of material, which could cause significant changes in topography, drainage, air quality (dust), soil quality and other features at the extraction site if it were sourced from adjacent land. However these impacts can be avoided relatively easily by utilising two readily available sources of waste sand and stone, which are:

- Material excavated to create the foundations of the piers that will support the RoB structure (if suitable);
- Sand and stone excavated to create treatment ponds at the STP site adjacent to Agyara Dam as part of the Alwar Sewerage and Sanitation subproject.

Using these sources would have the additional benefit of providing a beneficial use for what would otherwise be large quantities of waste material, so it will be very important to coordinate these activities to enable this to be done.

65. Moving such a large quantity of material could cause further physical impacts, including the creation of dust during dry weather and silt-laden runoff during rainfall, both of which would affect people who live and work near the site and reduce the quality of adjacent land. The Contractor will almost certainly plan the work to ensure that all earthworks are conducted during the dry season to avoid the difficult working conditions that prevail during the monsoon, so this will avoid any problems from runoff. It will however be necessary to prevent dust, so the Contractor should be required to:

- Excavate the bridge foundations at the same time as the access ramps are built so that dug material is used immediately, avoiding the need to stockpile on site;
- Damp down exposed soil and any sand stockpiled on site by spraying with water when necessary during dry weather;
- Use tarpaulins to cover sand and other loose material when transported by truck.

66. Conducting the work in the dry season should avoid any drainage problems from rainfall collecting in the bridge- and ramp- foundations during excavation, and although groundwater often collects in deeper voids, this should also not be a problem at this site because of the very low water table in Alwar.

67. The creation of ramps will gradually alter the topography and appearance of the site, and the work to install the pre-cast RoB sections will be especially visible in the local landscape. Visual impacts could be mitigated by erecting wooden fences to screen the site from view, but it is not considered that this will be necessary at this site, which is a congested road and rail junction with a very disrupted and “busy” appearance, that will not be significantly exacerbated by the construction activities.

3. Ecological Resources

68. There are no protected areas in or around Alwar town, and no known areas of ecological interest, and there are no trees at the site that need to be removed. The work should therefore have no ecological impacts.

4. Economic Development

69. Although much of this work will be conducted within the RoW of the existing roads and railway, there may be a need to acquire some land at the periphery of the site and for the construction of temporary access roads. This will be obtained through the legal mechanism of the Land Acquisition Act (1894) through which the government purchases the land compulsorily from the owners at a rate that is established on the basis of recent transactions. Land that may need to be acquired includes a small strip of the grounds of an educational establishment (including a boundary wall), and small plots occupied by some light industrial units, small traders and a tea stall. ADB policy on Involuntary Resettlement requires that no-one should be worse-off as a result of the project, so a Resettlement Plan and Resettlement Framework have been prepared to examine these issues. This establishes that no more than 10 % of the total land of any owner or occupant should be acquired, and that if any business premises have to be removed, the owners or tenants should be provided with:

- Compensation equivalent to the amount of business income lost;
- Compensation at replacement cost for any income-generating assets (eg shop premises) that have to be removed.

70. Certain roadside shops that are not purchased may still lose income because the presence of the construction site will deter customers, and access will be impeded by road closures, the presence of heavy vehicles and machinery, etc. These issues are also dealt with by the Resettlement Plan and Framework, which indicate that these impacts will be mitigated by:

- Keeping road closures to the minimum in terms of frequency, duration and extent;
- Maintaining vehicle and pedestrian access to roadside businesses wherever possible;
- Providing owners and tenants with financial compensation equivalent to the amount of business income lost.

71. Transportation is the other principal economic activity that will be impeded by this work, as the existing road will be removed at the location of the access ramps and gradually replaced by the new embankments. Trains will also have to travel slowly in the vicinity of the site, and when work is conducted close to the line, the train service may need to be interrupted temporarily. These impacts could be significant given the amount of traffic using this crossing (shown by traffic surveys to average 7781 vehicles per day) and the frequency of the train service (44 trains per day). These impacts will need to be mitigated by careful planning of the construction program, in conjunction with the road, rail and municipal authorities and the police, in order to:

- Keep the closure of Iterana and Station Roads and the rail crossing to a minimum and maintain safe passage for vehicles and pedestrians throughout the construction period;
- Provide effective, well signposted diversions and alternative routes when required;

- Conduct work that requires the closure of roads and the level crossing at times of low traffic volume;
- Conduct work on or close to the railway line at times when there are fewer trains;
- Schedule truck deliveries of soil to the site for periods of low traffic volume.

72. Excavation could also damage existing infrastructure (such as water distribution pipes, electricity pylons, etc) located alongside the 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 Council of the nature and location of all existing infrastructure, and planning excavation carefully to avoid any such sites if possible;
- Integrating construction of the various infrastructure subprojects conducted in Alwar (transport, water supply, 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

73. Rajasthan is an area with a rich and varied cultural heritage that includes many forts and palaces from the Rajput and Mughal periods, and large numbers of temples and other religious sites, so there is a risk that any work involving ground disturbance could uncover and damage archaeological and historical remains. In this case the excavation will occur in and around an existing roadway, so it could be that there is a low risk of such impacts. Nevertheless 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 the site;
- Considering an alternative transportation sub-project if the site is found to be 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.

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

75. Although this is not a major residential area, there are some living quarters in the vicinity of the site, so action should be taken to minimise disturbance as far as possible. This will require:

- Consultation with the local community to inform them of the nature, duration and likely effects of the construction work, and to identify any local concerns so that these can be addressed;
- Involving the community in planning the work programme so that any particularly noisy or otherwise invasive activities can be scheduled to avoid sensitive times;
- Avoiding conducting noise-generating activities at night;
- Implementing the measures described in Section IV.B.2 above to reduce dust;
- Utilising modern vehicles and machinery with the requisite adaptations to limit noise and exhaust emissions, and ensuring that these are maintained to manufacturers' specifications at all times.

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

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

77. 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.

78. Given the dangerous nature of this material for both workers and the public, 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)[3], 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;

[3] 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

- Reporting procedures to inform management immediately if AC pipes are encountered;
- Development and application of a detailed H&S procedure to protect both workers and citizens. This should comply with national and international standards for dealing with asbestos, and should include:
    - Removal of all persons to a safe distance;
    - Usage of appropriate breathing apparatus and protective equipment by persons delegated to deal with the AC material;
    - Procedures for the safe removal and long-term disposal of all asbestos-containing material encountered.

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

V. ENVIRONMENTAL IMPACTS AND MITIGATION: OPERATION AND MAINTENANCE

A. Screening out areas of no significant impact

80. Because roads and bridges generally operate without the need for major repair and maintenance (see below), there are several environmental sectors that should be unaffected once the new ROB begins to function. These are identified in Table 5 below, with an explanation of the reasoning in each case. These factors are thus screened out of the impact assessment and will not be mentioned further.

Table 5: Fields in which operation and maintenance of the completed road improvement is not expected to have significant impacts

Field	Rationale
Climate	Exhaust gases affect air quality but a new road does not alter climate
Fisheries & aquatic biology	There are no rivers or lakes close to the ROB site
Wildlife, forests, rare species, protected areas	There are none of these features in or outside the town
Coastal resources	Alwar is not located in a coastal area

B. Operation and maintenance of the new ROB

81. The new ROB will have a design life of 30 years, during which time it should require no major repair or refurbishment, beyond routine maintenance, which will include:

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

The stability and integrity of the bridge should also be monitored periodically to detect any problems and allow remedial action if required.

82. These operations will be the responsibility of the municipal highway department, who will be given training by this programme and provided with an operating budget for these purposes.

C. Environmental impacts and benefits of the operating ROB

1. Physical Resources

83. Once the ROB is completed and operating it will improve the physical environment by removing the severe traffic congestion that is such a feature of this location at present, with the resulting concentration of vehicle noise and pollution. This will be replaced by a modern elevated roadway, which allows the maintenance of a smooth flow of traffic into and out of the town and avoids the obstruction created by the former level crossing.

84. The ROB will however elevate the traffic 8 m above ground level (Photo 15), making the traffic and the structure significantly more visible than at present. This would not necessarily be a negative visual impact if the scheme included measures to mask the structure and give it a more pleasing appearance, for example by planting large-growing native trees at the periphery. As well as a visual screen this would also provide a natural barrier to noise, dust and exhaust gases so the planting of trees should be incorporated into the scheme.

85. When routine repairs are conducted to the road and ancillary facilities (signage, etc), the work will be very small in scale, and conducted manually by small teams of men with simple equipment (shovels, wheelbarrows, tarmac blender, etc). Even if larger vehicles are used to refurbish larger portions of the road the work will be very short in duration and will not cause significant physical impacts.

86. Although the ROB is located in an area of high seismic risk, it will be designed according to standard Indian Engineering Design Codes, which include measures to allow the structure to withstand tremors of the expected magnitude and above. There should therefore be little risk of the structure failing, even if the area is subject to seismic events of greater magnitude than those that have occurred over recent years.

2. Ecological Resources

87. As there are no significant ecological resources in or around the town, the operation of the ROB and the routine maintenance and repair of the road and surroundings will have no ecological impacts. There would be some small ecological gain from the planting of trees to mask the visual impact of the structure, so this is a further reason for this to be done.

3. Economic Development

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

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

4. Social and Cultural Resources

90. Effects of the operating ROB on social and cultural resources in the town will be relatively small in scale and intangible in nature, and are thus difficult to assess and quantify.

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

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

VI. ENVIRONMENTAL IMPACTS AND MITIGATION: LOCATION AND DESIGN

93. 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.

94. 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 road was built in an area of great landscape beauty there would be severe visual impacts as a result of the location, as these would not occur if the road was routed around the outskirts of a neighbouring city.

95. 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 project will be built at a single relatively small location and involves straightforward construction and low-maintenance operation, in an environment that is not especially sensitive, so it is unlikely that there will be major impacts;
- Most of the predicted impacts are associated with the construction process, and are produced because that process involves quite extensive groundwork. However the routine nature of the impacts means that most can be easily mitigated.

VII. INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MONITORING PLAN

A. Summary of environmental impacts and mitigation measures

96. Table 6 lists the potential adverse impacts of the Alwar transportation 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

97. 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 6: Environmental impacts and mitigation for the Alwar Transportation Subproject (Black = continuous activity; Grey = intermittent)

Potential Negative Impacts	Sig	Dur	Mitigation Activities and Method	Responsibility	Location	07	2008				2009			[4]
Construction: Road Over Bridge						D	1	2	3	4	1	2	Op	
Excavation of material to fill access ramps will change drainage, air & soil quality, topography at extraction site	M	P	Use waste sand and stone from sewerage subproject and material dug to create bridge pier foundations	DSC and Contractor	STP/ROB									+
Transporting sand and building ramps could create dust	M	T	Use tarpaulins to cover sand when carried on trucks	Contractor	On/off site									0
			Spray ramps and soil stockpiles with water in dry weather	Contractor	ROB site									0
Dust could be blown from soil stockpiled on site	M	T	Excavate foundations at same time as ramps are built so that dug soil can be used immediately without stockpiling	Contractor	ROB site									0
Rain may collect in dug areas and wash soil off stockpiles	M	T	Conduct excavation and ground works in dry season	Contractor	ROB site									0
Some owners will lose land needed for the project	M	P	*Purchase land as described in Resettlement Framework	LSGD	ROB site									0
			Avoid taking >10% of the total land of any occupant	DSC	ROB site									0
Some business premises may need to be removed	M	P	*Compensate business owners/tenants for lost income	LSGD	ROB site									0
			*Compensate owners for lost income-generating assets											0
Shops that remain may lose income if access is difficult for customers	M	T	*Compensate owners/tenants for lost business income	LSGD	ROB site									0
			Keep road closure to minimum (frequency, duration)	Contractor	ROB site									0
			Maintain vehicle and pedestrian access when possible											0
Road and rail traffic will be disrupted by construction work	M	T	Plan work with road, rail and town authorities and police	DSC and Contractor	ROB site									0
			Keep road and railway closures to a minimum	Contractor	ROB site									0
			Maintain safe passage of vehicles/pedestrians at all times											0
			Provide effective diversions & alternative routes if needed											0
			Conduct work that requires road and railway closure at times when traffic volume is low											0
			Conduct work near railway at times when trains are fewer											0
			Schedule truck sand deliveries for periods of low traffic											0
Existing infrastructure could be damaged by construction	S	P	Determine locations of water pipes, electricity pylons, etc and design scheme to avoid damage	DSC	ROB site									0
			Locate different infrastructure on opposite sides of road											0
Roads/people may be disturbed by repeated excavation	M	T	Integrate subprojects to conduct excavation at same time	DSC/LGD	ROB site									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	ROB site									0
			Select alternatives if site has medium-high potential	DSC										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
[4] 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

			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										+
People living nearby may be disturbed by noise, dust	M	T	Inform community of work in advance; address concerns	Contractor	ROB site									0
			Plan work with community; avoid work at sensitive times											0
			Avoid conducting noise-generating activities at night											0
			Reduce dust by spraying soil and covering with tarpaulins											0
			Use modern vehicles/machinery & maintain as specified											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	ROB site									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 all infrastructure to avoid locations of AC pipes	DSC	All sites									0
			Train all construction personnel in dangers of AC pipes and how to recognise them in situ	Contractor	All sites									0
			Develop and apply protocol if AC pipes are encountered. This should include:	DSC and Contractor	ROB site									0
			- immediate reporting of any occurrence to management;	Contractor	ROB site									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	ROB site									+
Operation and Maintenance														
New bridge will be more visible than present crossing	M	P	Plant and maintain large growing native trees at periphery	DSC/CC	ROB site									0
Worker safety at risk when conducting road repairs	M	T	Coordinate with police - provide warning signs/diversions	OMC	ROB site									0

98. 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.

99. 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

100. 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.

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

102. Table 6 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.

103. Table 7 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

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

Table 7: Environmental Monitoring Plan

Mitigation Activities and Method	Location	Responsible for Mitigation	Monitoring Method	Monitoring Frequency	Responsible for Monitoring
CONSTRUCTION					
Use waste sand/stone from STP ponds and bridge foundations	STP/ROB site	DSC/CC	Site observations; CC records	Monthly	EMS
Use tarpaulins to cover sand when carried on trucks	On/off site	CC	Observations on/off site	Weekly	EMS
Spray soil ramps and stockpiles with water in dry weather	ROB site	CC	Site observations	Weekly	EMS
Excavate foundations at same time as ramps are built	ROB site	CC	Site observations	Monthly	EMS
Conduct excavation and ground works in dry season	ROB site	CC	Site observations	Monthly	EMS
*Purchase land as described in Resettlement Framework	ROB site	LSGD	Landowner surveys; LSGD records	As needed	IMA[6]
Avoid taking >10% of the total land of any occupant	ROB site	DSC	Landowner survey; DSC records	As needed	IMA
*Compensate business owners/tenants for lost income	ROB site	LSGD	Owner/tenant surveys; LSGD records	As needed	IMA
*Compensate owners for lost income-generating assets	ROB site	LSGD	Owner surveys; LSGD records	As needed	IMA
Keep road and rail closure to a minimum frequency and duration	ROB site	CC	Site observations; CC records	Monthly	EMS
Maintain vehicle and pedestrian access when possible	ROB site	CC	Site observations; shopkeeper survey	Weekly	EMS
Plan work with road, rail and town authorities and police	ROB site	DSC/CC	Design reports	Monthly	EMS
Maintain safe passage of vehicles and pedestrians at all times	ROB site	CC	Site observations; CC records	Weekly	EMS
Provide effective diversions and alternative routes if needed	ROB site	CC	Site observations; CC records	Weekly	EMS
Conduct work requiring road/railway closure at times of low traffic	ROB site	CC	Site observations; CC records	Weekly	EMS
Conduct work near railway at times when trains are fewer	ROB site	CC	Site observations; CC records	Weekly	EMS
Schedule sand deliveries by truck for periods of low traffic	ROB site	CC	Site observations; CC records	Weekly	EMS
Determine locations of infrastructure and design scheme to avoid	ROB site	DSC	DSC records; design reports	As needed	EMS
Locate different infrastructure on opposite sides of roads	ROB site	DSC	Site observation; design reports	Monthly	EMS
Integrate subprojects to conduct excavation at same time	ROB site	DSC/LSGD	Site observation; design reports	Monthly	EMS
Request archaeological authorities to assess potential of all sites	ROB site	DSC	DSC records; design reports	As needed	EMS
Select alternatives if sites have medium or high potential	ROB site	DSC	DSC records; design reports	As needed	EMS
Include state and town historical authorities as stakeholders	ROB site	LSGD	LSGD records; meeting records	As needed	EMS

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

Develop and apply archaeological protocol to protect chance finds	ROB site	DSC/CC	DSC and CC records; site observations	Weekly	EMS
Inform community of work in advance and address their concerns	ROB site	CC	CC records; resident surveys	Monthly	EMS
Plan work with the community; avoid working at sensitive times	ROB site	CC	Resident surveys; site observations	Weekly	EMS
Avoid conducting noise-generating activities at night	ROB site	CC	Resident surveys; site observations	Weekly	EMS
Use modern vehicles and machinery and maintain as specified	ROB site	CC	Site observations; CC records	Monthly	EMS
Prepare and implement a site H&S Plan (safety of workers/public)	ROB site	CC	Site observations; CC records	Monthly	EMS
Exclude public from the site	ROB site	CC	Site observations; CC records	Monthly	EMS
Ensure that workers wear Personal Protective Equipment	ROB site	CC	Site observations; CC records	Monthly	EMS
Provide Health and Safety training for all personnel	ROB site	CC	CC records; worker interviews	Monthly	EMS
Follow documented procedures for all site activities	ROB site	CC	Site observations; CC records	Monthly	EMS
Keep accident reports and records	ROB site	CC	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	CC	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	CC	Site observations; CC records	Weekly	EMS
Remove all persons to safe distance	All sites	CC	Site observations; CC records	Weekly	EMS
Workers handling AC: wear breathing apparatus; protective suits	All sites	CC	Site observations; CC records	Weekly	EMS
All AC material must be removed and disposed of safely	All sites	CC	Observations on and off site; CC records	As needed	EMS
Employ at least 50% of workforce from communities near sites	ROB site	CC	CC records; worker interviews	Monthly	EMS
OPERATION AND MAINTENANCE					
Plant and maintain large growing native trees at periphery of site	ROB site	DSC/CC	Site observations; CC records	As needed	EMS
Coordinate repairs with police – provide warning signs/diversions	ROB site	OMC	Site observations	As needed	GA

measures shown in Table 6 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

104. Most of the mitigation measures require the Construction Contractors (CC) 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 CC or DSC are included in the budgets for the civil works and do not need to be estimated separately here. Mitigation that is the responsibility of LSGD will be provided as part of their management of the project, so this also does not need to be duplicated here. Costs of acquiring land and compensating businesses for loss of income during the construction period (Table 6) are calculated separately in the budgets for the Resettlement Framework and Resettlement Plans so are also excluded from this analysis.

105. 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 8. 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 8: 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[7]	300,000	
Survey Expenses	Sum	100,000	100,000	400,000
TOTAL				400,000

VIII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Project stakeholders

106. 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:

- People who live and work in the vicinity of the construction site;
- State and municipal highways and rail authorities;
- State and local authorities responsible for the protection and conservation of archaeological relics and historical sites and artefacts.

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

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, 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

107. 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 Alwar Town 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

108. DEA 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:

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

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

Consultation during construction:

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

Project disclosure:

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

IX. FINDINGS AND RECOMMENDATIONS

A. Findings

109. The process described in this document has assessed the environmental impacts of the infrastructure proposed under the Alwar Urban Transport and Roads Subproject. Potential negative impacts were identified in relation to both construction and operation of the improved infrastructure, but no impacts were identified as being due to either the project design or location. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects, and as a result some measures have already been included in the outline designs for the infrastructure. These include:

- Using waste soil from another subproject (sewerage) as infill for the access ramps to provide a beneficial use for waste material and avoid physical impacts from new excavation;
- Including tree planting within the design of the infrastructure to mask the elevated roadway from view and provide a natural barrier to vehicle noise and exhaust gases.

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

110. A change has also been made to the location of elements of the project to further reduce impacts. This is to:

- Locate as much of the proposed road improvement within the ROW of the existing roads and rail line to reduce the need to acquire land and avoid relocating people.

111. Regardless of these and various other actions taken during the IEE process and in developing the project, there will still be impacts on the environment when the ROB is built and when it is operating. This is mainly because of the relatively large size of the structure, its location at a busy road and rail intersection, and the fact that the work involves some excavation so there could be a risk of uncovering historical remains from the rich cultural history of Rajasthan. Because of these factors the most significant impacts are on the physical environment, the human environment, and the cultural heritage.

112. During the construction phase, impacts mainly arise from the need to import a large quantity of waste soil to fill RCC box-units built to raise the level of the approach roads, and because the work will inevitably cause some disruption to road and rail traffic. These are common impacts of construction in urban areas, and there are well developed methods for their mitigation. These include:

- Covering soil during transportation and when stored on site;
- Watering exposed soil during dry and windy weather;
- Planning work with the appropriate authorities to minimise disruption of road/rail traffic.

113. There could also be a need to acquire a small amount of land at the periphery of the site, which includes a thin strip inside the boundary of an educational establishment, and small plots of land occupied by some light industry, small traders and a tea stall. Such impacts are also frequently encountered and are dealt with by a combination of the legal process and additional measures required by ADB policy on Involuntary Resettlement. Actions are discussed in a separate Resettlement Plan and Resettlement Framework, and include:

- Acquisition of land through the GoI Land Acquisition Act, through which the market value is paid, based on an analysis of recent transactions;
- Ensuring that no more than 10% of the land of a single owner or occupant is acquired;
- Providing additional compensation for loss of business and income-generating assets.

114. 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 the site, and selecting an alternative subproject if the site is 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.

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

- 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).

116. 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 site to provide them with a short-term economic gain;
- Plant large-growing trees at the periphery of the site to mask it from view and give it a more natural and pleasing appearance.

117. These and the other mitigation and enhancement measures are summarised in Table 6, which also shows the location of the impact, the body responsible for the mitigation, and the programme for its implementation.

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

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

120. Table 6 also assesses the effectiveness of each mitigation measure in reducing each impact to an acceptable level. This is shown as the level of significance of the residual impact (remaining after the mitigation is applied). This shows that all impacts will be rendered at least neutral (successfully mitigated), and that certain measures will produce a benefit (in addition to the major benefits provided by the operating schemes).

121. 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.

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

123. 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 6) 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

124. The environmental impacts of the proposed improvements in transportation infrastructure in Alwar Town 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.

125. 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 economy and environment of the town once the scheme is in operation.

126. 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 1a: Iterana level crossing - ROB Site

Photo 3: Siliserh Dam and lake

Photo 1b: Iterana ROB site surroundings

Photo 4: Irrigation canal from Siliserh lake

Photo 2: Jaisamandh Dam

Photo 5: Polluted lake in Alwar

Photo 6: Agricultural land outside Alwar

Photo 9: Roadside drains in Alwar

Photo 7: Shops in Alwar town

Photo 10: Road in the outskirts of Alwar

Photo 8: Above ground water supply pipes

Photo 11: Road near the centre of Alwar

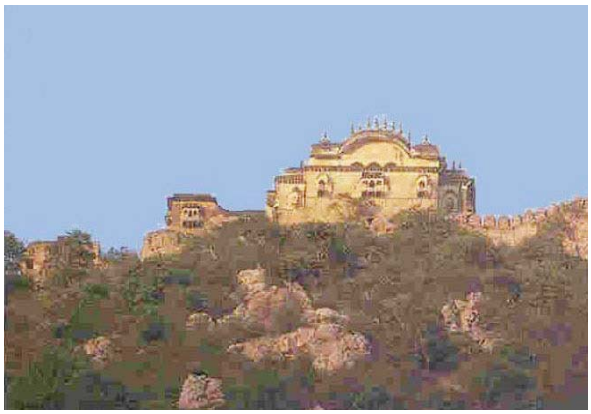


Photo 12: Alwar Fort Photo

15: View of an ROB

Photo 13: Alwar City Palace

Photo 14: Back hoe for excavations