

**Master Plan for Sewerage &  
Drainage, Feasibility Studies  
and Detailed Project Reports for  
Sewerage works for YAP-III in 8  
Towns of Uttar Pradesh Under  
YAP-II**

**Inception Report**

**MDP - DHV Consortium**

**in association with**

**CES, STC, Feedback and Jason**

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Pradesh Under YAP-II**

**Revised Inception Report**

**MDP - DHV Consortium**

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**July 2006**

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## ABBREVIATIONS AND ACRONYMS

ADA	Agra Development Authority
BOD <sub>5</sub>	5-day Biochemical Oxygen Demand
°C	Degrees Celsius
CBO	Community Base Organization
CETP	Common Effluent Treatment Plant
CPCB	Central Pollution Control Board. (Ministry of Environment and Forests)
CPHEEO	Central Public Health and Environmental Engineering Organization
CHA	Cis Hindon Area
CWC	Central Water Commission
DPR	Detailed Project Report
DWF	Dry Weather Flow
DMA	Delhi Metropolitan Area
E&M	Electrical and Mechanical
EIA	Environmental Impact Assessment
FSR	Feasibility Study Report
GDA	Ghaziabad Development Authority
GIS	Geographic Information System
GOI	Government of India
ha, Ha	Hectare
HP	Horse Power
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
kg	Kilogram
km	Kilometre
KVA	Kilo Volt Ampier
lpcd	Litre per capita per day
Intl.	International
IEE	Initial Environmental Examintation
IPS	Intermediate Pumping Station
LPM	Liters per minutes
M, m	Metre
m <sup>3</sup> /day	cubic metres per day
mg/L	Milligram per litre
mld	Million Litres per day (Mega litre)
MoEF	Ministry of Environment and Forests (GOI)
MP	Master Plan
MPS	Main Pumping Station
NCT	National Capital Territory
NEERI	National Environmental Engineering Research Institute
NGO	Non-Government Organization
NRCD	National River Conservation Directorate (Ministry of Environment & Forests)
NRCP	National River Conservation Plan
NH	National Highway

## ABBREVIATIONS AND ACRONYMS

O & M	Operation and Maintenance
PHED	Public Health Engineering Department
PIU	Project Implementing Unit
PMC	Project Management Consultant
PMU	Project Monitoring Unit
PS	Pumping Station
QA	Quality Assurance
QC	Quality Control
RCC	Reinforced Cement Concrete
RAP	Resettlement Action Plan
S/W	Scope of Work
SCADA	Supervisory Control and Data Acquisition
SIA	Social Impact Assessment
SPCB	State Pollution Control Board
STP	Sewage Treatment Plant
SC/ST	Schedule Caste/Schedule Tribes
ToR	Terms of Reference
THA	Trans Hindon Area
UASB	Upflow Anaerobic Sludge Blanket
ULB	Urban Local Body
UP	Uttar Pradesh (State)
UPJN	Uttar Pradesh Jal Nigam
WWTP	Wastewater Treatment Plant
WQ	Water Quality
YAP-I	Yamuna Action Plan – Phase I
YAP-II	Yamuna Action Plan – Phase II
YAP-III	Yamuna Action Plan – Phase-III

## **1. Introduction**

### **1.1 Yamuna Action Plan**

The Yamuna River is one of the major sources of fresh water in Northern India. Due to extremely high rate of growth of the urban population and the significant agricultural and animal husbandry activities in the watershed, the water quality of the river has continued to experience severe deterioration from organic pollution. This deterioration has had a significant impact on the health and welfare of millions of Indian citizens living in the towns situated along the Yamuna River.

The Yamuna Action Plan (YAP) – Phase I project was launched by National River Conservation Directorate (NRCD) under the Ministry of Environment and Forests (MoEF), GOI in 1993 with the objective of restoring the water quality of the Yamuna River to an acceptable standard. Financial assistance was provided by the Japan Bank for International Cooperation (JBIC). The Phase I Project was implemented over a ten-year period and completed in February 2003.

The present project, Yamuna Action Plan - Phase II, will address the urgent requirements of Delhi and Agra. It will also target completion of planning and design activities for 16 YAP towns in Haryana and Uttar Pradesh. The YAP-III project will be the next stage of implementation and will involve development of wastewater infrastructure in 8 towns in Haryana and 8 towns in Uttar Pradesh, as well as a number of environmentally linked initiatives in Delhi. The preparation of the Detailed Project Reports for these works is taking place as part of YAP-II, in order that these works proceed in a timely manner.

Building on the success and lessons learned from YAP-I, JBIC signed a new Loan Agreement on March 31, 2003 for the current YAP II Project as a continuation and expansion of the Phase I program. The YAP II budget was established in December 2002 at Rs 624 crore distributed as follows: Delhi – Rs 387 crore; Uttar Pradesh – Rs 124 crore; Haryana – Rs 63 crore; and Capacity Building in NRCD / PMC / WQ Monitoring / Overseas Training etc.– Rs 50 crore. The JBIC Loan Agreement provided for financial assistance of ¥ 13.33 Billion, or approximately 85 percent of the overall project budget.

In YAP-II, the works in Uttar Pradesh comprise sewerage works in Agra and a Consultancy study to prepare Master Plans for Sewerage and Drainage; Feasibility studies for Sewerage works; and Detailed Project Reports for sewerage for the eight towns in Uttar Pradesh.

Following an International Tendering Exercise, a consortium of 4 domestic firms, MDP Consultants Pvt Ltd, Consulting Engineers Services (India) Pvt. Ltd, Shah Technical Consultants Pvt. Ltd, and Feedback Turnkey Engineers together with the international firms DHV Water BV and Jason Consultants LLC was selected to supply these Consultancy Services. A Contract Agreement was signed in April 2006 and the study formally started on the 29 May 2006.

### **1.2 Study Objective**

The overall objective of the Yamuna Action Plan is to improve the water quality of the Yamuna River and its stretches. One of the important measures to reach this objective is by significantly reducing pollution discharges into the water bodies, which is the main focus of this Project.

The Yamuna River is one of the major fresh water resources in North India and as such very essential for the supply of drinking water to millions of people, including Delhi, for agricultural use and other

purposes. In the view of the expected high urban growth, continuous pollution control and water quality improvement of the Yamuna River and its stretches will be required.

Consultant's objective is to prepare master plans for sewerage & drainage (in separate volume), feasibility studies and detailed project reports for identified priority sewerage project components in each of the towns in an effective and efficient way. These projects will subsequently be implemented in the next stage, YAP-III. The DPR will present detailed designs for the selected, technically and financially viable, works. In addition the study would also address:

- Implementation arrangements (institutional, organisational, private sector participation, etc).
- Capacity building arrangements, including for Operation and Maintenance
- Financial management
- Arrangements for community participation and public awareness campaigns.
- Environmental Issues

## **2. Observations on Project Towns**

The Project team visited all eight towns in Uttar Pradesh, namely Saharanpur, Muzaffarnagar, Ghaziabad, Noida, Vrindavan, Mathura, Agra and Etawah.

To have a clear insight into the local conditions of each town, the project team undertook site inspections covering the area of the towns and gathered first hand information and also had discussions with available local staff. Our preliminary observations for each Project town are given below:

### **2.1 Saharanpur:**

#### **2.1.1 Location**

Saharanpur is a big commercial town with a wholesale market for foods, fibres and wood. It has major industries like manufacturing of cigarette and paper mill and woodcraft industry. The latitude and longitude of the town are 29° - 56' N – 77° - 33'E respectively. The general topography is flat and average level is 274.5 m above MSL. The climate is hot in summer with a maximum and minimum temperature of 49°C and 1°C respectively. Ground water level varies from 3m to 6m below ground level. Two rivers namely Paondhi and Dhamola pass through town, Paondhi joins the Dhamola after passing through the town and normally flown from north to south. Dhamola is flowing from North to South and join with river Hindon after travelling about 15 km downstream, that ultimately meets Yamuna River. The river Yamuna separates U.P. from Haryana and forms western boundary of the district.

#### **2.1.2 Present Area & population**

Saharanpur is a District Head Quarter with a average population of 4.50 lakhs (2001). The area is 2328.32 Ha and density is 201.77 per person per ha.

### **2.1.3 Land Use**

The present utilization of the land in Saharanpur is mixed. There are mainly residential, commercial and small scale industrial activities. The utilization of the internal part of the town exhibits is old buildings, congested areas, present development, new colonies on Delhi Road & Dehradun Road. Middle of the town is highly populated and commercial area.

### **2.1.4 Existing Condition**

#### **2.1.4.1 Water Supply**

The town is having water supply facility since 1958 through ground water tube wells. The present number of tube wells is 31, generating 69.616 mld of water for supply. The current water supply demand is 63.42 mld (135 lpcd). The rate of water supply in this town is 127 liters per capita per day but as per the discussion held with local people they are facing problem for the water supply and not getting enough water from the municipality.

#### **2.1.4.2 Drainage**

The city is not having any proper arrangement to trap open drain wastewater. The open drains are not in good shape at many places. These drains are either choked or damaged due to poor maintenance. (About 20 units of Sulabh Sauchalayas (Ordinary Toilets) exist at various part of town. Most of them are not being operated and maintained properly).

#### **2.1.4.3 Sewerage**

The Sewerage system in this town was constructed in 1960's and covers the western area comprising Zones A, B, C, D and F, with practically no sewerage system in Zone E, an area with a number of cluster colonies. The domestic effluent of this zone discharges into the river Dhamola through 44 drains and nallahs. Many of the old sewers are effectively non functional due to choking and collapse. The cleaning system of Saharanpur is in a very poor condition. According to one survey in 1995 out of 9,034 houses 53% (4,788) were connected to the flush system. Rest 47% (4,246) houses had no such system. The sewage collection is through existing open drains. Approximately 25 to 30% of city is sewerred.

Under YAP-I new sewers of dia 300 mm to 1200 mm in a length of about 5.6 Km. were laid, besides renovation of some existing sewerage system in zone A, B D and F to the extent of repair and in construction of manholes and gully traps, and 51 nos small and big nalas were tapped and diverted in main sewer lines. Two IPS of 9.97 MLD and 17.28 MLD capacity with a sump of 6 m dia and 11 m dia were constructed in Subzi Mandi and near Rakesh Cinema respectively. One old IPS of 28.88 MLD capacity in Gobind Nagar was renovated/remodelled, A 38 MLD STP (of UASB type) with 2 nos. of dual fuel generator set of 180 KVA each and laboratory (for monitoring the performance of the plant) was also constructed under YAP-I. 5 nos. of 14850 LPM/13 mtr head with 75 HP motor submersible sewage pumps are installed in MPS.

Major problems and bottlenecks in STP's are observed during site visit.

- The sewage is not received on regular basic due to improper operation of the main pumping station.
- Plant is not running in full capacity because of power failure and inadequate receiving sewer from the pumping stations.
- The sludge handling system is not in proper place
- The operating staff is not having enough knowledge regarding the process and O&M of the plant.
- O&M manual is not available at site  
No power backup in case of power failure

#### **2.1.4.4 Road Condition**

The town is well connected via road to Ghaziabad & Delhi. The condition of road is in good shape.

#### **2.1.4.5 Solid water Management**

At present everyday approximately 250 metric ton of solid waste generated in Saharanpur. The collected waste is dumped in open spaces i.e around roads, open pits and banks of drains in the city. The municipality (Public Health Department) has taken a land (5 acres) for dumping of solid waste near existing STP, but the land is not allotted..

#### **2.1.5 Major Issues**

The major issues for the town are:

- Condition of the sewerage system and pumping station is bad
- Many interception and diversion works are choked and the sewage is directly discharge in to the river
- Open drains are choked at various place due to improper maintenance
- Drains are seen constructed mostly in brick masonry without Plastering and in some part in stone masonry .These drains are heavily silted and broken.
- Dumping of debris into the drains and silting of drains are seen as regular features.
- Most of the drains tapping points are clogged.
- Operation of the pumping stations are affected due to insufficient electricity and inadequate education of the operating staff.
- Poor arrangement for the solid waste management

### **2.2 Muzaffarnagar:**

#### **2.2.1 Location**

Muzaffarnagar is a small & medium scale industrial town with a business of scrap, steel and other metal. the latitude and longitude of the town are 29°-26' N and 77° 0'- 42' E. The topography of this town is more or less flat and slopes towards river Kali. Kali river joins Hindon river about 12 Km down – stream from the town and Hindon discharges into river Yamuna. The ground water level varies from 9 to 11 m below ground level.

Muzaffarnagar Nagar is divided in two Zones, viz Western Zone and Eastern Zone. The Railway Track is the dividing line between two zones.

### **2.2.2 Present Area & population**

The population of Muzaffarnagar Nagar Town is 3.41 lakhs (2001). The area is 1203.96 Ha with population density is about 143.31 persons/ha.

### **2.2.3 Land Use**

The present utilization of the land in Muzaffarnagar is mixed. There are mainly residential, commercial and small scale industrial activities. The utilization of the internal part of the town exhibits is old buildings, congested areas, present development, new colonies on Delhi Road & Dehradun Road. Middle of the town is highly populated and commercial area.

### **2.2.4 Existing Condition**

#### **2.2.4.1 Water Supply**

The rate of water supply in this town is 74 liters per capita per day but as per the discussion held with local peoples they are facing problem for the water supply and not getting enough water from the municipality.

#### **2.2.4.2 Drainage**

The drainage system of Muzaffarnagar is in a very poor condition. There are some low lying areas in the town eg. near Malhupura & also on one side of Bhopa Road. In these low lying areas IPS will have to be constructed because gravity flow is not possible. Moreover proper planning of drainage has not been done. Rehabilitation of existing drains is inevitable. The area around Bus Stand gets flooded during rains.

#### **2.2.4.3 Sewerage**

The sewerage system was introduced in the year 1963 and was strengthened in piece meal from time to time in phases. At present about 65% of the town is not covered by the sewerage system. The sewerage system existing in mostly Western Zone where as hardly any sewerage system exists in Eastern Zone. Even in the Western Zone at some places the sewerage system is not functional due to chockage/blockage. At present about 22 Km sewer line, 2 IPS, one MPS with sump and rising main and one STP (Oxidation ponds) of 32.50 MLD capacity is existing. Out of which, pumping stations, STP and 3.81 Km of rising mains and 0.79 Km of sewer lines were laid under YAP-I.

Major problems and bottlenecks in STP's are observed during site visit.

- Screen chamber are chocked due to poor maintenance
- Laboratory is not properly functioning.
- Sewerage collection system is inadequate.
- O&M manual is not available at site

#### **2.2.4.4 Road Condition**

The town is well connected via road to Delhi to Haridwar highway . The condition of road is in good shape.

#### **2.2.5 Major Issues**

The major issues for the town are:

- Condition of the sewerage system and pumping station is bad
- Many interception and diversion works are chocked and the sewage is directly discharge in to the river
- Open drains are chocked at various place due to improper maintenance
- Dumping of debris into the drains and silting of rains are seen as regular features.
- Operation of the pumping station is affected due to insufficient electricity and inadequate education of the operating staff.
- Poor arrangement for the solid waste management

### **2.3 Ghaziabad:**

#### **2.3.1 Location**

Ghaziabad town is located in the Western part of Uttar Pradesh which is 22 km away from Delhi. This is an important town of U.P due to rapid growth of industrial, commercial activities. Major national highways (NH- 24, NH-58 & NH-91) are passing through the town. Hapur town is the East, Loni is theNorth, Noida in South and Delhi in the West of Ghaziabad town.

Hindon river passes through the middle of the town which receives waste water for the town and conveys towards downstream and discharges to Yamuna River.

#### **2.3.2 Area & Population**

Present area of Ghaziabad town is 84.85 sq km. As per 2001 census records population of Ghaziabad was 9.68 Lakh & density of population 130 persons / ha. There were 60 wards in Ghaziabad Master Plan 2021. During discussion with Nagar Nigam, it was informed that town has now been divided into eighty wards.

#### **2.3.3 Land use**

About 55 % of present area of Ghaziabad town is residential. Eastern part of the town is densely populated. Commercial & industrial area is predominant in old city area. The western part of the town is generally planned where Ghaziabad Development Authority developed residential areas. Sahaibabad industrial area and commercial activities are concentrated at identified location in the western part of the town. Northern part of the town is less populated where village are situated in scattered manner.

## **2.3.4 Exiting Conditions**

### **2.3.4.1 Water Supply**

Rate of water supply at present is 150 lpcd . It is understood from Nagar Nigam that water supply is not adequate according to demand. Therefore, some areas of the town are provided with tube wells. Industrial area have their own tubewells.

### **2.3.4.2 Drainage**

The city drainage system mainly depends on internal major drains, leading to mainly River Hindon. Eastern part of the town drains towards Dasna drain & partly to river Hindon while western part drains to Hindon cut & partly to River Hindon. According to topography of the town drains are flowing from North to South direction.

### **2.3.4.3 Sewerage**

Ghaziabad town is divided into 5 zones. The right & left bank area of River Hindon is fully sewerer except Zone –V located on right bank which is 60% sewerer.

The following works were executed under YAP-I:

- 70 mld Capacity STP (UASB based technology) in CHA
- 3 mld capacity STP under Karnal Technology in CHA
- 56 mld capacity STP (UASB based technology) at THA
- 4 no. of Sewage Pumping Stations
- 16 km of sewers

Sewage generated is about 130 mld of which CHA contributes about 73 mld and THA about 56 mld. Treatment capacity is 129 mld. However, only about 95 mld of sewage is actually getting treated.

The main sewage pumping stations as well as the STP of 70 mld & 56 mld are being maintained by UP Jal Nigam. The remaining sewage pumping stations and sewerage systems are being maintained by Nagar Nigam Ghaziabad or Ghaziabad Development Authority (GDA).

It was reported that at the 56 mld STP (THA) only about 40 mld is reaching to the treatment works - a result of the inadequate water supply.

Only 55 mld of sewage is reaching the 70 mld STP of CHA. It was suggested that this could be a result of illegal obstructions of the sewer lines for the purpose of irrigation and broken sewers. Also there is shortage of electricity generally to the extent of 5-8 hours per day, which hampers the pumping of various pumping stations. Moreover some pumps at various pumping stations are out of order. So, renovation of pumping stations as well as repairs and overhauling of pumps are needed.

THA is mostly sewerer except for some Jhuggi Jhopris (slum areas) and CHA is 60% sewerer. The THA having Indirapuram and other large colonies are developing rapidly with many new high-rise buildings coming up. The treatment capacity as well as the pumping capacity will have to be augmented in the short term. Augmentation space is available at the treatment sites to

increase the capacity by 50%. At the 56 mld STP (THA), it has been reported that sometimes industrial waste water create problems in the treatment process. Many pharmaceutical, dying and other major industries are there. The U.P. Pollution Control Board is responsible for monitoring the quality of the industrial waste water being discharged.

The Jal Nigam officers were of the view that all the equipments were working satisfactorily except the mechanical screens where manual operation is required. It is reported that effluent standards in terms of BOD/COD/SS are met at the STPs (UASB reactors & polishing ponds).

Major problems and bottlenecks in STP's are observed during site visit.

- Screen chamber are choked due to poor maintenance
- O&M manual is not existing at site
- Most of the spare parts of the machinery are not available for maintenance.
- Some of equipments are not in operating condition
- No proper utilization of the gas
- No power backup in case of power failure

#### **2.3.4.4 Road Condition**

Roads are generally wide and road network is systematic except few areas in the old town. Approximately road length is 800 km.

#### **2.3.4.5 Solid water Management**

Cleaning of drains and collection of solid waste is done by Nagar Nigam. Collection of solid waste is however not regular. Solid waste management of the city requires more attention. Dumping of solid waste around the NH bypass.

#### **2.3.5 Major issue**

The major issues for the town are:

- Size & condition of open drains within the town are poor. Major drains are generally okay & functioning well.
- Under ground drainage system is choked at various places.
- Dasna drain is unlined, full of weeds and silted up.
- Sewage pumping stations are not maintained properly and operation & maintenance staffs requires proper technical support and guidance.
- Absence of control structure at outfall of drains causing flooding in the town.
- Sewerage & drainage system do not cover the entire town.
- Waste water diversion arrangement from major drains to sewerage system are not functioning properly due to technical problems and /or poor maintenance.
- Sewage Treatment Plants are not fully utilized since internal sewer network is not fully developed within the city & many places house connections are required.
- Industrial waste water is discharging to roadside open drains.
- Waste water from the town is polluting Dasna drain, river Hindon and Hindon cut canal.

### **2.4 Noida:**

### **2.4.1 Location**

NOIDA is bounded by River Yamuna in West and South, River Hindon and Greater NOIDA in East and NH-24 & Ghaziabad in the North. It is located very close to Delhi and lies along the Eastern & South Eastern boundaries of National Capital Territory (NCT) of Delhi. It falls within the Delhi Metropolitan Area (DMA) and for this reason the city of NOIDA enjoys the status of DMA town. The area also forms part of the UP sub-region of National Capital Region (NCR). The township lies at an average elevation of 200 m above mean sea level and has a flat topography. The ground water level varies from 9 to 12 m BGL.

### **2.4.2 Area & Population**

The notified area of NOIDA comprises a total of 80 villages and one urban centre that is NOIDA census town. The developed urban area of NOIDA including NOIDA Phase-II area occupies the Northern half of the area. Present area of town is about 40 sq km and as per 2001 census population of the town is 5.5 lakh.

### **2.4.3 Land use**

The present developed area is divided into 62 sectors. It is understood from development authority that 14 sectors are industrial, 9 Sectors are institutional & commercial and 39 sectors are occupied for residential purposes. Southern half of NOIDA is predominantly rural settlement.

### **2.4.4 Existing Conditions**

#### **2.4.4.1 Water Supply**

Present rate of water supply is about 170 lpcd. Source of water supply in the township is mainly ground water although some water is made available under the Ganga Jal scheme also. About 70 tube wells are available which yield about 100 mld water daily. 30% water is used for industrial purpose & 70% in used for residential & other purposes.

#### **2.4.4.2 Drainage**

The area falls under threat of flooding zones of rivers Yamuna and Hindon and is protected by bunds. The irrigation channel NOIDA drain & other major drains of the town provide a drainage network of NOIDA which are finally falls in to river Yamuna. The ground topography is guiding factor for the drainage system of the township. The existing drains flow from north-east to south-west direction. Drainage system of the town is not proper because general ground level of the town is lower then adjacent areas and therefore outfalls of major drains are not functioning properly

#### **2.4.4.3 Sewerage**

The town has been divided into two sewerage zones. There are 3 STPs - a 9 mld oxidation pond, and two UASB STPs of 27 mld and 34 mld. NOIDA maintains the sewerage & drainage system including the treatment plant.

Both the UASB plants are and the generated gas is used to power for the generation the rough dual-fuel generators.

The treated effluent is discharged to the irrigation canal. NOIDA is planning to reuse the treated effluent for irrigation and civil works are under construction.

The following major problems and bottlenecks have been observed in STP's during site visit.

- Screen chambers are chocked.
- O&M manual is not available at site
- Most of the spare parts of the machinery is not available for maintenance
- Some of the equipments are not in operating condition

#### **2.4.4.4 Road Condition**

NOIDA is a planned township having wider roads & well connected with Delhi & Ghaziabad. About 300 km length of road is maintained by development authority.

#### **2.4.4.5 Solid Waste Management**

Collection & disposal of solid waste for the city is not regularly done. Presently solid waste is being disposed off at site near village Bhangel with an area of about 50 ha. It is understood that solid waste dumping yard is located outside the city limit & proposed land fill sites are in the process of acquisition outside the town. The city is not cleaned properly & it appears that more resources, equipment & solid waste collection bins are required. Cleaning of drains & sewers is not done regularly which creates flooding during rains.

#### **2.4.5 Major Issue**

The major issues of the town are:

- Maintenance of existing sewerage system is irregular.
- Proper training for O&M staff for pumping stations and treatment plants
- Improper solid waste management of the town.
- Drainage system is not adequate & outfalls without control arrangement causing flooding to the town.
- Study report on sewerage, drainage & solid waste management proposed by other agencies are not yet available for review.

### **2.5 Vrindavan:**

### **2.5.1 Location**

The topography of Vrindavan is such that the difference in lowest and highest ground levels is about 20 M. The general slope of the town is towards the river Yamuna. The strata consist of mainly sandy soil.

Vrindavan, which is about 15 km from Mathura, is another major place of pilgrimage. It is noted for its numerous temples - both old and modern. The name Vrindavan evokes the playfulness and lovable characteristics of Lord Shri Krishna. This is the wood where he frolicked with the gopis and tenderly wooed Radha.

### **2.5.2 Present Area & population**

Vrindavan town is an important pilgrim centre located on river Yamuna. Apart from the regular inhabitants of the town numbering about 0.80 lakh, thousands of pilgrims visit the town every day, round the year. On special festival days, the number reaches several lakh, and many of them take a holy dip in the river which is highly polluted. Average population of the area is 20973 per sq. Km.

### **2.5.3 Land Use**

The present utilization of the land in Vrindavan is mixed. There are mainly residential, commercial and spiritual activities. The utilization of the internal part of the town exhibits its ancientness, present development, customary utilization and the importance of spirituality. Middle of the town is highly populated and commercial area.

### **2.5.4 Existing Condition**

#### **2.5.4.1 Water Supply**

The rate of water supply in this town is 150 liters per capita per day but as per the discussion held with local peoples they are facing problem for the water supply and not getting enough water from the municipality. Many habitants are using their own tube wells to fulfill their water demand.

#### **2.5.4.2 Drainage**

The drainage system of Vrindavan is in a very poor condition. According to one survey in 1995 out of 9,034 houses 53% (4,788) were connected to the flush system. Rest 47% (4,246) houses had no such system. The sewage collection is through existing open drains. Approximately 40% of city is sewered. The open drains are discharging their wastewater in to Yamuna River directly.. The conditions of the open drains are not in good shape at various places. These drains are either choked or damaged due to poor maintenance. About 20 units of Sulabh Sauchalayas (Ordinary Toilets) are existing at various part of town. Most of them is do not have proper arrangements for their operation and maintenance.

#### **2.5.4.3 Sewerage**

About 40% of the town has sewer lines. The sewage is brought to the farm through 4 pumping stations.

Sewers had been laid about 30 years back in some parts of the city with a pumping station located at Bihar Ghat which intercepts the flow from 10 nos. of small and medium open surface drains. Another pumping station located at Laxman Shaheed zone intercepts the big municipal drain. From these two pumping stations wastewater is delivered to a main PS at Mukharji park

The following works were constructed under YAP-I:

- Trapping of 18 drains and nallahs,
- 2.4 km of intercepting sewers,
- 2 IPS,
- Renovation of MPS & 3 IPS,
- 5.54 km of rising main & intercepting sewers,
- 2 STPs (Oxidation Pond) of 4 mld & 0.5 mld.

The sewage generated is 9.3 mld. The treatment capacity is 4.5 mld but sewage treated is 5.8 mld. There is thus significant pollution in the river Yamuna. Major problems and bottlenecks in STP's are observed during site visit.

- Screen chamber are not in good operating condition.
- The sewage is not received on regular basic due to improper operation of the main pumping station.
- Plant is not running in full capacity because of power failure and inadequate receiving sewer from the pumping stations.
- The sludge handling system is not in proper place
- The operating staff is not having enough knowledge regarding the process and O&M of the plant.
- O&M manual is not available at site
- No power backup in case of power failure at the [pumping stations

#### **2.5.4.4 Road Condition**

The town is well connected to Mathura through National highway. The condition of road is good.

#### **2.5.4.5 Solid Waste Management**

At present every day 30 metric ton. of garbage is gathered in Vrindavan. This is collected in eleven open places and brought to the empty land near Pagal Baba Mandir.

#### **2.5.5 Major Issues**

The major issues for the town are:

- Condition of the sewerage system and pumping station is bad

- Many interceptions and diversion works are chocked and the sewage is directly discharging in to the river
- Open drains are chocked at various place due to improper maintenance
- Drains are seen constructed mostly in brick masonry without Plastering and in some part in stone masonry .These drains are heavily silted and broken.
- Dumping of debris into the drains and silting of rains are seen as regular features.
- Operation of the pumping stations are affected due to insufficient electricity and inadequate education of the operating staff.
- Poor arrangement for the solid waste management

## **2.6 Mathura:**

### **2.6.1 Location**

The city of Mathura, in Uttar Pradesh, the nucleus of Brajbhoomi, is located at a distance of 145 km south-east of Delhi and 58 km north-west of Agra. Covering an area of about 3,800 sq. km., today, Brajbhoomi can be divided into two distinct units - the eastern part in the trans-Yamuna tract with places like Gokul, Mahavan, Baldeo, Mat and Bajna and the western side of the Yamuna covering the Mathura region that encompasses Vrindavan, Govardhan, Kusum Sarovar, Barsana and Nandgaon.

Mathura town is an important pilgrim center located directly on river Yamuna and thousands of devotees take bath in the river on an average day, the number of such bathers increasing to lakhs during certain festivals.

### **2.6.2 Present Area & population**

Mathura town is an important pilgrim centre located on river Yamuna. Apart from the regular inhabitants of the town thousands of pilgrims visit the town every day, round the year. On special festival days, the number reaches several lakh, and many of them take a holy dip in the river which is highly polluted. Average population of the area is 15143 per sq. Km.

### **2.6.3 Land Use**

The present utilization of the land in Mathura is mixed. There are mainly residential, commercial, Industrial and spiritual activities. The utilization of the internal part of the town exhibits its ancientness, present development, customary utilization and the importance of spirituality. The town is highly populated near to the Yamuna River and the other part of the city having new colonies. The Cantonment is located on the Mathura Agra road and control by the military. The main activities for the commercial aspects are based at the city only. The industrial area is located near new bus stand and NH - 2.

### **2.6.4 Existing Condition**

#### **2.6.4.1 Water Supply**

The rate of water supply in this town is 150 liters per capita per day but as per the discussion held with local peoples they are facing problem for the water supply and not getting enough

water from the municipality. Many habitants are using their own tube wells to fulfill their water demand.

Mathura is the only district of the state where saline water, at large, starts right from the water table and continues up to the bedrock.

#### **2.6.4.2 Drainage**

The conditions of the open drains are not in good shape at various places. These drains are either choked or damaged due to poor maintenance. City is having about 5 major drains and these drains to the River Yamuna.

Some drains are joins the river directly at various ghats like near Swami Ghat, Vishram Ghat and Arya Samaj Road etc.

#### **2.6.4.3 Sewerage**

About 30 years ago an intercepting sewer and some trunk sewers were laid along the river bank which intercepted the flow from 13 nos. of drains, which was transmitted to a sewage farm on the other (eastern) side of the river with the help of two lifting stations located at Vrindavan gate and Swami ghat, and one sewage pumping station located at Bengali ghat by the side of the railway line. Due to poor maintenance, the system became almost defunct and most of the sewage and septic tank effluent found their way to road side open surface drains which ultimately discharged to Yamuna. Under YAP I in 1998, 5 drains were trapped before meeting Yamuna and flow was diverted to the Trans Yamuna 14.5 mld STP for treatment. After 1998, some other new drains have developed in the zone. Masani Nala on the extreme north of the town, is a major drain and carries, besides domestic wastewater, substantial industrial effluent from several printing industries. They are having proper pumping station to trap the nala wastewater and pumping to the sewage treatment plant. The sewers in the old city - Chaubia Para, Lal Darwaja, Chowk area, Bengali Ghat, were laid in 1938. The sewer lines vary from 150mm $\phi$  to 600mm $\phi$  and are either choked or broken with discharges to the drainage system.

The city is divided into 2 zones, the Masani Nallah zone and the Trans Yamuna zone

From Masani nallah wastewater is pumped to the sewage treatment plant through a 2900m long 500mm $\phi$  rising main. The capacity of the sewage treatment plant (oxidation ponds) in Cis Yamuna area is 12.5mld. Major problems and bottlenecks in STP's are observed during site visit

- No power backup in case of power failure
- Screen chamber are choked due to poor maintenance
- O&M manual is not available at site

#### **2.6.4.4 Road Condition**

The condition of roads in the city is not good at various spaces.

#### **2.6.5 Major Issues**

The major issues for the town are:

- Condition of the sewerage system and pumping stations is bad
- Many interceptions and diversion works are choked and the sewage is directly discharge in to the river
- Open drains are choked at various place due to improper maintenance
- Drains are heavily silted and broken.
- Dumping of debris into the drains and silting of rains are seen as a regular features.
- Operation of the pumping stations are affected due to insufficient electricity and inadequate education of the operating staff.
- Poor arrangement for the solid waste management

## **2.7 Agra:**

### **2.7.1 Location**

The city of Agra is situated on the right bank of river Yamuna down stream of Delhi and Mathura at 27° -10' N latitude and 78° - 02' E longitude. It is about 200 Kms from Delhi and 56 Kms from Mathura. The maximum temperature of Agra rises to 47° C during peak summer-season and drops down to minimum of 3° C during the winter season. Ground levels at Agra vary from Reduced Level 150 M TO 170 M. The strata consist of mainly sandy soil. The sub soil water level is generally 6 to 8 m below ground level. River Yamuna enters the town from the North-East Corner, flows towards South for same distance and then turns towards east. The city stretches for about 9.0 Kms along the river. The land on which the city has developed, slopes from West to East in Cis-Yamuna area on the right bank of the river Yamuna. The city is famous for Taj Mahal, a world heritage

Agra city lies in a moderate to high rainfall region with an average yearly rainfall of about 686 mm. The maximum and minimum rainfall recorded by Indian Meteorological department, Agra are 286.0mm (1939) and 32.5mm (1944) for 24 hours respectively between 1930 and 1997 (67 years).

### **2.7.2 Present Area and Population**

The population of the Agra town was 12.59 Lakh as per census of 2001 with the density of about 138 persons per ha. Total Municipal area of Agra city is about 9125.63 ha.

### **2.7.3 Land Use**

The present utilization of land in Agra is mixed type. There are mainly residential, public & semi-public and transportation. Total residential area is about 60% of total Municipal area.

### **2.7.4 Existing Conditions**

#### **2.7.4.1 Water Supply**

The city of Agra is facing an acute problem of raw water in terms of quality. The quality of water of River Yamuna, which is its raw water source, is highly polluted. Rate of water supply is 150 litres per capita per day.

#### 2.7.4.2 Sewerage

Agra city has a pathetic sewerage system. Only a small area of about 1400 ha. has been covered with an old inadequate sewerage system out of total area of 8360 ha. of the city. The old system that exists in 1400 ha area is also inadequate due to increase in population and extension of inhabited area. In the absence of comprehensive sewerage system, the storm water drains, open nallas & ponds are highly polluted and discharge the raw sewage coming to them directly in river Yamuna. The remaining area does not have any sewerage system. Work for prevention of pollution of river Yamuna has been taken up under Yamuna Action Plan. Under this programme 3 STP's with a total capacity of 90.25 mld have been constructed. The major works under YAP-I are as below.

- 9 new Sewage Pumping Stations,
- Renovation of 2 pumping stations,
- 3 STPs were constructed viz.  
Bhuri Ka Nagla STP (CIS Yamuna) Oxidation Pond of 2.25 mld, Dhandupura STP (CIS Yamuna) 78 mld (UASB) Pilakhar STP (Trans Yamuna) Oxidation Pond of 10 mld.
- 25.55 Km of sewer lines & rising main were laid.

Approximately 117 mld of effluent from the CIS area is discharged into the trapped nallahs compared to the 1998 design flow of 77.7 mld, Similarly in the Trans Yamuna Area about 18 mld of effluent is discharged compared to the 1998 design flow of 10.2 mld. During peak flow, the waste water discharges directly into the river Yamuna.

Works under YAP Phase-II have already been sanctioned and will start soon in the Northern and Western zones. In the Northern Zone, one STP at Jaganpur Village (14 mld), one MPS & one IPS, 6.1 Km of rising main & 33 Km of sewer line have been proposed. In the Western Zone one STP at Bichpuri (40 mld), 1 MPS, 2 IPSs, 8.4 Km of rising main and 41 Km of sewer line have been proposed.

Major problems and bottlenecks in STP's are observed during site visit.

- Screen chamber are not in good operating condition.
- The sewage is not received on regular basis due to improper operation of the main pumping station.
- Plants are not running to full capacity because of power failure and inadequate receiving sewer from the pumping stations.
- The sludge handling system is not proper.
- The operating staff is not having enough knowledge regarding the process and O&M of the plants.
- The incoming sewage is containing industrial influent along with the sewage
- Plant is not in good shape
- Improper sludge handling from UASB
- O&M manual is not available at site
- Most of the spare parts of the machinery are not available for maintenance
- Some of the few equipments are not in operating condition

### 2.7.4.3 Drainage

The city is facing big problem of Storm Water Drainage due to inadequate drainage system. The old drains laid about 50 years ago, are in very bad condition. These drains are heavily silted and broken at many places. Buildings have come up just over the drains resulting in water logging/flooding of this nearby areas. Due to new development the areas have been paved resulting in increased run off. Hence, the section have also become inadequate and need to be redesigned.

### 2.7.4.4 Road Conditions

Agra city is situated on National Highway (N.H.-2) at about 200 Kms. from Delhi in the state of Uttar Pradesh. Agra is connected by four National Highways namely Delhi-Kanpur (NH-2), Agra-Gwalior (NH-3), Agra-Jaipur(NH-11) and Agra-Aligarh (NH-93).

The road network within the city of Agra is not developed enough to cater for the requirement of tourism which Taj Mahal attracts. Intermediate Public Transport (I.P.T.) is the popular mode of transport due to lack of public transport system. In fact the road network of the city offers poor level of service affecting safety, efficiency and economy of traffic operation within the city.

### 2.7.4.5 Solid Waste Management

The present scenario of solid waste management in Agra city is as given in the following tables.

Functional Element	Detail
Segregation of Storage at Source	Generally absent, waste is thrown on streets.
Primary Collection	Does not exist, waste is deposited on the streets and picked up through sweeping.
Waste Storage Depot.	Very unscientific, waste is stored on open sites/ Masonry enclosures. A few containers are however, in use.
Transportation	Manual loading is open trucks/ Partly dumper placers.
Frequency of Removal	Irregular /Alternate day/ Once in three days/ Once in a week
Processing	No processing is carried out except WTE Pilot plant at Sikandra.
Disposal	Crude landfill at Shahdara Unauthorized dumping in open space.

### 2.7.5 Major Issues

The major issues for the town are:

- Existing sewerage system in Agra covers a small portion of the city only with very few house connections and mostly sewage goes into open drains.
- Conditions of open drains are very bad.
- Choking of open drains and sewerage systems
- Dumping of debris and solid waste into drains and silting of rains are seen as a regular features.
- All the drains are badly silted.

- The vertical walls of the drains are damaged at places resulting in water logging of the adjoining areas.
- The RCC cover slabs are broken/damaged at number of places.
- There are Kachha portions existing at places within the alignment of many drains, which also cause water logging in the areas.
- Buildings are existing right on the edge of the drains, with the result that drains cannot be desilted/ maintained. Moreover the households dump the garbage directly in these drains besides discharging sullage/ sewage.
- All most all of drains are carrying sullage/sewage, and such dry weather flow cause desiltation.

## **2.8 Etawah:**

### **2.8.1 Location**

Etawah is situated on the left bank of Yamuna. The topography is variable with flat areas and ravines with many steep slopes towards river Yamuna. Etawah lies entirely in the Gangetic plain, but its physical features vary considerably and are determined by the rivers which cross it. Soils are broadly distinguishable into dumat or loam, matiyar or clay, and bhur or sand. Besides these are found everywhere low-lying beds of clay in which water collects during the rains.

The Etawah town is surrounded by Kanpur in the east, Bandha Fisher Reserved forest in the west, Farrukhabad in the north and river Yamuna in the south. The town of Etawah is centrally located and it is well connected by road as well as by rail with surrounding districts. It is situated at a distance of 120 km from Agra, 165 km from Kanpur, 60 km from Mainpuri and 125 km from Gwalior by road. It takes around two hour journey by train from Kanpur to Etawah.

### **2.8.2 Area and Population**

The population of the Etawah town as per census of 2001 is 2.1 lakhs with the density of about 119 persons per ha. Total Municipal area of Etawah town is about 9.27 sq. km and total municipal area is about 65.4 sq. km which also includes about 30 villages.

### **2.8.3 Land Use**

The present utilization of land in Etawah is mixed type. These are mainly residential, public & semi-public and transportation. Total residential area is about 42% of total Municipal area. Middle of the city and market areas is highly populated.

### **2.8.4 Existing Conditions**

#### **2.8.4.1 Water Supply**

Rate of water supply is 105 litres per capita per day. Town area is covered by pipe water supply while village areas are facilitated with tube wells only.

#### **2.8.4.2 Drainage and Sewerage**

The town is not sewered. Approximately 30% of houses have septic tanks and soak pits with effluent discharged to roadside drains. The remaining 70% of houses discharge sewage directly to the open drains. Almost every street has drains on both sides. There are 2 major nallahs - Tikshi nallah which takes about 85% of the effluent and Jharna nallah taking the remaining 15%. The drainage system is being maintained by the Nagar Palika.

Present sewage generation of the town is around 16 to 17 mld. Under YAP-I, a sewage treatment plant of 10.5 mld capacity was constructed at Talheti in 1998. The STP has 2 anaerobic ponds of 4m depth, 2 facultative primary ponds of 2m depth and 3 maturation ponds of 1.25 m depth. Screened diversion channels have been constructed at the outfall of both major nallahs. The STP is operating at full capacity i.e. 10.5 mld and the remaining flow is bypassed to the Yamuna. One pumping station is constructed under YAP-1.

Wastewater from Tikshi and Jharna nallahs are diverted to pumping station and then pumping to oxidation pond for treatment. Treated effluent is discharged to river Yamuna. Untreated wastewater partly bypassed into river Yamuna since capacity of pumping station and treatment plant is insufficient against requirements.

Some localized places get water logged due to natural depression and blocked drains. Conditions of many nallahs are very bad in many locations and causing nuisance and health problems.

#### **2.8.4.3 Road Conditions**

Etawah is well connected with various cities through highway and railways. The old imperial highway existing from the times of Mauriyas traverse the district connecting the trade routes of Punjab, Delhi, Agra in the north-west with Allahabad and Bengal. It was the main line of Transportation prior to Railways before 1862. In 1876, the metalled roads consisted of Etawah-Farrukhabad Road, Etawah-Gwalior road, Etawah-Mainpuri road, and other roads were Phaphund railway station to Bela, Usrahar to Sandaus, Bidhuna to Achhalda, Etawah to Kalpi and Etawah to Jaswant Nagar. Now, a network of roads running in every direction is contemplated by the authorities. Planned development of means of transportation and the construction of new roads are undertaken by the public works department. In January 1999 the length of total metalled roads was 1279 Km.

Apart from these the municipal board, Etawah maintains 180 Km of roads within its limits. Roads are also constructed by the forest department to facilitate the export of forest produce in the area under its jurisdiction. Roads within the town are mostly narrow and condition is poor.

#### **2.8.4.4 Solid Waste Management**

At present there is no proper and scientific solid waste management system. Garbage is collected at open places and brought to dump lands.

#### **2.8.5 Major Issues**

The major issues for the town are:

- Town has no sewerage system.
- Condition of open drains is very bad. Choking of open drains is everywhere and causes health nuisance.
- Dumping of debris and solid waste into drains and silting in drains due to poor maintenance.
- Insufficient water supply and very less per capita demand supply.
- Improper solid waste management.
- Existing STP is not sufficient for full load.

### **3. Approach & Methodology**

#### **3.1 Inception Report**

This Inception Report details the outcomes, observations, progress and proposals for the reconnaissance, data collection and initial review of existing documents. An updated work programme, approach & methodology of various activities and manning schedule are also presented.

The primary objective of this report is to ensure that all stakeholders have the same understanding of the objective of the project and that the scope of work and final deliverables are understood and agreed by all stakeholders.

#### **3.2 Project Phases**

As per the Terms of Reference, the following three phases can be distinguished in the project:

- Master Planning for drainage and sewerage,
- Feasibility Study for sewerage works and
- Detailed Project Reports for sewerage works

The Master Plan is to be prepared for the base year 2010, intermediate stages 2025 and ultimate design horizon as 2040.

Detailed Work Plan /Activity Schedule of each town is presented in Figure Nos. 3.2 A to 3.2H

### **Study Phase I**

#### **I. Preparation of Master Plan for Sewerage and Drainage system**

##### **Act-1.0: Mobilization, Meetings & Site Visit.**

The Consultants Team members have been mobilized to project towns to identify suitable places to establish local offices and accommodations for the project staff. The structure of the project study team is given in fig. 3.2 I

The project initiated with kick-off meeting with the client UP Jal Nigam to fix up preliminary strategy for carrying out study of the town and collection of data/information from various agencies.

The project team visited all the 8 towns under study of YAP Project and gathered preliminary information about the existing land use pattern of the town, drainage system, sewer network, sewage treatment facilities, water supply status, road conditions etc. Land use Master Plans for 8 towns were also collected for studying population growth pattern, extent of development of the town and land utilization pattern in near future for each town.

### **Act-2.0: Data Collection**

The project team members will visit to various Urban Local Bodies (ULBs) and other government departments for collection of data/information on existing situation of the town. The consultants will collect reports and drawings already prepared by UPJN, ULB's and other Govt. departments for study of various work already executed/will be implemented shortly in each town.

Following data are to be collected :-

- a) **Urban Data :** Demography of town will be collected and analyzed for Projection of project area and population up to design horizon 2040 as per YAP project requirement.
- b) **Base Map:** Survey of India toposheets, town map, Resource SAT, quick bird, existing utility maps will be collected for preparation of base map of the project area.
- c) **Technical Data:** Existing water supply, sewerage system, drains, meteorological data, environmental status etc. will be collected & reviewed to assess present condition of the existing facilities & analysis of data for further utilization in formulation of proposed sewage & drainage system. Previous reports on quality of water, effluent at STP's industrial waste water etc. will also be collected for proper appreciation of the situation.
- d) **Social Status:** Socio-economic status of the town, slum area, village area, public awareness programs conducted so far, health status, etc. will be collected and analyses to assess social impact and environmental awareness of people.
- e) **Intuitional Status:** Organization structure of UP Jal Nigam, Urban Local Bodies, State Govt. Dept, National level Agencies and staffing pattern of operation & maintenance staff for sewerage, drainage system of the town will be collected for review & suggestion on institutional arrangement required for proposed woks under YAP project.
- f) **Financial Data:** Annual maintenance expenditure, plan & non-plan expenses of various ULBs, annual budget, revenue collection, tariff structure etc. will be collected for review and will be utilized for assessment of operation & maintenance (O&M) requirements and financial analysis of the project.

The consultants will also identify data gaps of the above categories and suitable strategies will be formulated in consultation with UPJN for necessary field surveys & investigations required for study of 8 towns.

### **Act-3.0: Base Map**

Collected information of civic amenities of the town will be incorporated in the town map. Satellite imagery/Quick bird images will be utilized for preparation of base map. An outline for preparation of base map for GIS is given in Figure-3.2 J

### **Act-4.0: Project Area Population Projection & Design Criteria**

The consultants based on existing data will analyze demography of the town and will finalize project area boundary for 2040. Project area will be demarcated in the base map. Population projection will be done at 5 year interval considering base year 2010. As per existing pollution level data, NRC guidelines, CPHEEO manual, rainfall analysis report, design criteria etc. will be considered for development of the proposals for sewerage & drainage facilities.

### **Act-5.0: Survey & investigation**

Following surveys & investigations will be taken up for formulation of Master Plan for sewerage and Drainage system.

- **Topographical Survey:** Land survey of roads, X-sections of drains existing manholes location, utilities drainage out fall, etc. will be surveyed and data will be utilized for updating base map and planning of sewerage & drainage system of town.
- **Geotechnical investigation:** Field investigations as required will be carried out for the hydro-geological information for the town. Data will be utilized for proposing laying of sewers, construction of pumping stations, STP's, drains, and drainage out fall structures etc.
- **Effluent Quality:** Effluent samples will be collected from STP's, at outfall point of industries for test and result will be utilized for IEE, design consideration for sewage treatment facilities.
- **Water Quality:** Water sample will be collected from identified drainage channels/river and test result will be utilized for IEE.
- **Sewer & Drain Condition Assessment:** Inventory of existing drains, sewers, out fall facilities will be carried out and data will be utilized for assessments of rehabilitation needs of existing facilities.
- **Existing Equipment:** Existing equipment at pumping stations, sewage treatment plants will be reviewed to assess their conditions and data will be utilized for suggesting improvements.

- **Socio Economic Survey:** Sample household survey in urban, semi-urban and village area covered in municipal boundary will be carried out and survey data will be utilized for analysis of socio-economic status of the city.
- **Public Participation & Awareness Programme**

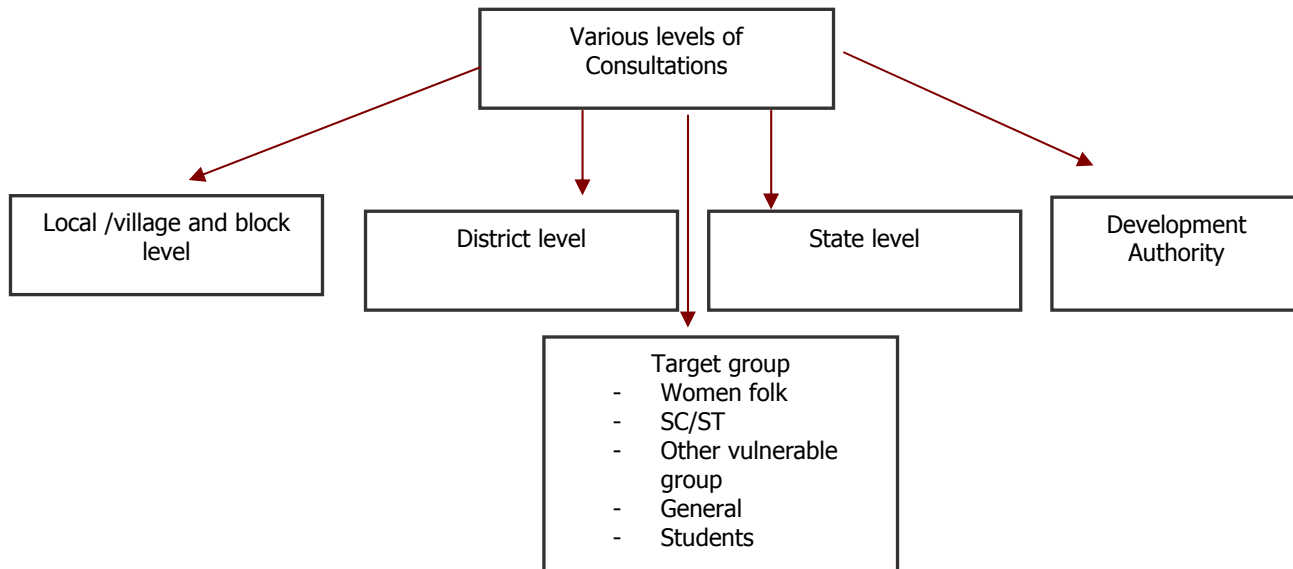
The role of various stakeholders contributes significantly towards problem solving and effective implementation of the project. The public consultation is an important tool to assess the perception of people towards the project. It helps significantly in understanding the priorities of the project-affected persons; hence it plays an important role in increasing the public participation.

Experience indicates that involuntary resettlement generally gives rise to severe problems for the affected population. These problems may be reduced if, as a part of RAP implementation, people are properly informed and consulted about the project, about their situation and preferences, and are allowed to make meaningful choices. This serves to reduce the insecurity and opposition to the project which otherwise are likely to occur.

The key informants during the project preparation phase included both individuals and groups namely:

- Head of households and members of households affected by the project particularly women & children
- Village Panchayats;
- Local voluntary organisations, and CBOs / NGOs;
- Government agencies and departments;
- Other project stakeholders with special focus on women & children

The various levels at which the consultation will be held will include:



### **Act-6.0: Formulation of Master Plan Frame work for Sewerage and Drainage System:-**

Based on inventory of existing sewerage & drainage system, survey & investigation, project area and population projection of the town for 2040 Master Plan, following components will be finalized in consultation with ULB's & UPJN and will be presented before City Level Working Committee (fig. 3.3A) prior to preparation of Master Plan for Sewerage and Drainage System.

- a) Finalization of Project Area for 2040 horizon.
- b) Population projects for 2010, 2025, & 2040.
- c) Rainfall Analysis Reports.
- d) Design Criteria for
  - Sewerage System
  - Drainage System.

The Master Plan Framework will also include planning, water supply, sewage generation, O&M issues and availability of land for STP's. On approval of above aspects, collected historical data/information and data collected through survey & investigation will be utilized for preparation of Master Plan for Sewerage & Drainage System of the 8 towns

### **Act 7: Discussion with ULB's & UPJN**

The Consultants will discuss with City Level Working Committee (Figure 3.3 A) consisting of representatives of ULB's & UPJN of the town undertaking regarding project area, population projection, design consideration for sewerage & drainage system and other technical aspects of the area to obtain consensus on various technical issues.

### **Act 8 : Preparation of Master Plan for Sewage & Drainage System**

Based on survey & investigation, analysis of project & secondary data and recommendation of City Level Working Committee on technical issues to the Consultants will develop Master Plan for Sewerage and Drainage system each in separate volume. The study for the proposed system will be provided in the Master Plan. The Master Plan will also cover social and environmental issues and a report on Initial Environmental Examination of the proposal. The O&M issues, Organizational and Institutional analysis as well as social impact assessment will be done and a Public Participation and Awareness Programme will be suggested. The Master Plan will also include phasing of the proposed works and priority sewerage works will be identified.

After consensus of the city level working committee the draft Master Plans will be submitted to State Level Working Committee (Fig. 3.3B ) for their review & approval. A workshop will be organized by the consultant with all committee members within 15 days from the submission of the report.

Suggestions & recommendations or draft Master Plan will be incorporated and the final Master Plans for sewerage & drainage will be submitted for acceptance. The identified priority projects for sewerage system will be considered for the feasibility study.

## **Study Phase II- Feasibility Study for Sewerage**

### **Act 9 : Collection of Additional data for Feasibility Study**

The feasibility study will be conducted for priority sewerage project identified at the time of formulation of Master Plan for sewerage. The consultants will identify additional data/ information, survey & field investigation required for further analysis of various alternatives for priority projects. Detailed inventory of priority project area will be taken up by the Consultants.

### **Act 10 : Updation of Base Map**

Additional data will be utilized for updating the base map for GIS.

### **Act 11 : Preliminary design of Priority Project**

Design of proposed sewerage system will be done by the Consultants for 8 towns.

### **Act 12 : Social & Environmental impacts**

The consultant will carry out socio-economic survey in the town, village & slum areas and survey data will be analysed for impact on existing sewerage system & sanitation facilities on society. Environmental awareness of people will also be assessed under this survey. Willingness to pay for sewer connection, maintenance of sewerage system & sanitation facilities will also be assessed through sample survey. A public awareness programme will be formulated based on analysis of house hold survey data.

The study teams will carry out the Initial Environmental Impact Assessment (EIA) for the project area. Necessary water quality, effluent quality etc. will be examined by the study team & will assess existing environmental conditions of the project area. The study teams will also assess possible improvement of water quality in the priority project area. Report on social & environmental impacts will be part of feasibility study report. The report will suggest mitigation measures also for various adverse environmental impacts during construction phase as well as operation phase. In general the JBIC, NRCD guidelines will be followed and screening matrix will be prepared.

### **Act 13 : Submission of Draft Feasibility Study Report (FSR)**

The Consultant will prepare draft Feasibility Study Report of the priority sewerage projects based on technical, social and environmental reports of the project area.

Design, drawings, cost estimates, O&M requirements, Institutional Development Programme, Public Participation and Awareness Programme, financial analysis for revenue generation (IRR) etc. for various priority project will be incorporated in the draft FSR. Draft FSR will be submitted to City Level Working Committee for their review & acceptance. A workshop will be organized by the Consultants for discussions with City Level Working Committee on FSR. After acceptance of draft FSR by City Level Working Committee, a workshop will be organized at State Level Working Committee for review & approval of draft FSR. Environmental & Social issues will also be discussed in the workshop for each priority project. Comments of the State Level Working Committee on draft FSR will be incorporated in the report & final FSR will be submitted for approval. After approval of the final FSR detailed project report of priority projects will be prepared by the Consultants..

## **Study Phase III- Preparation of Detailed Project Report (DPR) for Sewerage**

### **Act 14 : Additional Survey & Investigation**

The consultants will carry out additional survey & investigation in the priority project area finalized by State Level Working Committee as per requirement. The data will be utilised for updating base map and detailed design of selected priority projects.

### **Act 15: Detailed Design of Selected Priority Projects for Preparation of Detailed Project Report (DPR)**

The Consultants will design & prepare drawings for the selected priority project for sewerage schemes, cost estimate, O&M requirements, financial & economics analysis etc. Organizational & Institutional analysis for implementation of priority projects will be provided in the Details Design Report (DPR).

Project implementation schedule will be proposed considering tendering stage and construction period for the priority projects.

The Consultants will also suggest work packages and will prepare technical specifications and bill of quantities (BOQs) for the proposed works of the project.

Draft DPR and Draft Tender Document will be presented to City Level Working Committee. Recommendation of the committee will be incorporated in the draft DPR & Tender Documents.

A workshop will be organized for discussions on draft DPR and Tender Document at State Level Working Committee. Observations and suggestions on the said documents will be incorporated and final DPR and Tender document will be submitted by the Consultants.

## **3.3 Workshops**

Four workshops are programmed in each town – at presentation of the Sewerage and Drainage Master Plan Strategy; after submission of the Draft Sewerage and Drainage Master Plan; to discuss the Sewerage Feasibility Report; and to discuss the Detailed Project Report for Sewerage.

The workshops are aimed to ensure public acceptability of the project and would require the participation of consultants, National River Conservation Directorate (NRCD), MOEF GoI, Department of Urban Development , GUP, Pollution Control Board, Uttar Pradesh Jal Nigam staff, the PMC, staff of the ULBs, City Development Authorities, UP Housing and Development Authorities and other concerned bodies. The workshops would discuss any outstanding issues and ensure that all stakeholders are fully informed

The process described above will ensure that each of the reports adheres to a common framework for execution and reporting and that a high level of quality in the final deliverables is achieved.

### **3.3.1 Approval Mechanism**

Technical issues shall be discussed with City Level Working Committee. Organization and proposed structure of this Committee as give in Figure No. 3.3A

Approval of reports shall be obtained through Approval Mechanism as presented in Figure no. 3.3 B.

### **3.4 Activity Schedules**

The detailed Activity Schedule for each town is presented in Figure No. 3.2A to 3.2H. It is based on the “Interactive Dynamic Approach” adopted for the Master Planning. As such the Schedule expands the tentative schedule presented in the ToR. The time frame is the same, i.e. the project is expected to be completed in 16 months. However, this time frame is very tight and depends on the timely receiving of comments on submitted documents (within 2 weeks), approval of survey work plans (within 2 weeks), timely availability of all relevant stakeholders to participate in workshops and acquisition of up-to-date high resolution satellite imagery.

It can be seen that the programme does not envisage delivery of the reports in two batches but reports will be delivered over a three month period. The exact phasing will depend on data availability, duration of required surveys and time frame for responses.

A Summary of Activities in each town are shown in Figure No. 3.4

### **3.5 Manning Schedule**

The agreed key staff deployment and the proposed starting dates are shown in Figure 3.5. This deployment is dependent on the programmed activities with project staff mobilised in the first month of the project and design staff mobilised later.

## 4 Reports

The report submittal dates given below are based on the activity chart given in the Fig. 3.2A -3.2H. Submission dates for draft reports are one month earlier than for the final reports. As requested the reports for the 8 towns will be submitted individually over the period to facilitate individual assessment of the reports.

Report name	Submittal date	Number of Copies
Inception Report	29 June 06	5 copies + soft copy
Draft Master Plan	Oct. 06 –Dec. 06	5 copies + soft copy
Final Masterplan	Nov. 06- Feb. 07	5 copies + soft copy
Draft Feasibility Report	Jan. 07 – March 07	5 copies + soft copy
Final Feasibility Report	February 07 – April 07	5 copies + soft copy
Draft Detailed Project Report	May 07 – August 07	5 copies + soft copy
Detailed Project Report	June07 – September 07	5 copies + soft copy
Monthly Reports	On the 15th of each month	5 Copies

This schedule of deliverables is shown on Figure 4.1

### 3.5 Monthly Report

Monthly Report will summarise;

- Work undertaken to date, work undertaken in the last month and work to be undertaken in next month.
- Reports submitted to date and reports to be submitted in next month
- Workshops held to date and planned in next month
- Staff inputs in last month and planned for next month
- Financial progress report of consultants for this project.
- Issues resolved last month and outstanding issues to be resolved.
- Correspondences and letters on main issues and minutes of meeting.

## 4. Issues for agreement

It is noted that the YAP-I works were designed to a 1998 design horizon and were thus inadequate on completion. The recent Urban Masterplan Studies has a design horizon of 2021 which is only 11 years later than the given base year of 2010. In accordance with the CPHEEO Manual the design horizon should be 30 years for sewerage works. Wastewater treatment works and pumping stations should be phased with machinery given a 15 year life span with proper maintenance. Two design horizons for the development of the sewerage works will be prepared with 2010 as base year:

- 1) 2025 - Medium term development and
- 2) 2040 - Long term development

The ToR requires that measures be designed to reduce the pollution discharges into the River Yamuna. Both the provision of a combined sewer system and the provision of a separate sewer system will reduce pollution. Only the provision of separate sewerage will minimise the discharge of pollutants during the monsoon period and the study will prepare only separate sewerage proposals.

In Agra sewerage of two zones is to be taken up in YAP-II and it is proposed that for these areas. The proposed works be dovetailed in Master Plan. The sewerage of the Taj Ganj Zone is awaiting completion and will be treated in a similar manner. The Cantonment zone is not under the control of the ULB and will be excluded from the study except for assessment of the impact of this area on the city sewerage system. The study will thus concentrate on the unsewered zones and the older sewer City Zone.

A Sewerage DPR for Etawah has been recently prepared by the U.P. Jal Nigam. It is proposed that the works proposed in this DPR will be dovetailed in the Masterplan will be adopted by the study. The study team will however prepare GIS mapping showing the Sewerage Masterplan proposals. A Drainage Masterplan will be prepared.

## **5. Key Issues**

Except for Muzaffarnagar and Etawah, all of the Cities have a planning Masterplan with a planning horizon of 2021. These Masterplans have all been approved by the ULBs and are providing a focus for development in the cities. The Consultant will prepare a Sewerage Masterplan with a 2040 design horizon but it must be appreciated that predicted development outside of the 2021 Urban Masterplan will be a subjective estimate.

Based on the available data, available treatment capacity is 70% of the generated sewage flows, although due to other deficiencies only 60% of this sewage can actually be treated. It should be noted that site visits have shown that actual treatment is probably nearer 40% of the sewage generated

It was reported in a number of towns that backup generators could not be run as there was no budget for diesel. In fact the operation and maintenance budget was generally reported as inadequate with little maintenance performed. The study will prepare institutional proposals detailing the required staffing and operation and maintenance budgets.

It has been found that in a number of towns the as-constructed drawings and drawings of existing older works is not readily available.

There is little formal record keeping especially with respect to operational records and problems. Without records of collapses and blockages it is not possible to undertake a planned maintenance and rehabilitation programme.

The discharge of effluent from industries must be considered in the Masterplan. The assumption that industrial effluents will be taken to a separate treatment plant, especially in the smaller towns, cannot always be assumed. Discharge of untreated industrial effluents will nullify the improvements in water quality resulting from the collection and treatment of domestic sewage.

It must be appreciated that an integrated waste management approach must be undertaken by the concerned local authority. Lack of a solid waste collection in a town is resulting in solid waste being disposed of into the drains.

Acquisition of Satellite Imager/Quick Bird may take time therefore preparation of base map for GIS will be delayed.

Land availability for STP's, pumping stations, and other utility services to be finalised in consultation with ULB's and concerned authorities.

## **6. Status of Data Collection**

### **6.1 Review of Existing Reports**

All relevant existing reports have been briefly reviewed and abstracts of relevant information available in the reports are listed below:

*2001 Census Data, 2006, Government of India.*

Full Census data for Uttar Pradesh with limited population projections.

*Etawah Sewerage Scheme (SIS Railway Line), Phase I, Part – I, U.P. Jal Nigam, 2005.* DPR for the sewerage of the middle & east zones. Design horizons 2023 and 2038. Design of 95km of sewers, 3 pumping stations and an STP of 36 mld capacity.

*Etawah Sewerage Scheme (SIS Railway Line), Phase I, Part – II, U.P. Jal Nigam, 2005.* DPR for the sewerage of the Old City, Karan Pura and Civil Lines.. Design horizons 2023 and 2038. Design of 23km of sewers, 1 pumping station and two STPs of 10 and 13.5 mld capacity.

*Ghaziabad DPR Trunk and Out fall Sewers-THA GHZ part- I, Ghaziabad YAP Unit UP Jal Nigam, 1994.* Design Report, design horizons 2023 for sewerage and 1998 for pumping stations.

*Ghaziabad DPR Trunk and Out fall Sewers-THA GHZ part- II, Ghaziabad YAP Unit UP Jal Nigam, 1994.* Design Report, design horizons 2023 for sewerage and 1998 for pumping stations.

*Ghaziabad DPR Trunk and Out fall Sewers-CHA GHZ part III, Ghaziabad YAP Unit UP Jal Nigam, 1994*

Design Report, design horizons 2023 for sewerage and 1998 for pumping stations

*Ghaziabad DPR Trunk and Out fall Sewers-THA GHZ part- III, Ghaziabad YAP Unit UP Jal Nigam, 1994.* Design Report, design horizons 2023 for sewerage and 1998 for pumping stations.

*Ghaziabad DPR Trunk and Out fall Sewers-THA GHZ part- IV, Ghaziabad YAP Unit UP Jal Nigam, 1994.* Design Report, design horizons 2023 for sewerage and 1998 for pumping stations.

*Ghaziabad Executive Summary and Review Report on Works Proposed for Ghaziabad Town under YAP Ghaziabad YAP Unit UP Jal Nigam, 1994.* Summary of works contained in DPRs for THA & CHA

*Improvement of Sewerage System in Agra under Taj Trapezium Zone, Phase - I, Tajganj Drainage District, Volume I(Report, financial statement & estimate) IV Construction Division, U.P. Jal Nigam, Agra, 2001.* Summary of Scheme, development of drainage in the area and details of proposed works.

*Master Plan for Agra – 2021, Plan has been prepared by Agra Development Authority 2001.* Urban Planning Master plan covering all aspects of development in Agra. Population is predicted to increase 20.26 lakhs respectively in an urban area of 19,389 ha in 2021.

*Master Plan for Etawah – 2001, Plan has been prepared by Town & Country Planning Department in 1986.* Urban Planning Master plan covering all aspects of development in Etawah. Population is predicted to increase to 2.41 lakhs respectively in an urban area of 1,948 ha in 2001.

*Master Plan for Ghaziabad – 2021, Master Plan has been prepared by Ghaziabad Development Authority in 2001.* Urban Planning Master plan covering all aspects of development in Ghaziabad. Population is predicted to increase to 22.78 lakhs in an urban area of 15,554 ha in 2021.

*Master Plan for Mathura & Vrindavan – 2021, Town & Country Planning, 2001.* Urban Planning Master plan covering all aspects of development in Mathura. Population is predicted to increase to 7.28 lakhs respectively in an urban area of 21,498 ha in 2021(Mathura plus Vrindavan).

*Master Plan for Muzaffarnagar – 2001, Plan has been prepared by Town & Country Planning Department, Merrut in 1981.* Urban Planning Master plan covering all aspects of development in Muzaffarnagar. Population predicted in Masterplan for the year 2001 was 3.41 Lakh.

*Master Plan for Noida – 2021, School of Planning and Architecture, New Delhi, 2001.* Urban Planning Masterplan covering all aspects of development in Noida. Population is predicted to increase to 7.7 lakhs in an urban area of 14,964 ha in 2021.

*Master Plan for Saharanpur – 2021, Saharanpur Development Authority, 2001.* Urban Planning Masterplan covering all aspects of development in Saharanpur. Population is predicted to increase 1.01 lakh in an urban area of 6,928 ha in 2021.

*Manual on Sewerage and Sewage Treatment (2<sup>nd</sup> Edition), The Expert Committee, CPHEEO, Ministry of Urban Development, New Delhi, 1993.* Design guide for Sewerage schemes and sewage treatment works.

*NOIDA: Feasibility Report for NOIDA Town-Ganga Action Plan Phase II-1993-1994 including drawings, Ghaziabad YAP Unit UP Jal Nigam, 1994*

*Optimal Design of Wastewater Collection System for Agra Master Plan, Volume –I, Main Report, National Environmental Engineering Research Institute, Nagpur, 2002.* Wastewater Masterplan for Agra. Full details of sewerage and sewage treatment needed. Aerated lagoons recommended for wastewater treatment.

## **6.2 Other data to be collected**

- Urban Development Plans, land use, density, projections,
- Population estimates and growth,
- Commercial and Institutional developments, slum areas,

- Water supply demands, consumptions, projections,
- Existing design criteria in Uttar Pradesh,
- Existing Geophysical data and groundwater levels,
- Capacity of existing facilities (SPS & WWTP),
- Operational data of WWTP & SPS (quality & volumes, breakdowns, energy consumption),
- Sewer operational data (infiltration, collapses and blockages),
- Existing sanitation by area,
- Hydrologic data (rainfall volumes and intensity, stream flows),
- Existing effluent reuse & direct irrigation by sewage,
- Cost data,
- Organisational / operational details,
- Sociological and Environmental data.