



Asian Development Bank National Capital Region Planning Board

Capacity Development of the National Capital Region Planning Board Package 2 Component B TA No. 7055-IND

Volume III-D: Initial Environmental Examination Detailed Project Report for Rehabilitation of Major Drains in Hapur









July 2010

NCR Planning Board Asian Development Bank

Capacity Development of the National Capital Region Planning Board (NCRPB) – Component B

(TA No. 7055-IND)

Volume III-D: Detailed Project Report for Rehabilitation of Major Drain in Hapur

Initial Environmental Examination Report

August 2010



Abbreviations

ADB	:	Asian Development Bank
CC	:	Construction Contractor
CPHEEO	:	Central Public Health & Environmental Engineering Organization
DPR	:	Detailed Project Report
DSC	:	Design and Supervision Consultant
EAF	:	Environmental Assessment Framework.
EC	:	Environmental Clearance
EIA	:	Environmental Impact Assessment
EMP	:	Environmental Management Plan
ESMC	:	Environmental & Social Management Cell
FGD	:	Focus Group Discussions
GoI	:	Government of India
GoUP	:	Government of Uttar Pradesh
HH	:	Household
HPDA	:	Hapur-Pilkhua Development Authority
IA	:	Implementing Agencies
IDFC	:	Infrastructure Development Finance Corporation
IEE	:	Initial Environmental Examination
LA	:	Land Acquisition
NCR	:	National Capital Region
NCRPB	:	National Capital Region Planning Board
NCT	:	National Capital Territory
O & M	:	Operation and Maintenance
PCC	:	Plain Cement Concrete
RCC	:	Reinforced Cement Concrete
RF	:	Resettlement Framework
RoW	:	Right of Way
SIEE	:	Summary Initial Environmental Examination
STP	:	Sewerage Treatment Plant
SWM	:	Solid Waste Management
TA	:	Technical Assistance
TOR	:	Terms of Reference
UP	:	Uttar Pradesh

1.	INTRODUCTION	1
A.	BACKGROUND	1
2.	POLICY & LEGAL FRAMEWORK	3
A.		
B.		
C.		
C.	1. Environmental Policy	
	 Environmental Assessment Requirements 	
3.	DESCRIPTION OF THE PROJECT	
A.	PROJECT NEED	6
B.		
	1. Improvement of Drain 2 (Choyya Nala)	
	2. Rehabilitation of Drain 4 (Delhi Garh Road Nala)	
C.		
4.	DESCRIPTION OF ENVIRONMENT	17
A.	Physical Resources	
	1. Location	
	2. Topography, soil and geology	17
	3. <i>Climate</i>	
	4. Air Quality	
	5. Surface Water	
	6. Groundwater	
В.		
C.		
	1. Land Use	
	2. Industry & Agriculture	
	3. Infrastructure	
	4. Transportation	
D.		
	 Demography History Culture and Tourism 	
5.	ENVIRONMENTAL IMPACTS & MITIGATION MEASURES	
A.		
В.		
	1. Construction Method	
C	2. Construction Impacts OPERATION IMPACTS & MITIGATION MEASURES	
C.	<i>OPERATION IMPACTS & MITIGATION MEASURES</i>	
D.		
E.	ENVIRONMENTAL IMPACTS & MITIGATION. LOCATION AND DESIGN ENVIRONMENTAL MANAGEMENT PLAN	
	INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MONITORING PLAN	
A. B.		
В. С.		
	PUBLIC CONSULTATION AND INFORMATION DISCLOSURE	
A. B.		
	FINDINGS AND RECOMMENDATIONS	
A.		
В.	RECOMMENDATIONS	

Contents

9.	CONCLUSION4	8
----	-------------	---

List of Tables

Table 2-1: Environmental Category	5
Table 3-1: Proposed Subproject and Components	
Table 4-1: Rainfall Pattern in Panipat (2004-2008)	
Table 4-2: Water Quality of Choyya Nala	
Table 4-3: Characteristics of Accumulated Sediments in Choyya Nala	
Table 4-4: Population Growth of Hapur.	
Table 5-1: Environmental Management Plan	
Table 6-1: Environmental Monitoring Plan	
e	

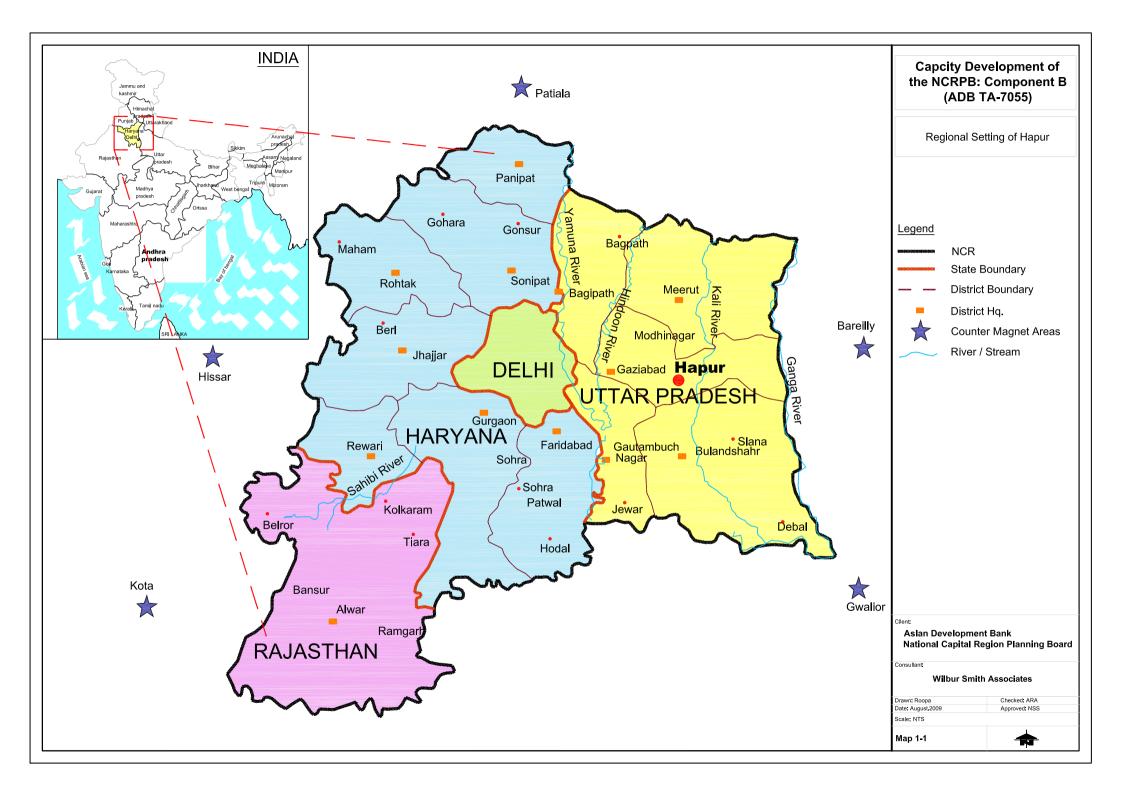
List of Maps

Map 1-1: Regional Setting of Hapur	2
Map 3-1: Existing Drain Network in Hapur	
Map 3-2: Flood Prone Areas in Hapur	
Map 3-3: Contributory Areas of Various Drains in the Study Area	
Map 3-4: Sections of Drain 2 and Drain 4 Proposed for Improvement	
Map 3-5: Proposed Cross Sections of Drains	
Map 3-6: Typical Section of Proposed Box Culvert	

1. INTRODUCTION

A. Background

- Hapur Town is situated in Ghaziabad District of Uttar Pradesh State in Northern India. Ghaziabad District shares borders with the National Capital Territory Delhi. Owing to its location advantage close to Delhi and with good road connectivity, Hapur is a fast developing town. It is one of the important towns in NCR being developed to decongest National Capital Delhi by improving infrastructure with the aim of shifting some of the offices and establishments of Government of India. Location of Hapur is depicted in Map 1-1.
- 2. Hapur was one of the sample towns selected by NCRPB for preparation of model project reports under this ADB TA. Accordingly the Master Plan for Storm Water Drainage System in Hapur was formulated and submitted in January 2009. In continuation, based on the recommendation of the Master Plan, this subproject for Drainage System Improvement in Hapur has been formulated and the Detailed Project Report (DPR) has been prepared. NCR Planning Board, a statutory body of Ministry of Urban Development, Government of India, is a likely source of funding for the subproject in Hapur.
- 3. Open drainage system is provided in the town to cater for collection and conveyance of storm water during rains. In the absence of proper functioning sewerage system, drain carries mostly wastewater including sewage. Due to encroachment of streams and flood plains, during monsoon rains, some areas experiences flooding. Most of the drains require immediate improvement to allow free flow of storm water and avoiding the flooding of low-lying areas.
- 4. This Initial Environmental Examination (IEE) Report is prepared in accordance with NCRPB Environmental and Social Management System (ESMS) and Policy for project funding.



2. POLICY & LEGAL FRAMEWORK

A. Extent of IEE Study

5. The subproject implementation shall comply with the policies of Government of India (GoI), Government of Uttar Pradesh (GoUP) and procedures/policies of NCRPB. Government regulations and the NCRPB policy require that impacts of the development projects have to be identified at the beginning and mitigation measures be incorporated in the project to reduce those impacts to acceptable levels. This is generally done through the process of environmental impact assessment.

B. Government Law and Policies

- 6. 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 categorized as A or B depending on the scale of the project and the nature of its impacts.
- 7. 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 prescribed manner with all requisite details, after which an Expert Appraisal Committee (EAC) of the MoEF prepares comprehensive Terms of Reference (ToR) for the EIA study. 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.
- 8. Category B projects require environmental clearance from the State Environment Impact Assessment Authority (SEIAA). The State level EAC categorizes the project as either B1 (requiring EIA study) or B2 (no EIA study), and prepares ToR for B1 projects within 60 days. On completion of the study and review of the report by the EAC, the SEIAA issues the EC based on the EAC recommendation. The Notification also provides that any project or activity classified as category B will be treated as category A if it is located in whole or in part within 10 km from the boundary of protected areas, notified areas or inter-state or international boundaries.
- 9. None of the components of this Drainage System Improvement Sub-project in Hapur falls under the ambit of the EIA Notification, and, therefore EC is not required.

C. Environmental and Social Management System of NCRPB

10. Recognizing the importance of environmental and social issues that can arise in infrastructure projects, NCRPB has formulated an Environmental and Social Management Systems (ESMS) in line with Government and other multilateral agencies like ADB safeguard requirements for Financial Intermediaries (FIs). The ESMS provides an overall management system to NCRPB to identify, assess, and mitigate environmental and social issues that are likely to arise in projects funded by NCRPB. The ESMS outlines the policies, methods of assessments and procedures that will enable NCRPB to ensure that a project that it funds is developed in accordance with ESMS and is adequately protected from associated risks. Implementing Agencies (IAs) will have to comply with the ESMS and Policy.

1. Environmental Policy

- 11. *Policy Statement*. "National Capital Regional Planning Board (NCRPB) will continually strive to ensure and enhance effective environmental management practices in all its operations". This is aimed to achieve through:
 - Minimizing negative environmental (including health & safety) impacts in its operations and risks to the environment (particularly eco-sensitive areas and culturally important areas) and people who may be affected through formulating and implementing commensurate plans
 - Ensuring that environmental safeguards defined as requirements of applicable Indian environmental legislation and multilateral / bilateral funding agencies are being adequately integrated by the project proponent / IA in the planning, design, construction prior to its financing and in its implementation during the operational phase.
 - Ensuring that compliance to all applicable national and local environmental legislation.
 - Encouraging that public and stakeholder consultation be carried out by the project proponent / IA and disclosing the required information in all stages of the project cycle.
 - Integrating environmental risk into its overall internal risk management analysis.
 - Including environmental management considerations in all aspects of operations and interactions with the project proponent / IAs in all stages of the project cycle.
- 12. This policy statement emphasizes NCRPB's sensitivity, concern and commitment to environmental safeguards. NCRPB will strive to ensure that the projects that it supports meets government policies and as well as of the bilateral/multilateral agencies such as ADB.

2. Environmental Assessment Requirements

13. The nature of the assessment required for a project depends on the significance of its likely 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. According to NCRPB ESMS, the projects are screened for their expected environmental impacts and are assigned to one of the following categories: E1, E2 or E3.

Environmental Scenario	NCRPB's	MOEFs	ADB
	Categorization	Categorization	Categorization
Significant impacts or in eco- sensitive area	E1	А	A
Limited impacts	E2	B1 or B2 or No Category	В
No impacts	E3	No Category	С

 Table 2-1: Environmental Category

- (i) <u>Significant impacts or in eco-sensitive areas (Category E1)</u>: If the project has significant adverse environmental impacts that are irreversible, diverse, or unprecedented, then it is regarded to have environmental scenario. These impacts may affect an area larger than the sites or facilities subject to physical works. These impacts will be considered significant if these are in eco-sensitive areas.
- (ii) <u>Limited environmental impacts (Category E2)</u>: If the project has impacts that are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed.
- (iii) <u>No environmental impacts</u> (Category E3): If the project is likely to have minimal or no adverse environmental impacts, then it is regarded to have this environmental scenario.
- 14. The proposed subproject of Drainage System Improvement in Hapur is likely to have some negative impacts including those typical impacts associated with the construction activity in urban areas and therefore classified as Category E2.
- 15. According to ESMS, E2 projects require carrying out Initial Environmental Examination (IEE) and preparation of IEE Report. This IEE report is prepared accordingly.

3. DESCRIPTION OF THE PROJECT

A. Project Need

16. In Hapur, open drainage system is provided to cater for collection and conveyance of storm water during rains. This open drain network consisting of primary, secondary and tertiary drains. Tertiary drains collect water from various streets and disposes in to secondary drains, which are further connected to primary drains, and to natural stream. There are four main drains in Hapur including Choyya Nala, which is a tributary of Kali River. Two primary drains dispose into Choyya Nala, which ultimately discharges into

Kali River in the southern side of the town. In the absence of proper functioning sewerage system, drain carries mostly wastewater including sewage. Due to encroachment of streams and flood plains, during monsoon rains, some areas experiences flooding. Existing drain network is shown in **Map 3-1** and flood prone areas are shown in **Map 3-2**.



- 17. Most of the drains require immediate improvement to allow free flow of storm water and avoiding the flooding of low-lying areas. Topography of the town is almost flat, necessitating a properly designed, constructed and operated drainage system. Besides, natural factors, there are following persisting problems in Hapur: (i) due to lack of sewerage system, drains are presently catering to wastewater collection and conveyance; (ii) drains are choked with silt, solid waste etc; (iii) drains are encroached upon by adjoining buildings, which lead to narrowing of drain width, and altering geometry and alignment of drains, ultimately effecting the flow of water through drains, and (iv) lack of proper maintenance.
- 18. The Drainage Master Plan (DMP) prepared for the town has identified deficiencies and formulated recommendations to be implemented in phased manner that include (i) Elimination of cross sewer connections; (ii) Rehabilitation and desilting of existing drains; (iii) Augmentation and rectifying the missing links of existing drains and (iv) Provision of new drains.

B. Description of the Sub-project

19. The Drain No 2 (Choya Nala) and 4 are most critical drains of the city. On priory as suggested by the Master Plan, rehabilitation of these two drains has been proposed and detailed project report was prepared. Location of drains in Hapur is presented in Map 3-4. The details of works proposed are given below:

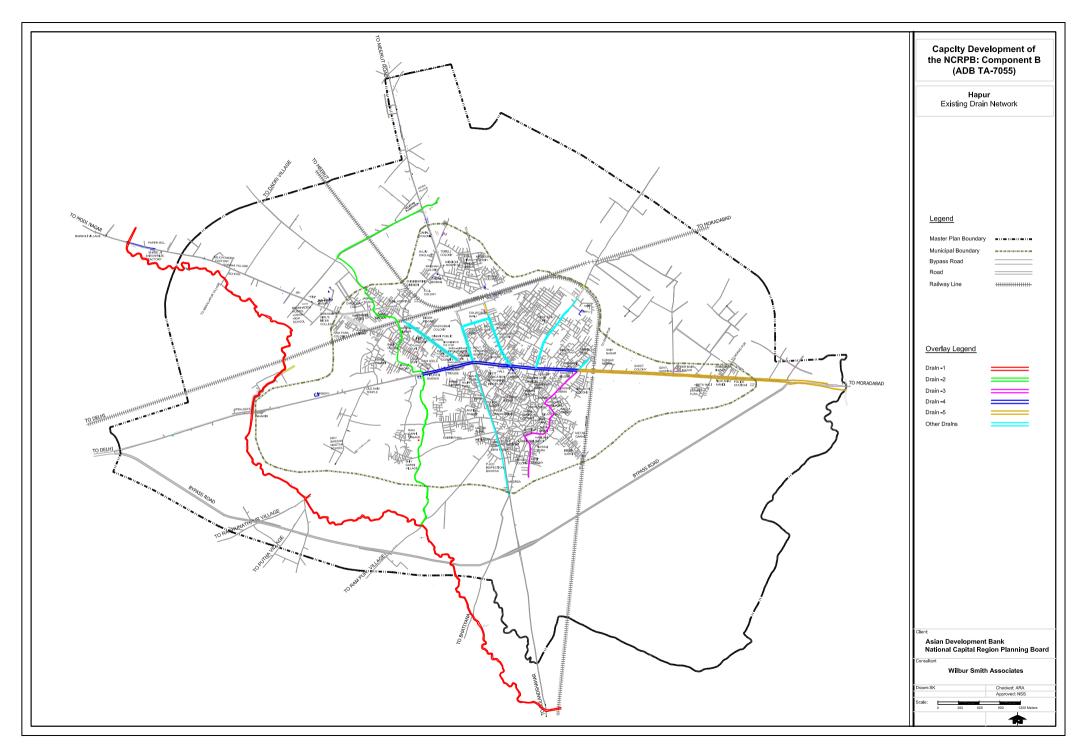
1. Improvement of Drain 2 (Choyya Nala)

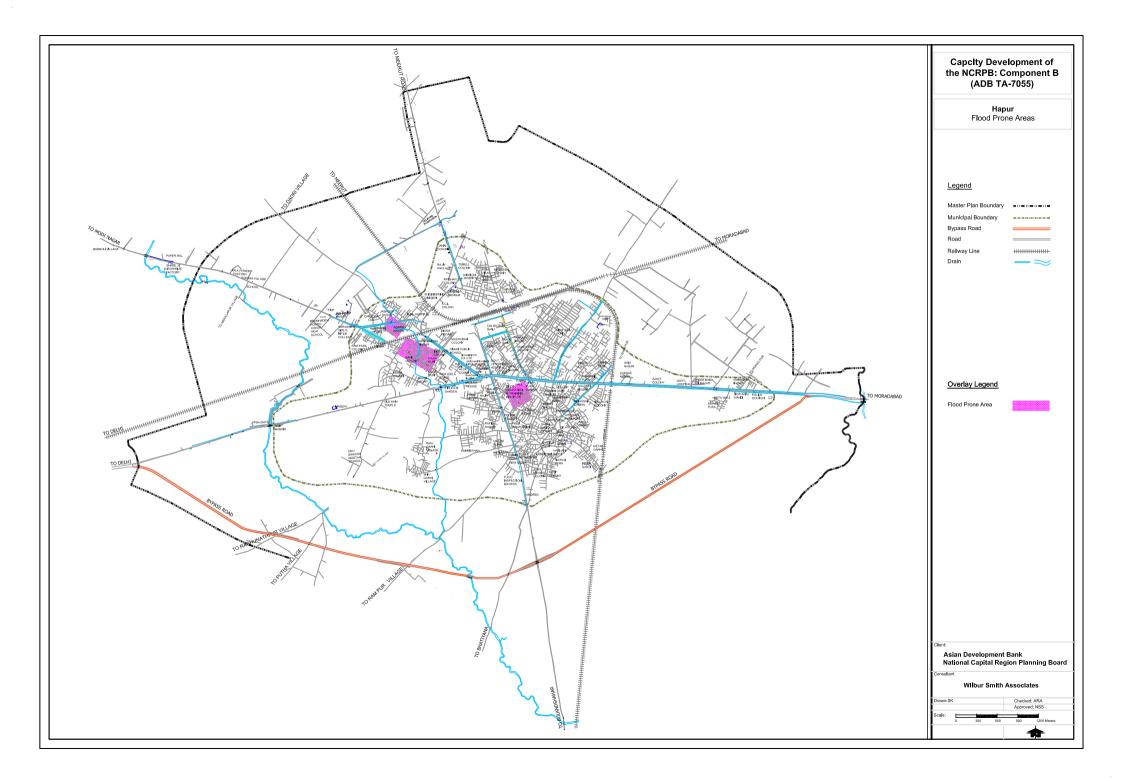
- 20. Choyya Nala (Drain 2) is the main drain of Hapur Town and is a small tributary of River Kali. The drain enters the master plan area of Hapur at Hasoda Village in the north, and flows through the town to join Kali River about 5 km south of the town. The length of the drain Hapur Master Plan area in about 4 km, and passes through Adarsh Nagar, New Ganesh Nagar, Lajjapuri, Ramgarhi and Shivgarhi in the north of the town.
- 21. At present, the drain is mostly encroached on in the municipal limits reducing its width to just about 2 m. In some stretches, drain is flowing on back sides of houses lined on both sides of the drain, which are encroached on the drain area and reducing it to a very narrow drain, and making it not accessible easily. Due to these, flooding in these areas is common. Due to lack of sewerage system, wastewater including sewage enters the drain. Indiscriminating dumping of solid waste in the drain by the households is common. The areas have become filthy and unhygienic. The drain requires immediate improvement to allow free flow to avoid flooding and related risks.
- 22. As it will be difficult to widen the drain amidst the dense development, HPDA has planned to construct a bye pass drain from chainage 1700 to Drain No. 1. Drain 1 discharge again into Drain 2 (Choyya Nala) in the further downstream, which ultimately discharges combined flow into River Kali. The present DPR takes into consideration, the new bye-pass drain proposed by HPDA and as such the flow prior to chainage 1,700 has not been considered for design the drain. This allowed the drain to develop mostly within the available ROW, avoiding major resettlement. Proposed improvement of Drain 2 are given in Table 3-1.

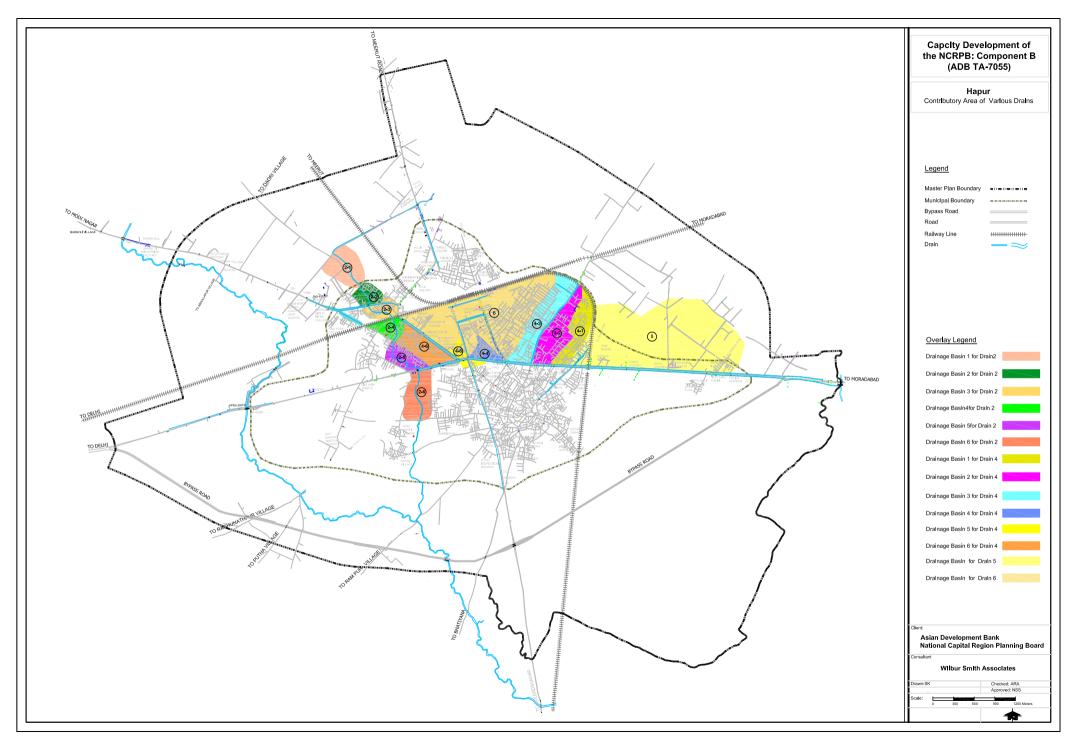


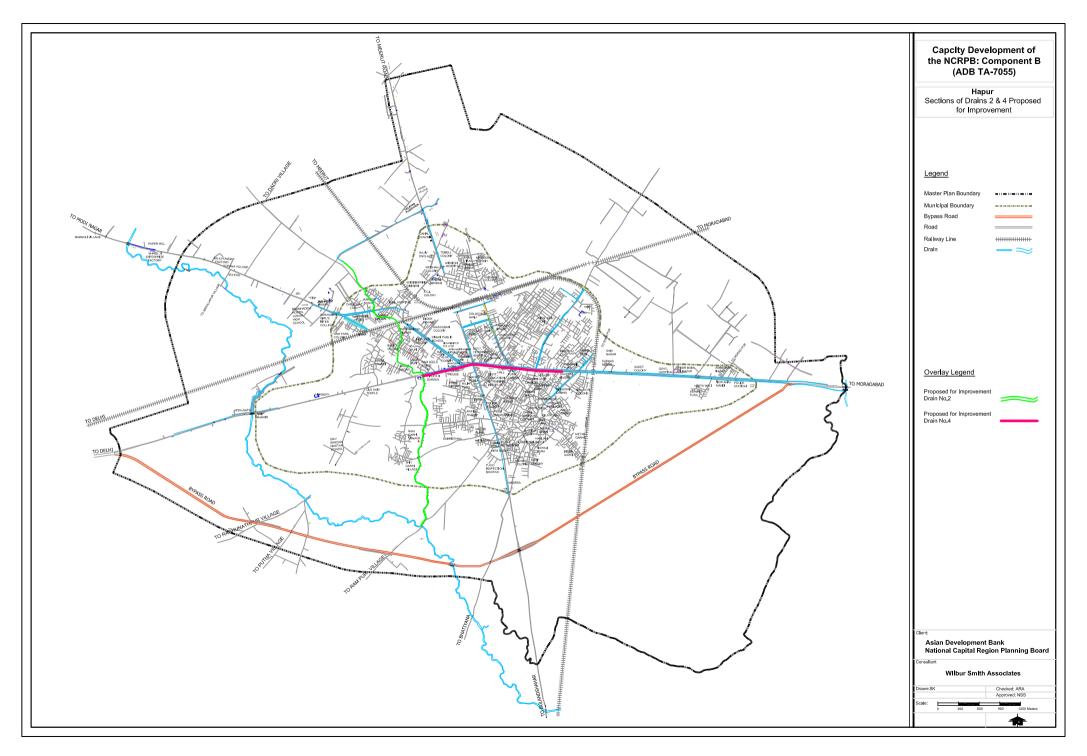












2. Rehabilitation of Drain 4 (Delhi Garh Road Nala)

- 23. Running on both sides of Delhi Gard Road, Drain 4 is an important drain in the town. Delhi Garh Road passes almost through the centre of the town in east-west almost direction, dividing the town into two parts. Drain collects and conveys storm water from both sides of the road, and joins Drain 2 (Choyya Nala) on the Delhi-Garh Road near Tirupati Garden Hotel. Width of the drain ranges from 1.5 m to 2 m and 0.8 to 2 m. Although according to the design flow requirement, section of the drain is sufficient, at many places water is accumulated along the drain due to overflowing. The following are the main issues in the drain section:
 - Wastewater discharge from all outlets of all houses and commercial establishments joins this drain. Sewage is also disposed into the drain. Indiscriminate disposal of solid waste is also rampant. Owing to these reason drain is choked allowing no or low flow resulting in overflow and water accumulation.
 - There are brick masonry arch culverts at junction of various roads connecting Delhi-Garh Road, which are reducing the net drain section. This can be handled through provision of box culvert with ramp for accessing the areas.
 - In many sections the side wall has been damaged and needs to be repaired.



- Atarpura Chouraha, the alignment of the drain is through back side of the shops and as such difficult for operation and maintenance. A bye-pass link needs to be constructed along the road.
- In some places, the entry of storm water to the drain has been blocked.
- 24. Rehabilitation works proposed for Drain 4 are presented in **Table 3-1**.

C. Estimated Cost & Implementation Schedule

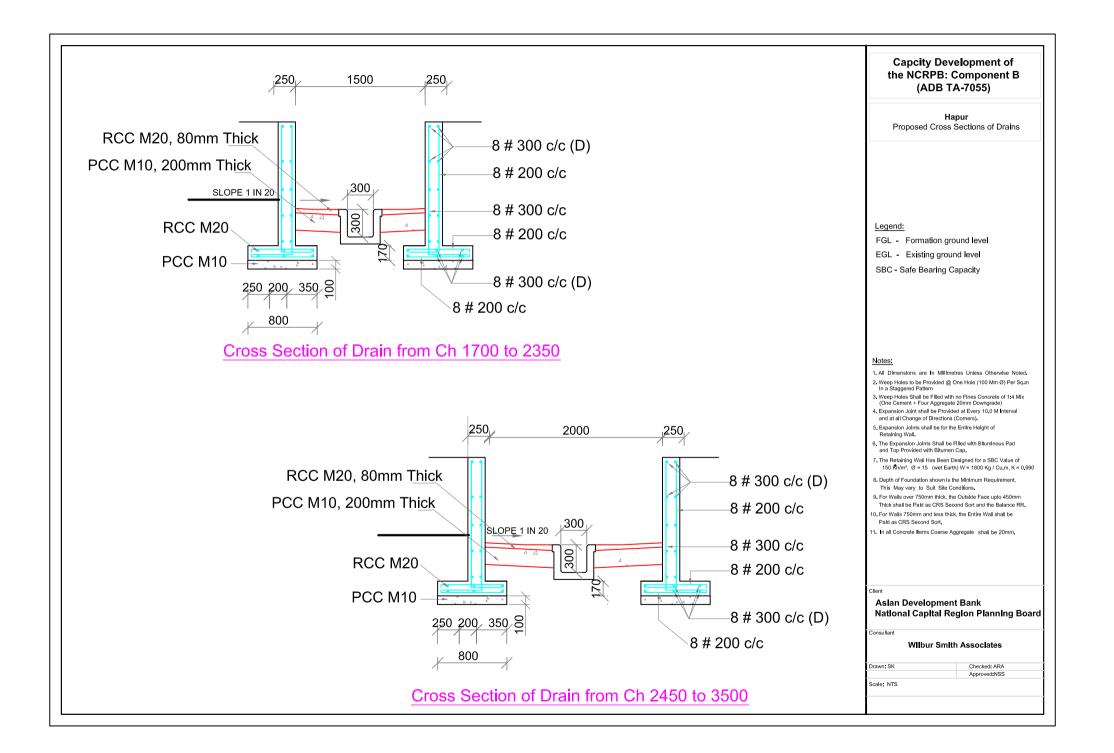
25. Estimated cost of the subproject for the improvement of 2 major drains in Hapur is Rs. 148.5 million. Construction and rehabilitation work will take upto 1¹/₂ years.

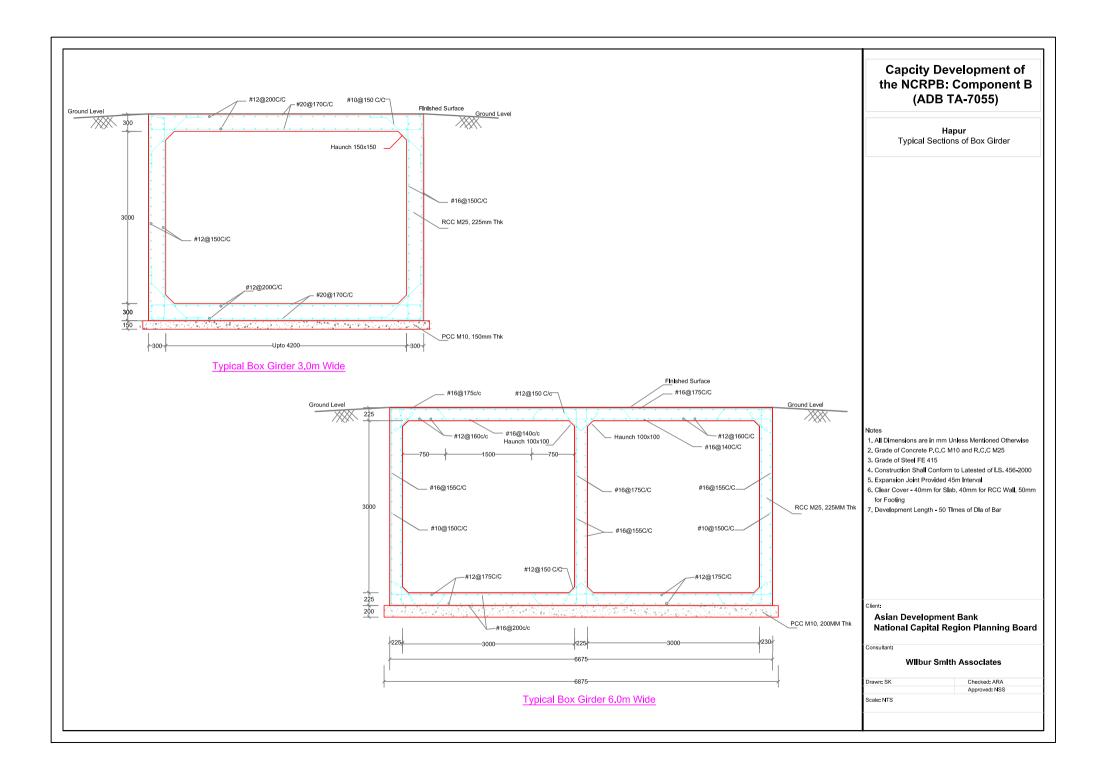
S. No	Chainage	Existing situation	Proposed improvement	Location
Ι	Drain 2		•	
1	Ch1750 to 2350 Length: 600 m	The drain section is almost nonexistent. Due to no proper channel, water is generally accumulated in the area. The drain course is presently 1.5 m wide.	• Construction of new drain in cement concrete (CC) of wide 1.5 m depth 0.3 m.	This is low density residential area. Construction within the available drain ROW.
2	Ch2350 to 2700 Length: 350 mKutcha drain section; water accumulates in the surrounding area. Existing width ranges from 1.5 to 3.2 m• Channalization and construction of drain in CC. • Drain width at initial section will be 1.5 m and gradually increased to 2 m.T		This is low density residential area. Construction within the available drain ROW.	
3	Ch2700 to 3550 Length 850 m	Pucca drain available, but chocked due to sludge and solid waste. Drain almost dry in the initial section, as no water reaches here from upstream. In some portions the wall of the drain is damaged. Existing width is about 2 m.	 Desilting and cleaning of the drain Construction of cement concrete floor/base Construction of new drain section where necessary. Width of the proposed drain is 2 m. Cleaning of pipe culvert at Charni Road Crossing 	Densely populated area and drain is not easily accessible. Construction within the available drain ROW Drain crosses Charni Road
45	Ch3550 to 4250	Pucca drain available, but chocked due to sludge and solid waste. In some portions the wall of the drain has been broken or inexistent. Width of the drain is 2 m. At the Delhi Garh Road Crossing the width of the drain is about 10 m (at Chainage 4200 to 4250). Here Drain 4 (Delhi-Garh Road Drain) joins this drain.	 It is proposed to clean the drain and level the base and make the cement concrete floor; Side wall will be repaired/constructed as required. Proposed width varies from 2 to 10 m in this section. Existing width of the drain for about 150 m in this section is very narrow due to encroachments. This section will be widened from present varying section ranging from 1 to 2 m to uniform 2m. 	Drain will improved within the available ROW. Drain crosses Delhi Garh Road
6	Ch4250 to 6700	Present drain is kutcha section and width ranges from 7 to 10 m.	 Drain to be constructed and channelized in CC. Proposed width of drain varies from 7 to 11 m. Construction of box culvert at Rampur village road crossing (5050 Chainage) 	Improvements will be with in the available drain ROW. Low density/ sparsely developed area

 Table 3-1: Proposed Subproject and Components

S.	Chainage	Existing situation	Proposed improvement	Location
No	Drain 4			
1	5190 to 6540 Length: 1,350 m	Pucca drain available, but chocked due to sludge and solid waste. Drain almost dry in the initial section, as no water reaches here from upstream. In some portions the wall of the drain is damaged. Existing width is about 2 m.	 Repair and construction of broken masonry wall; Dismantling arch culverts and replacing with CC box culverts at identified locations; Provision of new box culverts at identified locations; Plastering of existing masonry walls; Construction of drains (missing links) in identified reach; Provision of RCC block covers over drain 	The drain runs on both sides of Delhi Garh Road. Drain will be improved within the available land.

Proposed cross sections of drain are shown in Map 3-5, and box culvert is in Map 3-6.





4. DESCRIPTION OF ENVIRONMENT

A. Physical Resources

1. Location

- 26. Hapur Town is in Ghaziabad District of Uttar Pradesh State in north India. Geographically, Hapur is situated at 28⁰ 44' N latitude and 77⁰ 47' E Longitude. Hapur Town is situated at about 54 Km east of Delhi, and 432 km west of the State Capital, Lucknow. The district headquarter and fast growing city of Ghaziabad is situated about 36 km east of Hapur. Town is well connected with important cities of the country; two National Highways (NH 24 - Delhi-Lucknow-Muradabad Road, and NH 18 - Meerut-Bulandsahar Road) passes through Hapur city. Two branches of northern railway pass through Hapur Town.
- 27. The population of Hapur Town as per census 2001 was 211,983. Hapur Municipality (Hapur Nagar Palika Parishad) was established in 1982. At present, the municipal area of Hapur is 1,401 ha (14 sq. km).

2. Topography, soil and geology

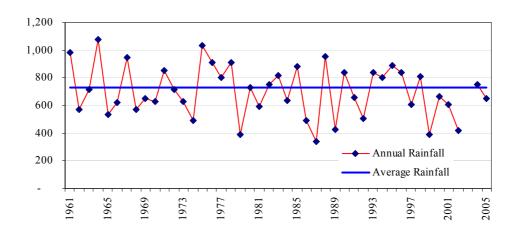
- 28. The town has almost flat topography except a small portion in the south, which is a marginally higher than the general ground level. The general slope of the town is from north to south. The difference between the maximum and minimum ground levels is about 3 m varies from 213 to 210 m above mean sea level. The depth of groundwater in the town varies from 9-12 m. The town is located in the catchment area of the Ganges River, the most important and perennial river of India, flowing at a distance of 30 km east of the town. River Kali, a tributary of River Ganges, flows in the eastern outskirts of the town in the north-south direction. Hapur Town drains into this Kali River. The general nature of the soil is sand mixed with clay.
- *3. Climate*
- 29. Typical humid subtropical climate of north India prevails in Hapur, with high variation between summer and winter temperatures and precipitation. There are three distinct seasons first of which is the monsoon season hot and humid season from mid-June to September. Second season, winter, is the cool and dry season from October to March. The third phase, summer, is characterized by hot and dry weather which prevails from April to mid-June. The average temperature ranges from a minimum of 1.8oC to a maximum of 44.9oC; occasional extremes may in the ranges of 0.6oC to 47oC. Predominant winds are from north, northwest and west. Extreme temperatures have ranged from −0.6 °C to 47 °C. Annual average rainfall is 732 mm.

30. Rains in Hapur are mainly concentrated in monsoon season. The region receives rainfall mainly under the influence of southwest monsoon from July to September. Over 75 percent of the total rainfall is received during the month from July to September and the remaining rainfall is received during December to February. The annual average rainfall is 745 mm.

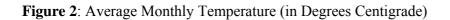
Month	Rainfall (mm)					
	Normal	2004	2005	2006	2007	2008
January	20.5	7.8	0	0	0	NA
February	20.6	0	23.9	0	45	NA
March	17.4	0	19	NA	64	NA
April	5.8	30.4	0	0	0	NA
May	12.8	75	0	0	0	NA
June	43.8	20.6	80.5	34.2	64.1	16.4
July	216.5	36.8	185.7	250.5	84.1	124.4
August	234.5	520.6	57.9	20.4	99.8	58.1
September	129.2	50.4	284.2	114	4.7	8.7
October	34.1	12.6	0	16	0	0
November	4.3	0	0	0	NA	2
December	6.1	0	0	0	0	NA
Total	745.6	754.2	651.2	-	-	-

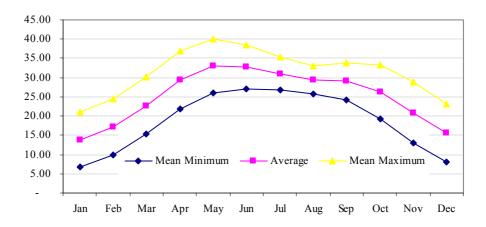
 Table 4-1: Rainfall Pattern in Panipat (2004-2008)

Figure 1: Long-term Annual Rainfall Pattern of Hapur (in millimeter)



- 31. Owing to its sub-tropical continental monsoon climate with hot summers and cold winters, Hapur experiences large variations in temperature across the year. May and June experiences high temperatures and the lowest is recorded in the months of December and January. **Figure 2** depicts the monthly averages of minimum, mean and maximum temperature.
- 32. Winds predominantly blow from north, north-west and west direction, followed by east and south-east direction.





4. Air Quality

33. There are no data on ambient air quality in Hapur Town, which is not subject to monitoring by the Uttar Pradesh Pollution Control Board (UPPCB) as there are no major industries. Dry weather coupled with dusty roads, particulate matter is likely to be high, particularly during summer months. Traffic is the only significant pollutant, so levels of oxides of sulphur and nitrogen are likely to be well within the National Ambient Air Quality Standards (NAAQS)..

5. Surface Water

- 34. The town is located in the catchment area of the Ganges River, the most important and perennial river of India. River Kali, a tributary of River Ganges, flows in the eastern outskirts of the town at Tatarpur Village, in the north-south direction. Hapur Town drains ultimately into Kali River. Most of the town drains into Choyya Nala flowing through the town, which meets Kali River about 10 km south of the town. River Kali ultimately meets the Ganges far downstream.
- 35. Due to seasonal and low rainfall concentrated for short duration, drains carry mostly the

wastewater. Absence of proper sewerage system is one of the main reasons for
wastewater entering into the drains and reaching River Kali, and then ultimately to the Ganges. The main drain of Hapur, Chhoya Nala enters the town from north. The Nala enters into the town with polluted water, which it received mainly from Dheerkukheda industrial area, and other habitations upstream of Hapur. Once it enters Hapur, due to lack of sewerage system, the domestic wastewater – including sewage in some



cases, is discharges into the drains through network of drains. Another drain – known as Circular Drain, carries wastewater from a part of the town and drains directly into Kali River on the eastern outskirts. Indiscriminate disposal of solid waste into the drains is prevalent. Chocking, blocking and overflowing of drains is common. The drains, due to accumulation of wastewater, acts as mosquito breeding grounds and giving rise to diseases.

36. Following **Table 4-2** shows the water quality of Choyya Nala at two locations as per a sample test conducted in October 2009. It clearly establishes that the Nala carries wastewater with high BOD levels. **Table 4-3** presents the characteristics of accumulated silt in the Nalla. This shows the presence of heavy metals, although in lesser concentration to be defined as "hazardous waste" as per the Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008.

S. No	Parameters	Sample1(in the City))	Sample2 (City outskirts)
1	BOD.,	117.30	107.20
2	COD	221.00	210.00
3	pН	6.85	7.00
4	Color	Gray	Gray
5	Total Suspended solids	446.00	450.00
6	Oil and Grease	306	289.00
7	Nitrate as NO3	72.82	67.571
8	Sulphate,as SO4	27.98	31.240
9	Floride,as F	4.00	4.00
10	Total Hardness, as CaCO3	612.25	580.86
11	Phosphates, as PO4	42.77	30.24
12	Cloride,as Cl	329.06	289.00
13	Total Dissolved solid	1170.00	1044.00

Table 4-2: Water Quality of Choyya Nala

S. No	Parameters	Sample1 (in the City))	Sample2 (City outskirts)	Hazardous waste concentration limit#
		mg/kg	mg/kg	mg/kg
1	Nickel	17.99	18.00	5000
2	Zinc	186.03	179.0	20,000
3	Mercury	32.98	31.15	50
4	Chromium	14.81	14.00	50
5	Lead	472.68	465.74	5,000
6	Cadmium	0.39	0.39	50
7	Copper	112.00	110.00	5000
8	Iron	223.53	223.53	-
9	pН	7.65	7.50	-
10	Color	Black	Black	-
11	Manganese	74.59ppm	74.53ppm	-

If concentration of respective element is equivalent or more than this limit, the waste material can be termed as Hazardous Waste and falls under the ambit of Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008.

6. Groundwater

37. Hapur is located in Central Gangetic Alluvium of quaternary age. The alluvium comprises of clay mixed kankar and fine and medium sand. The ground water in the area occurs under the unconfined to semi confined conditions. Groundwater is the prime and only source of water supply to Hapur Town. Following is a brief on groundwater situation in Hapur as provided in the "Appraisal Note of Hapur Water Supply Reorganization Scheme" submitted for finance under centrally sponsored UIDSSMT scheme (this is presently under implementation). This was prepared by Uttar Pradesh Jal Nigam (UPJN). No background data/results of the study were available.

"As per the subsurface configuration study of the nearby area, the saturated/tapped granular zones occur between the depth ranges of 70 - 100 meter below ground level. Yield of tube wells is 750-1,000 LPM. Depth of tube wells is about 110 meters. As per study and evaluation of chemical analysis results, it has been found that the formation water of upper and middle aquifer is potable. The chemical analysis results of the tube wells upto the depth of 110 meter below ground level indicate fresh/potable water".

B. Ecological Resources

38. There are no forests or any other environmental sensitive locations in or near Hapur. Although due to its location close to the National Capital Delhi is fast attracting various developments, Hapur region is predominantly an agricultural based economy. Hapur Town is an urban area surrounded by land that was converted for agricultural use many years ago. 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 plus other species able to live close to man.

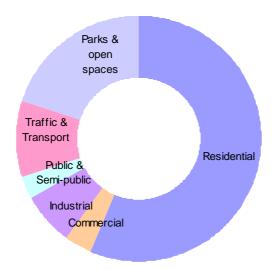
C. Economic Development

1. Land Use

39. The area of Hapur Town within the municipal boundary is 14.01 sq. km, while the Hapur Master Plan covers an area of 46.33 sq. km. In the total Master Plan area only about 15 percent in inhabited and the remaining is mostly agricultural and vacant land. Hapur is one of the towns of NCR being developed to decongest National Capital Delhi by improving infrastructure with the aim of shifting some of the offices and establishments of Government of India. Owing to its location advantage close to Delhi and with good road connectivity, Hapur is a fast developing town. It is a much sought-after destination for setting up of educational and professional institutes. There are a number of educational institutes, etc in Hapur.

- 40. The town is developing mainly in two directions linear development can be observed on both sides of Bulandsahar Road towards south and along Delhi- Muradabad National Highway towards east. The Hapur-Pilkua Development Authority, which regulates the development activities, is presently developing land areas between Bulandshahar Road and NH 24 in the western part of the town. These include development of residential layouts, and a Leather Park and IT Park for industrial development.
- 41. As depicted in the following figure, as per the 2005 Master Plan of Hapur, nearly half of the total area is provided to the residential use. Industrial land use is about 6.7 percent. However, the actual growth of the town has been not on the lines of projections made in the Master Plan. The projected population considered in Master Plan for 2005 was 450,000 while the census 2001 put the actual population only 211,493.

Figure 3: Land Use as per 2005 Master Plan



- 2. Industry & Agriculture
- 42. Owing to vast agriculturally rich hinter land, Hapur has traditionally been an important commercial and agricultural trade centre in western Uttar Pradesh region. It is the main centre for trade and export of agricultural produce in the region, and houses a big Agricultural Produce Market, mainly trading in Grains, Joggery and Potato. Hapur also has one of the biggest grain storage facility in the country there are six big solos of the Ministry of Food and Agriculture, Government of India, which act as a reserve for essential food grains.
- 43. There are no major industries in Hapur. However, there is a number of small scale engineering industries in the town to cater to the demands of its agriculturally dominant vast hinter land. Most of these industrial units are into manufacturing and repair of farm equipments and oil expellers. There are a number of cold storage units for storing of agricultural produce like potatoes. There are also some units manufacturing sewing machines.
- 44. Owing to fertile agricultural lands and good availability of groundwater, agricultural activity is very active. Although the land within the town limit is converted to developmental purposes, there are vast hinterlands starting from town skirts which agriculturally rich. Varieties of crops are cultivates here including paddy, vegetables, pulses, sugan cane etc.

3. Infrastructure

45. *Water Supply*. Two agencies are involved in provision of water supply service in Hapur;

while the state line agency Uttar Pradesh Jal Nigam (UPJN) is responsible for development of new infrastructure and all capital works, the Hapur Municipality is responsible for its day-to-day operation and maintenance. Piped water supply system in the town was provided in the town in 1950s, and expanded subsequently to cover expanding areas. However, at present, this water supply system serves only 60 percent of the total population. Groundwater is the principle and only source of water. Groundwater is abstracted from 18 tube wells, and supplied through distribution system – water from about 60 percent of tube wells are pumped to over head reservoirs for supply through distribution system, and from the remaining tube well water is directly pumped into distribution system and supplied. Groundwater quality is good, and water is disinfected with chlorine prior to supply.

- 46. Water is supplied to the consumers for about an hour every day. The rate of water supply is about 100 liters per capita per day (LPCD), less than the CPHEEO stipulated norm of 135 LPCD. The Municipality has provided 14,000 individual house service connections and 150 public stand posts. In addition, there are 810 hand pumps for drawing of groundwater for use by households, mostly to serve the areas unserved by the piped water supply system.
- 47. Sewerage System. UPJN carries out all new and capital works while the Hapur Municipality operates and maintains the sewerage system in the town. Underground sewerage system, consisting of lateral sewers, pumping station and trunk sewers, was developed in 1970s. There was no sewage treatment facility developed. This system at present covers about 30 percent of the town area, but it is almost defunct. In the remaining areas, people use septic tanks (for sewage disposal) and open drains (for sullage) and some households illegally dispose wastewater including sewage into open drains. Few households resort to open defecation.
- 48. Most of the sewer lines are choked and are overflowing. Due to lack free flow in the system, most of the sewers are discharging sewage into open drains. Almost all of the open drains in the congested city area are carrying sewage. As a result, the total sewage reaches the sewage pumping station is very minimal. At present pumping is done for 2 hours a day with one pump operating against installed capacity of four pumps. The sewage reaching sewage pumping station is hardly 5-10 percent of design flow. Since there is no sewage treatment facility, sewage pumped from SPS is discharged directly into Choyya Nala and this untreated wastewater is used for irrigation.
- 49. Solid Waste Management. About 65-75 tons of municipal solid waste is generated in the town. There is no door-to-door collection system in the town and the waste is collected through dust bins. Hapur municipality collects nearly 50 percent of the waste. Indiscriminate disposal of solid waste into drains, roads and vacant plots is prevalent. In most of the areas drains are chocked with solid waste, and surroundings are very unhygienic. There is no proper disposal site in Hapur, and the waste is disposed along the roads on outskirts. Due to crude open dumping the areas have become filthy and unhygienic.

50. *Storm Water Drainage*. Open drainage system is provided in the town to cater for collection and conveyance of storm water during rains. This open drain network consisting of primary, secondary and tertiary drains. Tertiary drains collect water from various streets and disposes in to secondary drains, which are further connected to primary drains, and to natural stream. There are four main drains in Hapur including Choyya Nala, which a small tributary of Kali River. Two primary drains dispose into Choyya Nala, which ultimately discharges into Kali River in the southern side, while another primary drains disposes directly into Kali River in the eastern outskirts of the town. In the absence of proper functioning sewerage system, drain carries mostly wastewater including sewage. Due to encroachment of streams and flood plains, during monsoon rains, few areas experiences flooding.

4. Transportation

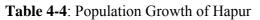
- 51. Town is well connected with other parts of the state and country. Two National Highways (NH 24 Delhi-Lucknow-Muradabad Road, and NH 18 Meerut-Bulandsahar Road) pass through Town. Hapur is well connected with railway and is a railway junction. Two branches of Northern Railway network Hapur Branch and Ghaziabad-Moradabad Brach, pass through the town.
- 52. Except in the newly developed areas in the outer areas of the town, most of roads in the town are narrow and more congested (with both traffic and pedestrians), and the roads are not well maintained. Most of the internal roads in the old city are constructed with cement concrete blocks.
- 53. There are regular bus services to its hinterland and other towns and cities in the neighboring states operated by both by state-run and private transport services. Being a small town there is no public transport facility with in the town. Commuters mainly depend on IPT modes of Auto Rickhwas and Cycle Rishwas, besides the private vehicles for intra-city travel.

D. Social and Cultural Resources

1. Demography

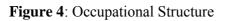
54. According to the national census the population of Hapur was 211,983 in 2001, increased from 146,591 in 1991, recording a growth rate of of 44.6 percent over the decade, much higher than the urban growth rate of the country. The decades of 1971-81 and 1981-91 also experienced similar growth rates. Gross average density is increased from 105 persons per hectare in 1991 to 151 in 2001. The total population in Master Plan area of Hapur is according to 2001 Census is 354,148. Following Table shows the population growth of the town within the municipal limits.

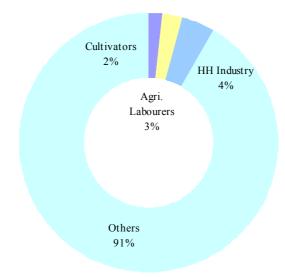
Year	Population	Decadal Growth Rate (%)
1951	49,260	-
1961	55,248	12.16
1971	71,266	28.99
1981	102,837	44.30
1991	146,591	42.55
2001	211,983	44.61



Source: Census of India

- 55. Overall literacy is 68%, reported at 77% for males and 59% for females, which is considerably higher than literacy in the state as a whole, which is 57% overall, and 70.2% for males and 43% for females. The sex ratio is significantly below the natural 1:1 ratio, being 873 females per 1000 males, lower than both the state and national averages (898 and 929 respectively).
- 56. According to the census, in 2001 workforce participation rate (WPR) in Hapur was 28 percent. As shown in the following figure, 91 percent of the total workforce is engaged in trade & commerce sector and other service sectors. About 5 percent are engaged in primary sector (agricultural related).





57. Majority of people in Hapur are Hindus and the remainder are mainly Muslims. Almost all people speak the national language of Hindi. A few also speak English. Scheduled tribe population in the town is negligible; around 29% of the population belongs to scheduled castes (SC).

2. History Culture and Tourism

- 58. Hapur is a very old town and there are various accounts in the public domain on how the town is named as 'Hapur'. It is said that King Harischandra was established the town of Hapur and some say that Shree Haridutt of Meerut-Bulandhshahar established and named it as Hapur, and there is also a story that Hapur name is derived from the word 'Hapar', which means garden.
- 59. There are no notable historic or cultural sites in Hapur. A wall was constructed around the town with five gates for entry-exit Delhi Gate, Meerut Gate, Garh Mukteshwar Gate, Kothy Gate and Sikandra Gate. However, at present only some remains can be seen, and almost everything was destroyed. Mughal Emperor Aurangazeb constructed a mosque (named as Jama Masjid) in Hapur in 1670. The town has no tourism significance.

5. ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

A. Physical Resources

60. ADB Environmental Assessment Guidelines stipulates 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 should be identified, and mitigation is devised for any negative impacts. Following sections evaluate impacts of the proposed subproject for improvement of drains in Hapur.

B. Construction Impacts

- 61. Proposed drainage subproject will include:
 - (i) Construction of new drain section in cement concrete (CC), which will involve:
 - Excavating the drain area to form the trench required for construction of drain section. The trench size will vary from 2.5 m to 13 m and depth from 0.3 m to 1.5 m at different location
 - Construction of base in plain cement concrete (PCC),
 - Placing a RCC pre-fabricated cunnet of width 0.3 to 0.5 m and depth 0.3 to 0.5 m in the bottom centre of the drain
 - Construction of side walls in RCC or random rubble masonry, as required at different places
 - (ii) Construction of box culverts or girders; this will involve site clearance & formation of base; laying of base in RCC; construction of retaining walls in RCC; construction of upper slab in RCC
 - (iii) Cleaning & rehabilitation of drains; this will include: clearing of accumulated water; clearing of accumulated sludge and solid waste; repairs to the masonry wall, repair and smoothening of drain floor
 - (iv) Widening of drains; this will include dismantling of existing sections and removal of encroachments, if any; excavating the drain area to form the trench required for construction of drain section. The trench size will be 2.5 m wide. A new drain will be constructed in the section as explained above.

1. Construction Method

- 62. Initially, at work sites where requires, the accumulated water in the drain will be pumped out, using a mobile pump set. At each working section of drains, all the inlets will be closed, and the drain is allowed to dry for some time, before the cleaning and desilting of the drains are carried out. Desilting work will be carried out mostly manually with appropriate tools or using mini excavator cum loader equipment, where there is sufficient space to work. Collected material will be loaded on to trucks for further disposal.
- At the sections where the new drain sections are proposed and where the existing kutcha 63. drains are proposed for replacement with the pucca CC drains, the site clearance including uprooting of rank, vegetations grass, push, wood trees and samplings of girth for the area of the drain will be undertaken. Trench for foundation of drain will be excavated manually or using mechanical excavators, where possible. Once the cavity of required size has been created, concrete will be poured in to form the foundation of the drain. Bottom surface will be rammed, leveled and pre-fabricated cunnets brought to the site on trucks will be positioned at the centre of drain and the base of the will be formed with plain cement concrete on the both sides with required slope to allow free flow of water into the cunnet.. Side walls will be constructed by pouring the concrete into the wooden casing till the required depth of drain is achieved. After drying, the wooden casing will be removed and the top and inside surface of each wall will be finished with a mortar covering. Prefabricated concrete slabs will be brought to the site on a truck and offloaded and placed into position over the top of the drain by hand. Road surface will be restored to its original position, where it is distributed due to construction work.
- 64. Construction will be carried out in a single operation, which will begin with the removal of the existing road surface and existing culvert by backhoe diggers at the locations of drain crossing to create a solid box culvert to provide for flow of drain below at a required level and a solid surface above the drain at the required elevation for the traffic flow. Subsequent to excavation, the base will be leveled and base raft foundations will be formed by positing the iron bars in wooden casing and then pouring the concrete. The reinforcing rods will extend out of the base to create retaining walls on both the sides. These will then be encased in shuttering, into which more concrete will be poured to form the walls. Thereafter, wooden casing will be fixed connecting the top of the walls, and reinforcing bars will be positioned. The reinforcing bars extending from walls are also integrated, and concrete will be poured on the wooden plot form to complete the box structure of culvert.
- 65. The construction work will be conducted by small teams of 10-15 men, comprising masons, labourers, and truck drivers, surveyors and supervisors. Each team will construct the drains along a short length of road (approximately 10-20 m) before moving on to the adjacent length.

2. Construction Impacts

- 66. This work will involve straightforward construction, alongside relatively short lengths of road, so if appropriate precautions are taken, physical impacts should not be greatly significant. Since the project involves rehabilitation of existing drains, it will not involve any major earth work or exaction. So typical impacts associated with earth work, like impacts due to disposal of waste/surplus soil, dust and noise, etc are not anticipated.
- 67. The proposed works invariably include cleaning and desilting of drains. In the existing situation, drains in Hapur are carrying wastewater including sewage, and indiscriminate disposal of solid waste into drains is also prevalent. The drains have been chocked and water accumulated at many stretches of drain. The proposed works therefore include dewatering of drains by pumping out of accumulated wastewater, and desilting. As per the estimate provided in the DPR this activity will produce about 6.5 ML of water, and 7,750 m3 of sludge including drain debris. Accumulated silt contains heavy metals (refer **Table 4-3**), and improper handling and disposal may cause health and environmental problems.
- 68. The following measures are to be included in the project and implemented:
 - Start the work from downstream end of the drains (from chainage 6700 of Drain 2 and Chainage 6450 of Drain 4)
 - Conduct work in small sections, say 100 m at a time; confine the drain in the section and stop all inlets in general, and into that section in particular
 - Provide a bypass arrangement for the water coming for upstream by providing pumping arrangement so that the water coming from upstream side of the selected section are pumped through a pipe to the downstream
 - Dewater the selected section; pump the accumulated water into the downstream;
 - As far as possible allow the silt to dry before start of desilting work.
 - Avoid manual desilting of drains as far as possible in the section where there is space to employ mechanical diggers or appropriate equipment and tools
 - Where manual method is adopted in narrow and inaccessible sections, provide proper tools and equipment for disilting (winches and buckets), and personal protection equipment (PPE) for workers (gloves, gum boots, face masks, etc); additional oxygen tanks in case the drain is deeper than four feet. Workers should also be given oils for protecting skin and soap to clean up later.
 - Provide onsite training to workers on safe handling of contaminated water and sludge
 - Silt/soil generated from desilting shall be land filled safely in consultation with Uttar Pradesh Pollution Control Board; shall not be used as manure or for land application

- 69. There may be dust generation from transportation of construction material like sand and it's loading, unloading and storing. The Contractor should therefore be required to:
 - Bring the material (aggregate and sand) as and when required;
 - Ensure speedy completion of work;
 - Use tarpaulins to cover loose material that is transported to and from the site by truck
- 70. There will be a need to break the cement concrete or bituminous roads (manually or through pneumatic hand drills where feasible) for construction of culverts and widening of narrower section of drains at few locations. This activity will certainly generate noise and vibrations. The following measures therefore shall be implemented to reduce the impact:
 - Provide prior information to the local public about the work schedule
 - Do not conduct noise generating activities in the night
 - Ensure that there are no old and sensitive buildings that may be in risk due to use pneumatic drills
 - Employ pneumatic hand drill only when it is feasible
- 71. Another important impact associated with this project is that of removal of some encroachments for improvement of drains. Although removal of encroachments is minimized by redesigning the drain within the existing alignment and footprint, it cannot be avoided in few sections where widening and improvement to the geometric alignment of the drains is proposed as per the design to carry the anticipated discharge. These resettlement 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. Therefore it is necessary that:
 - Resettlement Plan prepared for the subproject is implemented in full and all its recommendations are complied with.
- 72. The drain construction works will also disturb some modern-day social and cultural resources, such as schools, hospitals and temples. Repair and rehabilitation of Delhi Garh Road Drain (Drain 4) interrupt access to commercial establishments, residences and for pedestrians and vehicles. This will be achieved through several of the measures recommended above, including:
 - Avoiding working at sensitive times,
 - Limiting dust by removing waste soil quickly, bringing sand to site only when necessary, covering and watering stockpiles, and covering soil and sand when carried on trucks;
 - Increasing the workforce in sensitive areas to complete the work quickly;
 - Providing wooden bridges for pedestrians and metal sheets for vehicles to allow access across open trenches where required (including access to houses);

- Using modern vehicles and machinery with standard adaptations to reduce noise and exhaust emissions, and ensuring they are maintained to manufacturers' specifications.
- 73. Transport is another type of infrastructure that will be affected by drain improvement work, particularly the construction work of culverts at road crossings. Traffic on Delhi Garh Road will be affected during the construction of box culvert, and also during the improvement of Drain 4. Following measure can potentially avoid traffic disruptions:
 - Do not close the road completely, ensure that work is conducted in one line of the road; allow traffic to move on one line
 - In unavoidable circumstances of road closure, provide alternative routes, and ensure that public is informed about such traffic diversions
 - In case of closure of important roads, provide information to the public through media daily news papers and local cable television (TV) services, about the need and schedule of road closure, and alternative routes
 - At all works sites public information/caution boards shall be provided information shall inter-alia include: project name, cost and schedule; executing agency and contractor details; nature and schedule of work at that road/locality; traffic diversion details, if any; entry restriction information; competent official's name and contact for public complaints.
 - Providing wooden bridges for pedestrians and metal sheets for vehicles to allow access across open trenches where required (including access to houses)
- 74. It is inevitable that there will be an increase in the number of heavy vehicles in the town (particularly trucks carrying construction materials and desilted material), and this could disrupt traffic and other activities. These impacts will therefore need to be mitigated by:
 - Careful planning of transportation (material and silt) routes in coordination with the Traffic Police to avoid sensitive areas as far as possible, including narrow streets, congested roads, and other important area
 - Scheduling the transportation of waste to avoid peak traffic periods, the main tourism season, and other important times
- 75. 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 formulate and implement health and safety measures at construction sites, which should include such measures as:
 - Following standard and safe procedures for all activities such as provision of shoring in trenches where required in deeper trenches of more than 2 m
 - Excluding the public from the site enclosing the construction area, warning boards and sign boards
 - Ensuring that all workers are provided with and use appropriate Personal Protective Equipment like gloves, boots, face masks, etc to the workers

- In very deep and narrow sections of existing drains, where de-sludging is conducted, there will invariably be risk due to hazardous working conditions at the bottom of drain due to possible gas formation; in these section it entering drain for manual cleaning must be avoided by using appropriate equipment like long handled shovels. In unavoidable cases, provide additional oxygen tanks in case the drain is deeper than four feet. Workers should also be given oils for protecting skin and soap to clean up later
- On/off-site Health and Safety Training for all site personnel;
- Maintaining accidents reports and records
- 76. There could again be some short-term socio-economic benefits from the construction work if local people gain employment in the workforce. To ensure that these benefits are directed to local people, the Contractor should be required to employ as much of his labour force as possible from the local communities in the vicinity of construction sites. Drawing of majority of workforce from local communities will avoid problems that can occur if workers are imported, including social conflicts and issues of health and sanitation due to labour camps. If temporary labour camps are to be provided; Contractor should ensure that they are maintained well with proper water supply and sanitation facilities.

C. Operation Impacts & Mitigation Measures

- 1. Operational Activities
- 77. The drains will not function without maintenance, as silt inevitably collects in areas of low flow over time. The project will therefore provide equipment for cleaning/desilting of drains, including buckets and winches to remove silt.
- 78. Rehabilitation of two important and major drains in Hapur will improve the drainage system of Hapur, through quick disposal of rainwater from the localities. However, implementation of the other recommendations of the Drainage Master Plan will be necessary to eliminate all the storm water related issues of Hapur. Some of these recommendations like elimination of cross sewer connection, stopping of entry of wastewater into drains are addressed through the sewerage subproject, which is also prepared parallel with this drainage subproject. Implementation of following measures will avoid any risk on health and environment that may result from malfunction of system due to (i) entry of waste:
 - Prevent entry of wastewater into drains; this requires development of sewerage system in the town. The DPR prepared for Hapur Sewerage System in parallel process shall be implemented on priority
 - Ensure regular cleaning and desilting of drains; project shall include provision of necessary maintenance equipment
 - Prevent encroachment of drains

D. Environmental Impacts & Mitigation: Location and Design

- 79. 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 projects are identified, and mitigation is devised for any negative impacts. This has been done in earlier Sections and no other impacts are expected.
- 80. In the case of this subproject there are almost no impacts that can clearly be said to result from either the design or location. An impact that can be said as a result of location and/or design is the removal of few encroachments for improvement of drains. Although removal of encroachments is minimized by redesigning the drain within the existing alignment and footprint, it can be avoided in few sections where widening and improvement to the geometric alignment of the drains is proposed as per the design to carry the anticipated discharge. These resettlement 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. Resettlement Plan prepared for the subproject is implemented in full and all its recommendations are complied with during implementation.

E. Environmental Management Plan

81. Following **Table 5-1** shows the potential negative impacts of the Hapur Drainage Subproject as identified and discussed earlier in this Section, and the mitigation measures proposed to reduce those impacts to acceptable levels. The table also shows mitigation activities, methods, its location and schedule of implementation, and project agencies responsible for implementation. An assessment of whether or not proposed mitigation measure will successfully mitigate the impact (shown as 0) or provide an additional benefit (shown as +), is also presented in **Table 5-1**.

Potential Negative Impacts	Sig	Dur	Mitigation measures	Responsibility	Location	Net Impact
Preconstruction						
Removal of encroachments	L	Р	• Implement compensatory measures as recommended by the Resettlement Plan prepared in compliance with Government and ADB legislations	HNP	Encroached sites	0
Construction						
Handling & disposal of accumulated water and sludge in the drains	М	Т	• Start the work from downstream end of the drains (from chainage 6700 of Drain 2 and Chainage 6450 of Drain 4)	CC	All drain rehabilitation	0
			• Conduct work in small sections, say 100 m at a time; confine the drain in the section and stop all inlets		sites	
			• Provide a bypass arrangement for the water coming for upstream by providing pumping arrangement so that water coming from upstream of the selected section are pumped through a pipe to the downstream			
			• Dewater the selected section; pump accumulated water downstream;			
			• As far as possible allow the silt to dry before start of desilting work.			
			• Avoid manual desilting of drains as far as possible in the section where there is space to employ mechanical diggers or appropriate equipment and tools			
			• Where manual method is adopted in narrow and inaccessible sections, provide proper tools and equipment for disilting (winches and buckets), and personal protection equipment (PPE) for workers (gloves, gum boots, face masks, etc); additional oxygen tanks in case the drain is deeper than four feet. Workers should also be given oils for protecting skin and soap to clean up later.			
			• Provide on-site training to workers on safe handling of contaminated water and sludge			
			 Silt/soil generated from desilting shall be land filled safely in consultation with Uttar Pradesh Pollution Control Board; shall not be used as manure or for land application Dispose at any nearest sanitary landfill 	CC	All drain rehabilitation sites	
Dust generation from transportation,	L	Т	Bring the construction material (aggregate and sand) as and when required to the	CC	Transport routes	0
loading/unloading of construction material			site; avoid temporary storage		_	
			• Use tarpaulins to cover waste soil in transport			
			Ensure speedy completion of work			
Generation of noise and vibrations	L	Т	Provide prior information to the local public about the work schedule	CC	Culverts and	0
from excavation in CC & BT Roads			• Do not conduct noise generating activities in the night		other road	
			• Ensure that there are no old and sensitive buildings that may be in risk due to use		crossings	

Table 5-1: Environmental Management Plan

Potential Negative Impacts		Dur	Mitigation measures	Responsibility	Location	Net Impact
			pneumatic drills			
			Employ pneumatic hand drill only when it is feasible			
Impacts due to improper mining for construction materials	L	Р	• Obtain construction materials such as sand, aggregate and gravel only from quarries licensed and approved by GoUP (Directorate of Geology and Mining)	CC	NA	0
Traffic could be disturbed due to construction of box culverts (Delhi Garh Road, Charni Road etc)	L	Т	 Do not close the road completely, ensure that work is conducted in one line of the road; allow traffic to move on one line In unavoidable circumstances of road closure, provide alternative routes, and ensure that public is informed about such traffic diversions In case of closure of important roads, provide information to the public through media – daily news papers and local cable television (TV) services, about the need and schedule of road closure, and alternative routes At all works sites public information/caution boards shall be provided (name of the project, cost, schedule, contractor name, implementing & executing agency, schedule of work at that locality, details of traffic diversion, responsible officer for implementation and receiving complaints) 	CC/HNP	Culvert sites	0
Site of social/cultural importance (schools, hospitals and religious places) may be distributed by noise, dust, and impeded access	L	Т	 Avoiding working at sensitive times, Limiting dust by removing waste soil quickly, bringing sand to site only when necessary, covering and watering stockpiles, and covering soil and sand when carried on trucks; Increasing the workforce in sensitive areas to complete the work quickly; Providing wooden bridges for pedestrians and metal sheets for vehicles to allow access across open trenches where required (including access to houses); Using modern vehicles and machinery with standard adaptations to reduce noise and exhaust emissions, and ensuring they are maintained to manufacturers' specifications. 	CC	All sites	0
Workers and public at risk from accidents on site	L	Т	 Ensure that health and safety measures are in place as part of the contract. These shall include: Follow standard and safe procedures for all activities, like provision of shoring in trenches Exclude the public from all construction sites; barricade the site; provide caution & sign boards Ensuring that all workers are provided with and use appropriate Personal Protective Equipment like gloves, boots, face masks, etc to the workers In very deep and narrow sections of existing drains, where de-sludging is conducted, there will invariably be risk due to hazardous working conditions at the bottom of drain due to possible gas formation; in these section it entering drain for 	CC	All sites	0

Potential Negative Impacts	Sig	Dur	Mitigation measures	Responsibility	Location	Net Impact
			 manual cleaning must be avoided by using appropriate equipment like long handled shovels. In unavoidable cases, provide additional oxygen tanks in case the drain is deeper than four feet. Workers should also be given oils for protecting skin and soap to clean up later Provide On/off-site Health & Safety Training to workers; Maintain accident reports and records. 			
Economic benefits for people employed in workforce	L	Т	• Ensure that most of the workforce is from local communities	CC	All sites	+
Operation & Maintenance						
Entry of wastewater, blocking/choking of drains due to accumulation of silt, and solid waste could damage the health and environment	L	Р	 Prevent entry of wastewater into drains; this requires development of sewerage system in the town. The DPR prepared for Hapur Sewerage System in parallel process shall be implemented on priority Ensure regular cleaning and desilting of drains; provide appropriate maintanance equipment & tools as part of the project Prevent encroachment of drains 	HNP	Entire City	+

Sig - Significance of impact (L-low; M-medium; High; NS – not significant); Dur – Duration (T-temporary; P-permanent) 0 – impact mitigated to acceptable level; + positive benefit ADB – Asian Development Bank; CC – Construction Contractor; HNP – Hapur Nagar Palika

6. INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MONITORING PLAN

A. Institutional Arrangements

- 82. Following agencies are involved implementing the Hapur Drainage Subproject:
 - (i) <u>Executing Agency</u>: National Capital Region Planning Board will be the executing agency for the project, responsible for management, coordination, and execution of all the activities funded under the ADB project loan.
 - (ii) <u>Implementing Agency</u>: Implementing Agency of the Project will be Hapur Nagar Palika. IA will be responsible for day-to-day activities of the project implementation. Implementing Agency will be assisted by Design and Supervision Consultants (DSC) in tendering, and reviewing and revising designs during the construction, if required, and supervising the construction to ensure quality. IA will appoint Construction Contractors (CC) to build the infrastructure elements.
- 83. An Environmental and Social Management Cell (ESMC) will be established within the NCRPB to assist and coordinate on environmental social issues. ESMC will be headed by a qualified environmental professional with necessary training and expertise in dealing with environmental and social aspects of planning and project implementation. He/she will be supported by three professionals to look into (i) environmental aspects of planning process and its coordination with various groups, (ii) environmental issues in projects implementation review and coordination with IAs and other agencies, and (iii) a social development specialist to deal with LA and R&R issues.
- 84. ESMC will review and approve IEE, oversee disclosure and consultations, and will monitor the implementation of environmental monitoring plan and environmental management plan where required. The Construction Contractor (CC) will implement mitigation measures in construction. DSC will conduct regular monitoring during implementation and ensure that mitigation measures as suggested in the IEE is implemented in full. Environmental Management Specialist (EMS) of PMC and ESMC of NCRPB will oversee the implementation of mitigation measures.
- 85. Implementation of mitigation and monitoring measures during the operation and maintenance (O&M) stage will be the responsibility of the implementing agency, i.e. Hapur Nagar Palika.

B. Environmental Monitoring Plan

- 86. **Table 5-1** shows that most mitigation activities are the responsibility of the Construction Contractors (CC) employed to build the infrastructure during the construction stage. Responsibility for the relevant measures will be assigned to the Contractors via the Contracts through which they are appointed, so they will be legally required to take the necessary action. There are also some actions that need to be taken by Implementing Agency in their role as project proponent,.
- 87. 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. Regular monitoring of implementation measures by Construction Contractors will be conducted by the Implementing Agency with the assistance of DSC. Periodic monitoring and overseeing of implementation of mitigation measures will be conducted by ESMC of EA. Monitoring during operation stage will be conducted by the Operating Agency, and third party monitoring will be conducted by government regulatory agencies like UP Pollution Control Board.
- 88. Most of the mitigation measures are fairly standard methods of minimising disturbance from building in urban areas (maintaining access, planning work to minimize public inconvenience and traffic disruptions, finding uses for waste material, etc). 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. IA will submit quarterly progress reports to EA on the work progress, which will include a section implementation of environment mitigation measures. ESMC will review the reports, and will also conduct random site visits to check the implementation. ESMC will provide necessary guidance on implementation.
- 89. **Table 6-1** shows the proposed Environmental Monitoring Plan (EMP) for this Project, which specifies the various monitoring activities to be conducted during different phases of the project. The EMP describes: (i) mitigation measures, (ii) location, (iii) measurement method, (iv) frequency of monitoring and (v) responsibility (for both mitigation and monitoring).

Table 6-1: Environmental Monitoring Plan

Mitigation measures	Location	Responsible for Mitigation	Monitoring method	Monitoring frequency	Responsible for monitoring
Preconstruction					
• Implement compensatory measures as recommended by the Resettlement Plan prepared in compliance with Government and ADB legislations	Encroached sites	HNP	As suggested in the RP	As suggested in the RP	EA
Construction					
 Start the work from downstream end of the drains (from chainage 6700 of Drain 2 and Chainage 6450 of Drain 4) Conduct work in small sections, say 100 m at a time; confine the drain in the section and stop all inlets Provide a bypass arrangement for the water coming for upstream by providing pumping arrangement so that water coming from upstream of the selected section are pumped through a pipe to the downstream Dewater the selected section; pump accumulated water downstream; As far as possible allow the silt to dry before start of desilting work. Avoid manual desilting of drains as far as possible in the section where there is space to employ mechanical diggers or appropriate equipment and tools Where manual method is adopted in narrow and inaccessible sections, provide proper tools and equipment for disilting (winches and buckets), and personal protection equipment (PPE) for workers (gloves, gum boots, face masks, etc); additional oxygen tanks in case the drain is deeper than four feet. Workers should also be given oils for protecting skin and soap to clean up later. Silt/soil generated from desilting shall be land filled safely in consultation with Uttar Pradesh Pollution Control Board; shall not be used as manure or for land application 	All drain rehabilitation sites	Construction Contractor	Check construction schedule/site observations	One-off before start of construction and weekly during construction	HNP
 Bring the construction material (aggregate and sand) as and when required to the site; avoid temporary storage Use tarpaulins to cover waste soil in transport Ensure speedy completion of work 	Transport routies	CC	Site observations/CC records/ informal discussion with workers and people residing near the work	Weekly	IA

Mitigation measures	Location	Responsible for Mitigation	Monitoring method	Monitoring frequency	Responsible for monitoring
 Provide prior information to the local public about the work schedule Do not conduct noise generating activities in the night Ensure that there are no old and sensitive buildings that may be in risk due to use pneumatic drills Employ pneumatic hand drill only when it is feasible 	Culverts and other road crossings	СС	sites Site observations/CC records/ informal discussion with workers and people residing near the work sites	Weekly	ΙΑ
Obtain construction materials such as sand, aggregate and gravel only from quarries licensed and approved by GoUP (Directorate of Geology and Mining)	NA	СС	Records Check	Before start of construction, & periodic during construction	IA
 Do not close the road completely, ensure that work is conducted in one line of the road; allow traffic to move on one line In unavoidable circumstances of road closure, provide alternative routes, and ensure that public is informed about such traffic diversions In case of closure of important roads, provide information to the public through media – daily news papers and local cable television (TV) services, about the need and schedule of road closure, and alternative routes At all works sites public information/caution boards shall be provided (name of the project, cost, schedule, contractor name, implementing & executing agency, schedule of work at that locality, details of traffic diversion, responsible officer for implementation and receiving complaints) Providing wooden bridges for pedestrians and metal sheets for vehicles to allow access across open trenches where required (including access to houses); 	Culvert sites	СС	Check construction schedule/ Site observations/CC records/ informal discussion with workers and people residing near the work sites	Weekly	ΙΑ
 Avoiding working at sensitive times, Limiting dust by removing waste soil quickly, bringing sand to site only when necessary, covering and watering stockpiles, and covering soil and sand when carried on trucks; Increasing the workforce in sensitive areas to complete the work quickly; Providing wooden bridges for pedestrians and metal sheets for vehicles to allow access across open trenches where required (including access to houses); Using modern vehicles and machinery with standard adaptations to reduce noise and 	All sites near sensitive area like schools, hospitals, religious places				

Mitigation measures	Location	Responsible for Mitigation	Monitoring method	Monitoring frequency	Responsible for monitoring
exhaust emissions, and ensuring they are maintained to manufacturers' specifications.					
 Ensure that health and safety measures are in place as part of the contract. These shall include: Follow standard and safe procedures for all activities, like provision of shoring in trenches Exclude the public from all construction sites; barricade the site; provide caution & sign boards Ensuring that all workers are provided with and use appropriate Personal Protective Equipment like gloves, boots, face masks, etc to the workers In very deep and narrow sections of existing drains, where de-sludging is conducted, there will invariably be risk due to hazardous working conditions at the bottom of drain due to possible gas formation; in these section it entering drain for manual cleaning must be avoided by using appropriate equipment like long handled shovels. In unavoidable cases, provide additional oxygen tanks in case the drain is deeper than four feet. Workers should also be given oils for protecting skin and soap to clean up later Provide On/off-site Health & Safety Training to workers; Maintain accident reports and records. 	All sites	CC	Site observations/ informal discussion with workers and people residing near the work sites	Weekly	ΙΑ
Ensure that most of the workforce is from local communities	All sites	CC	Site observations/ informal discussion with workers	Randomly	IA
 Operation & Maintanance Prevent entry of wastewater into drains; this requires development of sewerage system in the town. The DPR prepared for Hapur Sewerage System in parallel process shall be implemented on priority Ensure regular cleaning and desilting of drains; provide appropriate maintanance equipment & tools as part of the project Prevent encroachment of drains 	All drain sites	HNP	Site observations -	Randomly-	EA/ UPPCB

C. Environmental Management and Monitoring Costs

- 90. Most of the mitigation measures require the Contractors to adopt good site practices, which are part of their normal procedures, so there are unlikely to be major costs associated with compliance. The costs required for collection and disposal of accumulated water and sludge from drains is included in the project costs. These costs of mitigation by the contractors are included in the budgets for the civil works. Mitigation and monitoring provided by the IA/EA or its DSC will be part of incremental administration costs, which are already included in the project.
- 91. The most important mitigation measure is that of disposal of contaminated sludge. Since there is no sanitary landfill in Hapur it has to be transported and disposed in the nearest landfill with the coordination of Uttar Pradesh Pollution Control Board. The total cost of disposing this material (7,750 m3) is estimated as INR 11. 62 million, at a rate of INR 1,500 per m3. This is included in the project cost.

7. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Project Stakeholders

- 92. Most of the main stakeholders have already been identified and consulted during preparation of this IEE, and any others that are identified during project implementation will be brought into the process in the future. Primary stakeholders are:
 - Residents, shopkeepers and businesspeople near the work sites
 - Public representatives and prominent citizens
 - Hapur Nagar Palika
 - Hapur Pilkhua Development Authority
- 93. Secondary stakeholders are:
 - NCRPB as the Executing Agency;
 - Other concerned government institutions (utilities, regulators, etc)
 - NGOs and CBOs working in the affected communities;
 - Other community representatives (prominent citizens, religious leaders, elders, women's groups);
 - The beneficiary community in general; and
 - The ADB.

B. Consultation and Disclosure

- 94. A series of public consultation meeting were conducted during project preparation. Two forms of public consultations (consultation through household surveys and as well as ad hoc discussions on site) have been used to discuss the project and involve the community in planning the project and mitigation measures.
- 95. Photographs of consultation meeting are appended at **Appendix 1**. All the stakeholders were supportive of the project and indicated that the drainage system in Hapur needs immediate improvement. Stakeholders were of the view that the project will bring enormous benefits to the inhabitants.

8. FINDINGS AND RECOMMENDATIONS

A. Findings

- 96. The process described in this document has assessed the environmental impacts of all elements of the infrastructure of the Hapur Drainage Sub-project. Potential negative impacts were identified in relation to design, location, construction and operation of the improved infrastructure. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects, and measures have been included in the designs for the infrastructure. This means that the number of impacts and their significance has already been reduced by amending the design. These include:
 - Improving the drains within the existing drain ROW as far as possible to avoid/minimize the issues related to involuntary resettlement
- 97. Regardless of these and various other actions taken during the IEE process and in developing the project, there will still be impacts on the environment when the infrastructure is built and when it is operating. This is mainly because (i) the silt accumulated in the drain contains heavy metals (although less concentration than that specified for hazardous waste) and (ii) the drain network is located in an urban area, some parts of which are very densely populated.
- 98. At present, due to lack of sewerage system in the town, drains are practically carrying only wastewater including sewage from nearby residential areas. Throwing/disposal of solid waste into the drains is also prevalent in the town. Adding to these, there has been no regular maintenance of drains like desilting, which resulted in accumulation of silt/sludge in the drains. The proposed subproject involves cleaning of drains. As the sludge contain harmful substances and from worker, public health and environment point of view, it therefore needs to be collected, handled and disposed in a safe manner. Similarly the accumulated water also needs to be disposed off safely. The following measures were suggested:
 - Start the work from downstream end of the drains (from chainage 6700 of Drain 2 and chainage 6450 of Drain 4)
 - Conduct work in small sections, say 100 m at a time; confine the drain in the section and stop all inlets in general, and into that section in particular
 - Provide a bypass arrangement for the water coming for upstream by providing pumping arrangement so that the water coming from upstream side of the selected section are pumped through a pipe to the downstream
 - Dewater the selected section; pump the accumulated water into the downstream;
 - As far as possible allow the silt to dry before start of desilting work.
 - Avoiding manual desilting of drains as far as possible in the section where there is space to employ mechanical diggers or appropriate equipment and tools

- Where manual method is adopted in narrow and inaccessible sections, provide proper tools and equipment for disilting (winches and buckets), and personal protection equipment (PPE) for workers (gloves, gum boots, face masks, etc); additional oxygen tanks in case the drain is deeper than four feet. Workers should also be given oils for protecting skin and soap to clean up later.
- Safe land filling of the Silt/soil generated from desilting shall be land filled safely in consultation with Uttar Pradesh Pollution Control Board; shall not be used as manure or for land application
- Providing on-site training to workers on safe handling of contaminated water and sludge
- 99. During the construction phase, impacts mainly arise from generation of dust from transport, loading, unloading, storing of construction material, and from the disturbance of residents, businesses, and traffic by the construction work. These are common impacts of construction in urban areas, and there are well developed methods for their mitigation. Among these, traffic disturbance during construction is considered to be significant due to narrow roads. Measures such as following have been suggested:
 - Avoiding the need to close road completely due to construction work by employing better methods;
 - Providing alternative routes in case of unavoidable situation of road closure, and informing public about such traffic diversions;
 - Providing at all works sites public information/caution boards with information about the project, construction schedule, traffic diversion if any; entry restriction information; competent official's name and contact for public complaints.
 - Providing wooden bridges for pedestrians and metal sheets for vehicles to allow access across open trenches where required (including access to houses);
- 100. There were limited opportunities to provide environmental enhancements, but certain measures were included, as given below:
 - Employing in the workforce people who live in the town to provide them with a short-term economic gain
- 101. During the operation, the drains will not function properly without maintenance, as silt inevitably collects in areas of low flow over time. The project will therefore provide equipment for cleaning/desilting of drains, including buckets and winches to remove silt. No major impacts envisaged from operation of the drainage system. However, certain important are suggested to avoid risk due to malfunction of the system. The Following measures are suggested:
 - Prevent entry of wastewater into drains; this requires development of sewerage system in the town. The DPR prepared for Hapur Sewerage System in parallel process shall be implemented on priority
 - Ensure regular cleaning and desilting of drains; provide appropriate maintenance

equipment & tools as part of the project

- Prevent encroachment of drains
- 102. The main beneficiaries of the improved system will be the citizens of Hapur, who will be provided with an improved drainage system which serves all sections of the population, including urban poor. This along with the proposed sewerage system subproject will improve the quality of life of people as well as raising standards of both individual and public health as the improvements in hygiene should reduce the incidence of disease associated with poor sanitation. This should lead to economic gains as people will be away from work less and will spend less on healthcare, so their incomes should increase.
- 103. Mitigation will be assured by a program 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.
- 104. Finally, stakeholders were involved in developing the IEE, after which views expressed were incorporated into the IEE and the planning and development of the project. The IEE will be made available to the public. A town level stakeholder workshop for safeguard disclosure and consultation is scheduled for third week of September; the comments and feedback of this will be reflected in the next revision of this IEE.

B. Recommendations

- 105. 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 EA should ensure that:
 - Environmental Management Plan (EMP) proposed in this IEE report and all mitigation, compensation and enhancement measures proposed in the Resettlement Plan (RP) of the Project are implemented in full, as described in these two documents;
 - The Environmental Monitoring Plan proposed this report and the monitoring proposed in the Resettlement Plan are also implemented in full.

9. CONCLUSION

- 106. The environmental impacts of the proposed drainage subproject in Hapur 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.
- 107. 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 major improvements in quality of life and individual and public health once the scheme is in operation.
- 108. 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.

Appendix 1

Appendix 1

Photographs of Consultation:













Participants of Consultation meeting on 26-March-10

26/3/2010 को भेवीली जांव के लिए मुक्ते का मूल रिष्ट्रकारिण के रिल्स रिक्साके रवन प्रापटन की लहां के राइन के नहीं की जही। wind at after land lang & ... । यह साल पटले वार्यास वनने के सरम के 30 हे ते 40 लहन 2. algute and an and and and all altra to so to come Sa 3. 1955 Monagan Sante hour it at even year been and आवासीय तेमाइ नहीं । इसनी जीतन राठक से 100 प्रती मीटर thank aft 4. Its lack and a winder of ear of the the दीयागर 1 Viloz in Amist and Store -2) Janak Roperty Dealer - Al (S) Bana Property scales - supender Bana Fr સંબળ LAN - 2 (101-971) 4 g-6, चतन 2421 (7)

www.WilburSmith.com



#8, Second Floor, 80 Feet Road, RT Nagar Bangalore Karnataka - 560 032. India w +91.80. 3918.7500 f+91.80. 2363.4097