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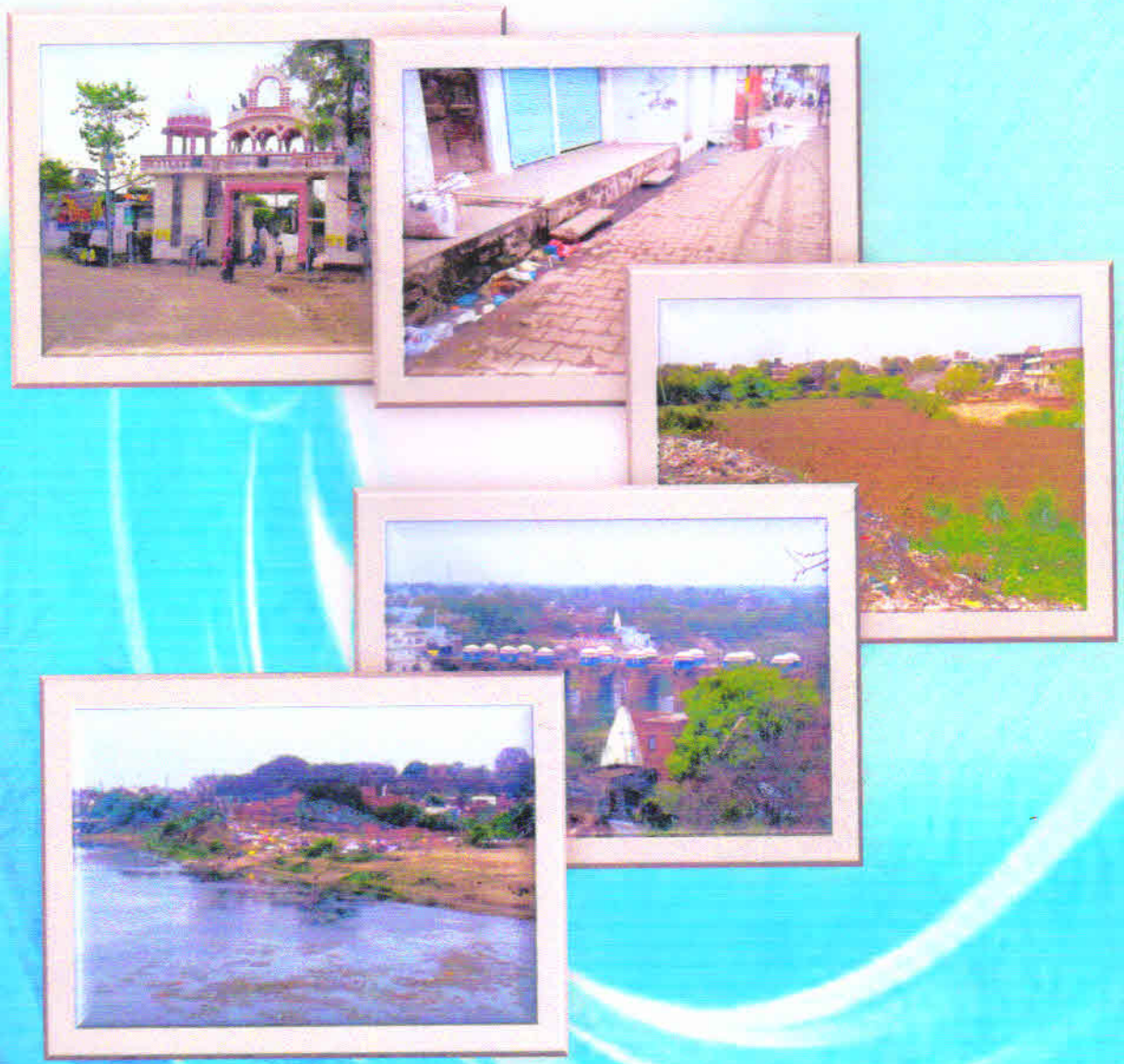
CITY SANITATION PLAN
Jaunpur, Uttar Pradesh

Nagar Palika Parishad
Jaunpur



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FAGEOCAD Systems Pvt. Ltd.

CONTENTS

LIST OF ABBREVIATIONS

3R	Reduce, reuse & recycle
CAGR	Compounded Annual Growth Rate
CPHEEO	Central Public Health and Environmental Engineering Organization
CSP	City Sanitation Plan
C&T	Collection & Transportation
CSTF	City-Sanitation Task Force
DEWATS	Decentralized Waste Water Management System
DPR	Detailed Project Report
DUDA	District Urban Development Authority
DWWM	Decentralised Waste Water Management
EWS	Economically weaker Section
FOP	Financial Operating Plan
GDP	Gross Domestic Product
GIS	Geographical Information System
GOI	Government of India
HUDCO	Housing and Urban Development Corporation
I & PH	Irrigation and Public Health department
IEC	Information Education Communication
ILCS	Integrated Low Cost Sanitation
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
LCS	Low Cost Sanitation
LIG	Low Income Group
LPCD	Litre Per Capita Per Day
MT	Metric Tons
MIS	Management Information System
MLD	Million Litre per day
MOA	Memorandum of Agreement
MSW	Municipal Solid Waste
MTV	Mobile Toilet Van
NEDA	Non-Conventional Energy Development Agency
NEERI	National Environmental Engineering Research Institute
NGO	Non-Government Organization
NPP	Nagar PalikaParishad
NUSP	National Urban Sanitation Policy
PPP	Public Private Partnership
PWD	Public Works Department
RCC	Reinforced Cement Concrete
SAR	Situational Analysis Report
SPS	Sewerage Pumping Station
STP	Sewerage Treatment Plant
SUDA	State Urban Development Authority
SWM	Solid Waste Management

TPD	TonsPer Day
USP	Uttar Pradesh Sanitation Policy
ULB	Urban Local Body
UNEP	United Nations Environment Programme
UPPCB	Uttar Pradesh Pollution Control Board
WHO	World Health Organization

EXECUTIVE SUMMARY

1. INTRODUCTION

The sanitation situation in India depicts a very grim picture as Census of India 2011 results have indicated that nearly 17 million urban households (more than 20 percent of the total 79 million urban households) suffer from inadequate sanitation.About11.88 million households are not connected to any kind of drainage network, 23.28 million households are connected to open drains (*ref: various publications of MoUD, Govt. of India*).This situation has resulted into significant public health issues and very high environmental cost for urban area affecting the country's GDP. The problem is further compounded by the fact that as high as 69% of the waste water generated in urban areas is not treated is disposed into the water bodies without any treatment due to which three fourths of surface water resources are polluted (*ref: Central Pollution Control Board, 2009*).

Realizing the vastness and implications of this serious environmental and socio economic issue, the Ministry of Urban Development, Government of India (GOI) announced the National Urban Sanitation Policy (NUSP) in December 2008. As directed by the policy, cities are to prepare City Sanitation Plans (CSPs) addressing all aspects of sanitation in the city. FA Geocad Pvt. Ltd. has been entrusted with the task of preparation of City Sanitation Plan for Jaunpur.

The National Urban Sanitation Policy

The National Urban Sanitation Policy (NUSP) seeks to address the gap in sanitation infrastructure and move Indian cities towards "total sanitation through a "systems driven approach. NUSP tries to create a more coordinated institutional roles and responsibilities to reach the poor and the un-served. Under the NUSP, Jaunpur Nagar Palika Parishad has to prepare City Sanitation Plan (CSP), with the active participation of the city level stakeholders.

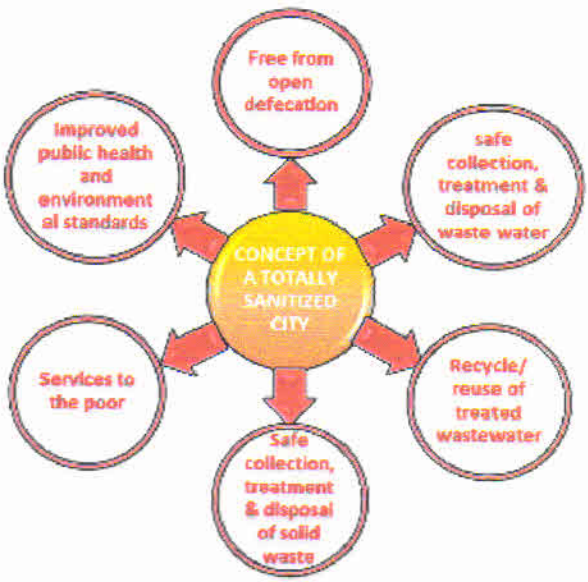


Figure 1: national urban sanitation policy

Vision of NUSP

The NUSP outlines the vision of urban sanitation as "All Indian cities and towns become totally sanitized, healthy and livable and ensure and sustain good public health and environmental outcomes for all their citizens with a special focus on hygienic and affordable sanitation facilities for the urban poor and women."

Uttar Pradesh Sanitation Policy

In line with NUSP Uttar Pradesh Sanitation Policy to meet specific requirement of the state

Vision

All the cities and towns become totally sanitized healthy and livable.

Goals

A Awareness generation and behavior change
B Open Defecation free cities
C Integrated city - wide sanitation
D Sanitary and safe disposal
E Implementations support strategy

Objectives of the City Sanitation Plan in Jaunpur City

The City Sanitation Plan has been prepared after carrying out a situation analysis and after a structured consultation with stakeholders. The Plan attempts to achieve the following objectives:

- To adopt locally suitable methods, technology and materials, and provide necessary facilitation support to Jaunpur Nagar Palika Parishad.
- To encourage community and private participation and define their role in creation and maintenance of sanitation infrastructure, thereby ensuring a sense of ownership.
- To ensure coordination between various departments working in the field of water supply and sanitation, such as departments of health, education, public health and engineering, industry, environment, transport, pollution control board, etc.
- To ensure an optimum use of funds allocated by 13th Finance Commissions for solid waste management and other sanitation related projects. To coordinate various externally aided projects for their optimum results.
- To promote novel ideas in mobilization of funds, including reforms in tax regime, public private partnerships, exploring the private market, user charges, beneficiary contribution, etc.

2. APPROACH AND METHODOLOGY

The overall work is divided into four broad tasks as shown in the chart and the steps to be taken and deliverables for completion of the tasks are provided below:

- Step 1 - Formation of City-level Implementation Committee/Cell
- Step 2 - Conduct 1st Consultation
- Step 3 - Reconnaissance Survey
- Step 4 - Preparation of Situation Analysis
- Step 5 - Conduct 2nd Consultation
- Step 6 - Preparation of Draft City Sanitation Plan
- Step 7 - Preparation of Implementation Plan
- Step 8 - Conduct 3rd Consultation
- Step 9 - Final City Sanitation Plan

3. AN INTRODUCTION TO JAUNPUR

Jaunpur's notable history dates from 1388 during the Tughlaq rule, when it was a major center of Urdu and Sufi knowledge and culture.

Jaunpur is well-connected with all major cities of India by railways. It has three major railway stations namely Jaunpur City Station, Jaunpur Junction and Shahganj Junction. Jaunpur is well connected by roads to Lucknow,Varanasi, Allahabad and other cities like Azamgarh, Mirzapur, Bhadohi, Sultanpur

and Ghazipur. Varanasi International Airport is just a 45-minute drive from Jaunpur city on National Highway 56.

There are several interesting architectural monuments inJaunpur dating back to the Tughlaq and Mughal rule,such as Atala Masjid, Jama Masjid, LalDarwazaMasjid,Jaunpur Fort and Shahi Bridge over the river Gomti(dating back to 1564 during the reign of Akbar).

The total population of Nagar Palika Parishad, Jaunpur during Census 2001 was counted as 1,60,055persons, which increased to 2,08,459 persons during Census 2011 (Figure 3.4). Thus, there is a net accretion of 48,404persons during 2001 -11 decade, which is about 30% during the decade. Annual growth rate has increased from 1.8% to 3% during the last decade.

Jaunpur city has 895female per 1000 male. The sex ratio of the city is less than state average of 908 and national average of 940. The total literacy rate in NPP, Jaunpur has been observed to be growing at the rate of 2.27% p.a. and has been recorded in Census 2011 as 82 %. Overall, the entire district of Jaunpur has shown the increasing trend of literacy rate, which jumped from 59.98% in 2001 to 82% in 2011. It is noted that total female literacy during Census 2011 for Jaunpur city was recorded as 77.98% as against the state female literacy rate of 59.26%.

Jaunpur has an extreme tropical climate, with maximum summer temperatures reaching 44º C and winter temperatures dipping to 3º C. The average annual rainfall is around 1000 mm, received mostly in the monsoon season from July-September.

4. POPULATION PROJECTION

The population is one of the major factors in determining future patterns of progress and development of the city. As per Census 2011, NPP, Jaunpur has population of 2,08,459 persons. The population of NPP, Jaunpur has increased from 1,60,055 persons in 2001 to 2,08,459 in 2011, recording a decadal growth rate of 30 percent. The population projection for Jaunpur city has been carried out using 3 commonly used methods i.e. Arithmetic Increase Method, Geometric Increase Method, and Incremental Increase Method: (Method of Varying Increment).

For the purpose of population estimation at CSP level the average of all the 3 methods was considered as the final figure. The resultant year wise population is provided in Figure below

TABLE1 : AVERAGE OF DIFFERENT POPULATION PROJECTION METHODS

Year	Arithmetic	Geometric	Incremental	Average
2011	208,459	208,459	208,459	208,459
2016	223,115	237,311	226,331	228,919
2021	237,771	266,163	246,347	250,094
2026	252,427	303,002	268,507	274,645
2031	267,083	339,841	292,811	299,911
2036	281,739	386,878	319,259	329,292
2041	296,394	433,914	347,850	359,386
2046	311,050	493,971	378,586	394,536
2051	325,706	554,028	411,466	430,400
2056	340,362	630,709	446,490	472,520

2061	355,018	707,390	483,658	515,355

Projections of Water Demand, Sewage & Solid Waste Generation

As per recommendations of Section 2.2.8.3 of the CPHEEO Manual, city level water demand has been projected considering 135 LPCD for residential population and sewage generation as 80% of the water demand. Solid waste generation is taken as 350 gm. per capita as prescribed by CPHEEO. Considering the projected population per capita water demand, per capita sewage and solid waste generation, the total water demand, sewage and solid waste generated is calculated for Jaunpur City (Table 3).

TABLE 2: SUMMARY OF CITY LEVEL INFRASTRUCTURE DEMAND

Year	Population in Thousand	Water (MLD)	Sewage (MLD)	Solid Waste (TPD)
2011	208	28	23	73
2016	229	31	25	80
2021	250	34	27	88
2026	275	37	30	96
2031	300	40	32	105
2036	329	44	36	115
2041	359	49	39	126
2046	395	53	43	138
2051	430	58	46	151
2056	473	64	51	165
2061	515	70	56	180

5. SITUATION ANALYSIS

The key infrastructure available in the city with regards to CSP is summarized in table below.

TABLE 3: KEY SANITATION INFRASTRUCTURE IN JAUNPUR[1]

S.no	Item	Value
1	Population in year 2011	208459
2	Area in sq Km	25
	Household	
3	Residential establishment	31285
4	Commercial establishment	3257
5	Industrial establishment	0
6	Other establishment	56
7	Total establishment	34598
	Water Supply	
8	Water supplied in MLD From surface water (River)	4 ~~5~~
9	Water supplied in MLD From Ground water	16.8 ~~11~~
10	Water supplied in MLD in the city	17.36. 16
11	Underground Reservoir (Number)	2
12	Overhead reservoir (Number)	7
13	Total Reservoir (Number)	9
14	Underground reservoir capacity in Kilo Litres (KL)	2000 ~~3600~~
15	Overhead reservoir capacity in Kilo Litres (KL)	4970 ~~5800~~
16	Total Capacity in KL	6970 ~~9400~~
17	Length of pipe line in Km	75 ~~44~~
18	Amount of water distributed through piped network (MLD)	17.76 ~~11~~
19	Motorised pumps (number)	24 ~~25~~

[1] (http://localbodies.up.nic.in/Smeeksha%20Meeting/UP_SLB_10-11(E).pdf)

20	Hand Pump (number)		980
21	Un serviced population (Water Supply)		20000
22	Un serviced household (Water Supply)		4495
23	Public Taps (Number)		25
24	Supply of water in Hours a day		6
25	No of days in month when water is supplied		30
26	Non Revenue water		3.5
27	Number of samples taken per month to check quality of water	150	5
28	Number of samples pass quality of water test	128	4
29	Monthly average Number of complaints received on water supply	92	69
30	Monthly average Number of complains resolved on water supply	81	56
	Sewerage and Sanitation		
39	Presence of Sewerage network		0
40	Presence of STP plant		0
41	Number of flush toilet	13324	30000
42	Number of Paid toilet		0
43	Number of community / public toilet	11	12
44	Coverage of toilets (%age of households)	37.4	87
45	Coverage of sewage network service		-
	Solid Waste Management		
46	Daily generation of Solid waste (TPD)		80
47	Daily Collection of Solid waste (TPD)		60
48	Types of vehicle used for collection of MSW	mech 23 MAN 453	126
49	Area of dumping ground (Ha)		0
50	Capacity of vehicles used for collection of MSW (Metric Tons)		60
51	Treatment system of MSW weather Available		0
52	Treatment system of MSW weather Planned		0
53	Treatment system of MSW weather under construction		0
54	Efficiency of collection of municipal solid waste		75
	Storm water		
55	Length of Pucca Drain (Km)	90	110.68
56	Length of Kuccha Drain (Km)	45	33
57	Length of storm water Drain (Km)	16	17.3
58	Un serviced population in storm water aspect	35000	25000
59	Incident of water logging in past year	2	4
60	Coverage of storm water drainage network	42	45
61	Incidence of water logging/ flooding	1	4
	Roads		
62	Length of cement / concrete road in KM	70	77.27
63	Length of Damar road in KM	60	66.44
64	Length of WBM road in KM		0
65	Length of kuccha road in KM	30	24.95
66	Total un serviced population with regards to road network	16000	12000

Water Supply system

TABLE 4: WATER SUPPLY BENCHMARK V/S STATUS

	Performance Indicator	Benchmark	Current (2011 – 12)	Target (2012-13)
1.	Coverage of water supply connections	100 %	44	46
2.	Per capita supply of water	135 lpcd	63	66
3.	Extent of metering of water connections	100%	.....	.....
4.	Extent of non-revenue water	20%	21	20
5.	Continuity of water supply	24 hrs	7	8
6.	Quality of water supplied	100%	84	88
7.	Efficiency in redresal of customer complaints	80%	81	81
8.	Cost recovery in water supply services	100%	98.1	100
9.	Efficiency in collection of water supply related Charges	90%	91.1	91

Gap Analysis – Water Supply

- Varying quantum of water availability at source, Water supply is erratic; especially during summer.
- Proximity of water supply network is a critical issue.
- Shortage of manpower
- Poor maintenance of water sources and infrastructure
- Water theft and illegal connections
- Ineffective land zoning and building regulations
- Lack of proper consumer data

Natural Drains and Storm water Drainage Gap analysis

- Poor O&M of storm water drains along the major roads, streets and natural drains is a major issue of concern.
- At many places the natural drains have been encroached and solid waste is randomly being dumped. This is major cause of concern in core city areas. A lot of waste (packing material, vegetable waste, meat waste etc.) finds its way into the road side drains leading to its blockage. Also in periphery areas dumping of waste on natural drains causes nuisance and contamination of natural water streams in downstream areas.
- It has been observed that the local residents dump their domestic solid waste in the nearby drains. There is no regular arrangement of cleaning of these drains.
- In most cases, the overflow from septic tanks and soak pits finds its way into natural drains leading to siltation. The wastewater flow in the drains causes unpleasant odor.

- Use of storm water drains for laying water pipes and other utilities resulting in blockages and also possibility of contamination of water supply.
- All existing drains need to be widened
- Kuccha drains needs to be converted to pucca to prevent contamination of ground water.

Sewerage System

TABLE5 : SERVICE LEVEL BENCHMARK FOR SEWERAGE SYSTEM

Performance Indicator	Benchmark	Status 2011-12	Target 2012-13
1. Coverage of Toilets	100%	91	96
2. Coverage of Sewerage Network	100%	n.a.	0
3. Coll. Eff. of Sewerage Network	100%	n.a.	0
4. Adequacy of Sewage Treatment Capacity	100%	n.a.	0
5. Quality of Sewage Treatment	100%	n.a.	0
6. Extent of Reuse and Recycling of Sewage	20%	n.a.	0
7. Extent of cost recovery	100%	n.a.	0
8. Eff. in re-dressal of customer complaints	80%	n.a.	0
9. Eff. In Collection of Sewage Water Charges	90%	n.a.	0

Issues pertaining to Sewerage System

- The city does not have any sewage management system.
- Jaunpur City does not have adequate and proper facilities for septage management, most of the time the overflow from the septic tank is discharged directly into the open drains. Also the sludge removed from the tanks is disposed into the drains without proper treatment.
- Due to haphazard development activities, proper planning of waste management is not happening.

Gap Analysis – Sewage System of Jaunpur

Currently there is no Sewerage network or a sewage treatment facility in the city. All waste water is either treated in septic tank or discharged directly in storm water drain. Over next 20 years at least 32 MLD of sewage treatment facility needs to be installed in the city.

Solid Waste Management

TABLE 6: SERVICE BENCHMARK FOR SOLID WASTE MANAGEMENT

Performance Indicator	*Benchmark*	*Current (2011-12)*	*Target (2012-13)*
1. Household Level Coverage	100%	0	0
2. Eff. in Collection of Solid Waste	100%	83	91
3. Extent of Segregation of MSW	100%	0	0
4. Extent of MSW Recovered	80%	0	0
5. Extent of Scientific Disposal of MSW	100%	0	0
6. Extent of Cost Recovery	100%	0	0
7. Eff. in Re-dressal of Customer Complaints	80%	0	0
8. Eff. in Collection of SWM Charges	90%	0	0

Gap Analysis – Solid Waste Management system of Jaunpur

- Absence of waste treatment facility resulting in health and environmental hazard.
- Door to door collection and transportation is not effectively happening.
- Some of the dumper bins for waste collection are broken, resulting in littering of waste while transporting to the dumping site. Also there are not enough numbers to cater to the quantum of waste generated daily in Jaunpur. The dumpers are usually overflowing with waste and clearance frequency is inadequate.
- Storm water drains and natural drains get choked due to random disposal of the solid waste.
- The waste segregation and door to door collection is not being practiced effectively due to lack of awareness and willingness of the citizen and commercial establishments.
- Non-availability of adequate staff for door to door waste collection.

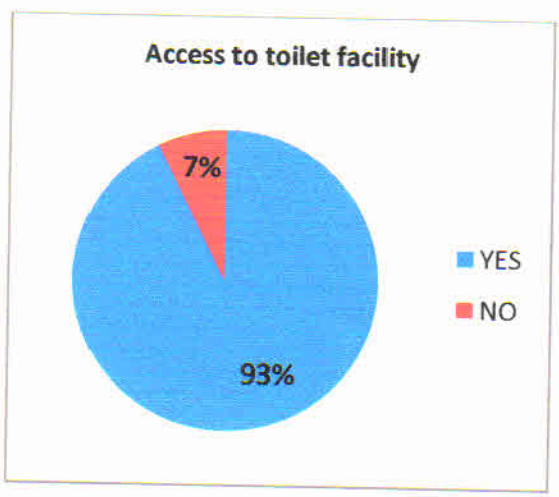
6. CITY SANITATION TASK FORCE

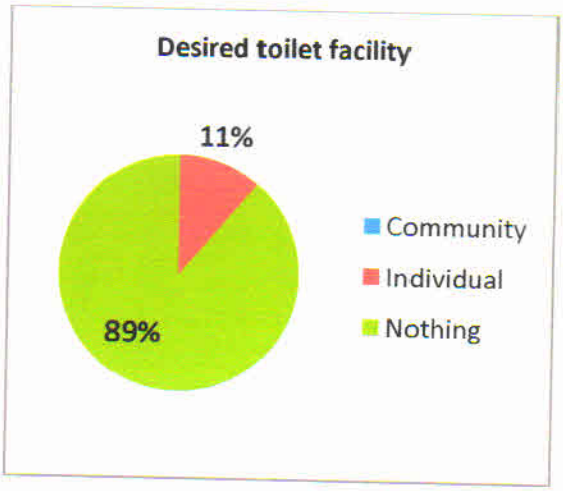
The first step in making the cities 100% sanitized is to elevate the consciousness about sanitation in the mind of municipal agencies, government agencies and most importantly, amongst the people of the city. Hence, it is one of the main recommendations and pre-requisites for the preparation of the city sanitation plan, under the National and state policy framework that a city sanitation task force (CTF) is formulated at city level. The CTF is involved in the preparation and execution of the sanitation plan from the very initial stage of the planning and conceptualization. A well diversifies CTF has been formed in Jaunpur. The details of CTF member is provided in Annex 1 of this report. The CSP has been prepared based on continuous inputs from CTF members.

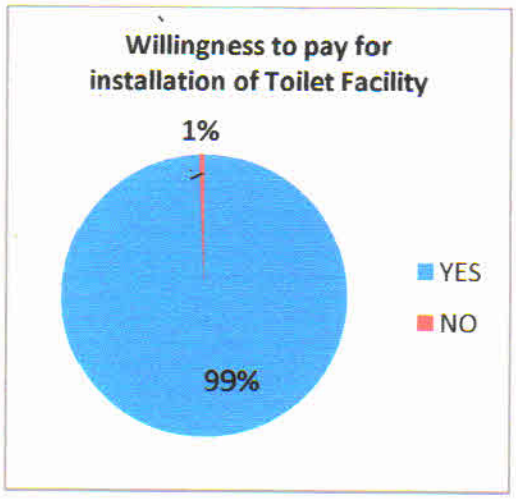
7. FINDINGS FROM PRIMARY SURVEY AND PRIORITISATION WORKSHOP

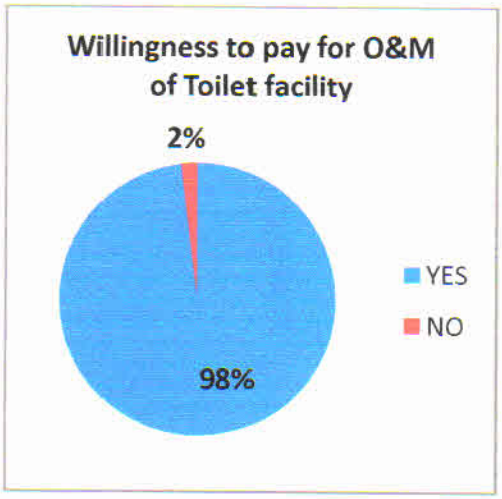
More than 300 primary surveys were carried out across all the wards of Jaunpur. The survey predominantly concentrated on availability of water and sanitation facility in the city like toilet facility, MSW facility, water source and quality etc. A willingness to pay survey was also carried out as a part of primary survey.

Toilet facility



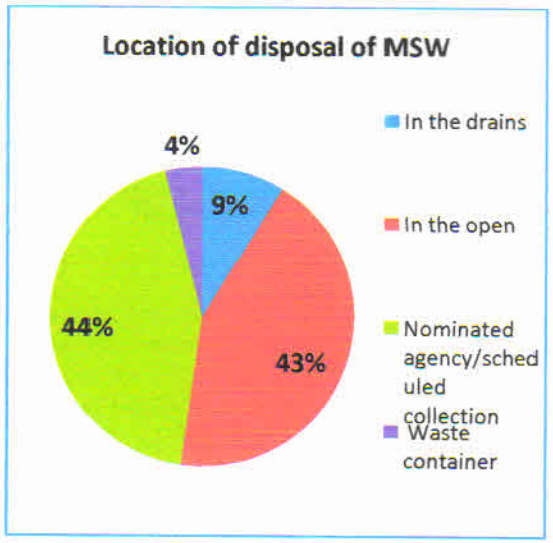


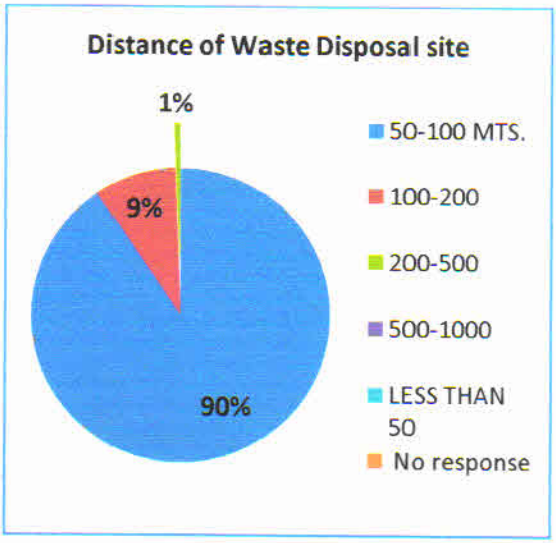


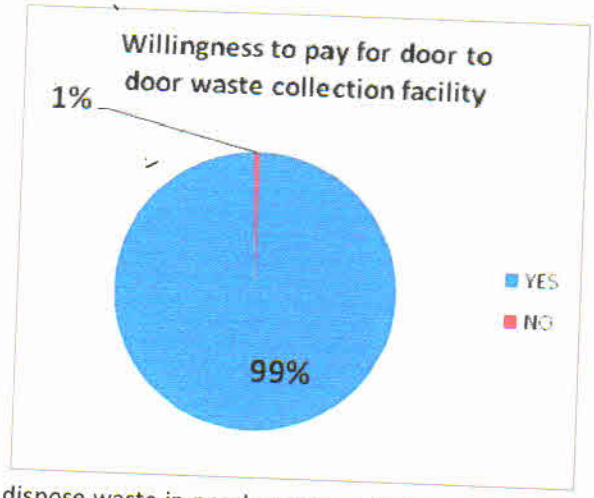


A majority of the respondents reported presence of toilet facility at household level. Most of the respondent reported access to individual toilets. However, visual inspection during survey revealed a much higher fraction of disposal of night soil directly in drains.Since most of the respondents surveyed have reported access to individual toilet, a majority of them do not desire any toilet facility. Number of respondents expressed willingness to pay for community toilet facility. Hence a Public Private Partnership approach may be explored for construction of community toilets in the city. Number of respondents expressed willingness to contribute towards maintenance of toilet facility. Hence, a Public Private Partnership approach may be explored for maintenance of toilets in the city.

Municipal solid waste

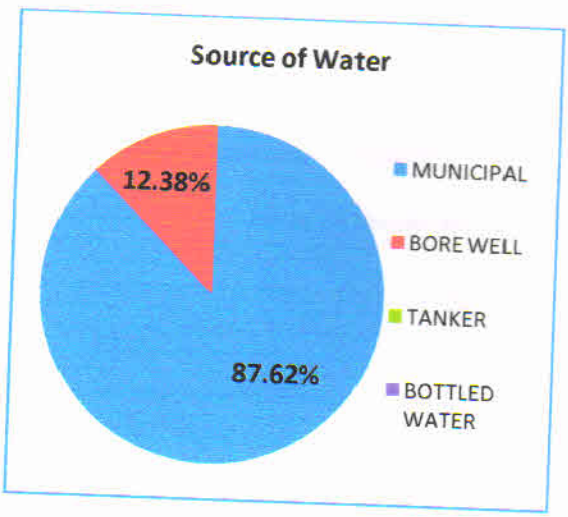


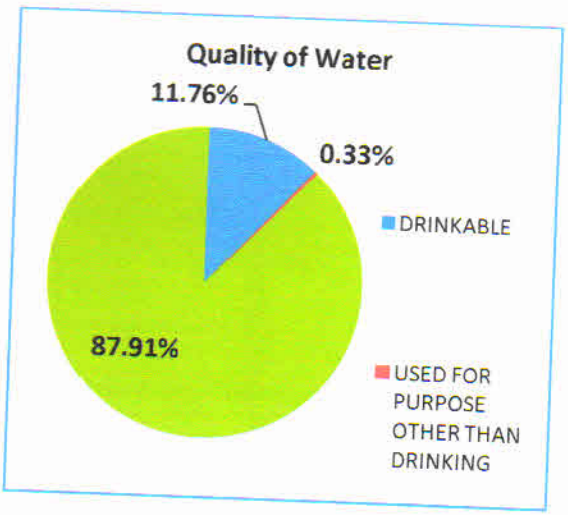




Disposal of Municipal Solid waste in Open is common in city. This may cause environmental and health hazards. The waste disposed in open area finds it's way in storm water drain and water bodies. Most of the time, waste is disposed in low lying areas and in surface water system causing contamination of ground and surface water. Proper waste collection system needs to be designed for the city to prevent this.A number of respondent reported waste disposal site to be less than 100 meters. Though these are open dumping sites not covered under municipal waste collection system, in absence of a designated waste disposal area it is common for citizen to dispose waste in nearby areas. A number of respondents agreed to pay for door to door collection of MSW thereby highlighting the possibility of a PPP approach for implementing a door to door collection system in the city.

Water

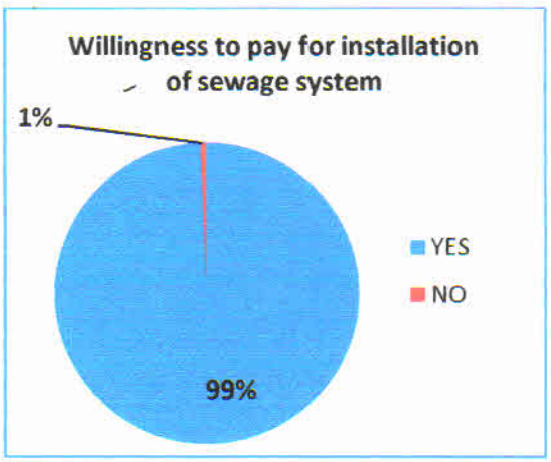


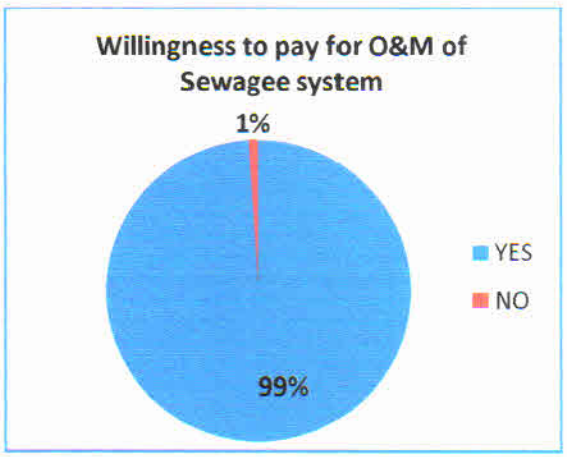


Bore well and municipal supply forms the major source of water in Jaunpur. Even a majority of Municipal supply of water is extracted from ground water. Jaunpur also has surface water as a source of water for the city. The current sanitation and waste management practice in Jaunpur as witnessed earlier is highly detrimental to ground water quality and there is immediate threat of contamination of ground water if preventive measures are not taken. Thus the CSP should focus on avoiding contamination of ground water and preventing outbreak of epidemic by suggesting proper management practices for waste water and Municipal solid waste in the city.

Most of the respondents reported turbid or bad quality of water. This is an area of concern. Indiscriminate disposal of solid waste and waste water in low lying areas and surface water source has created the problem in the city. In the event immediate steps are not taken to improve sanitation and waste treatment aspect of the city, the city health is expected to deteriorate further and major outbreak of epidemic is expected.

Sewage





Jaunpur does not have a centralized sewage system and septic tank is the only source of treatment. The construction of the septic tanks is often faulty leading to contamination of ground water. Most of the respondents were willing to pay for installation of a sewerage system of the city thus possibility of a PPP approach. The authorities may however explore other source of funding for the project including grant from central and/or state government. Similar to installation services, the willingness to pay for O&M of a sewerage system is high as per the primary survey.

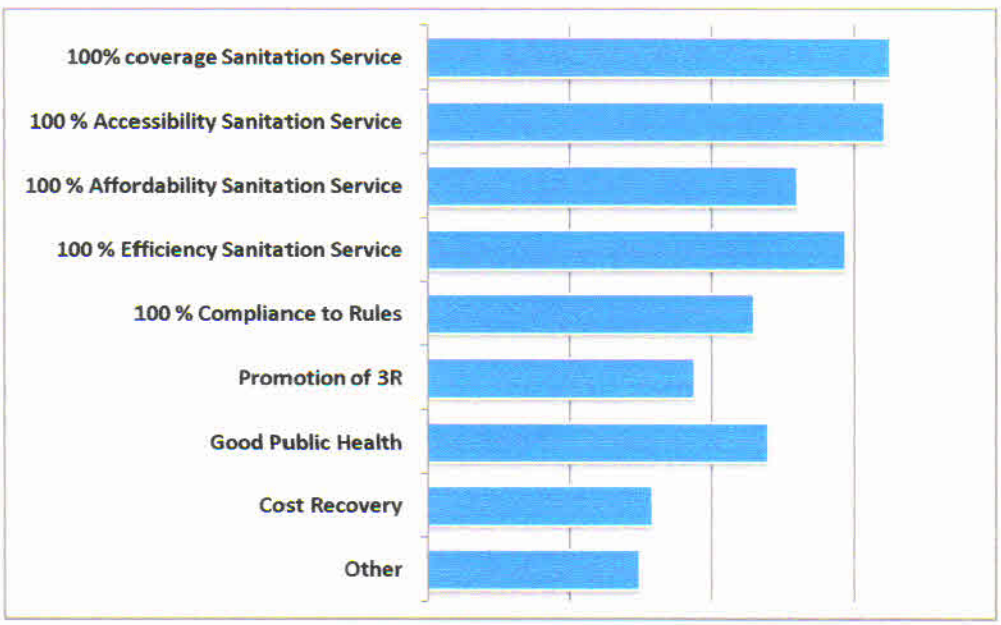
Results of prioritization workshop

A workshop was conducted by the city sanitation task force to:

- ✓ Prioritize the goal of CSP,
- ✓ The key issues linked to sanitation situation of the city and
- ✓ The key projects that should be taken up in the city on a priority basis.

The workshop was backstopped by the CSP consultants. The Key findings of the workshop are presented below

Goal of City sanitation Plan in Jaunpur



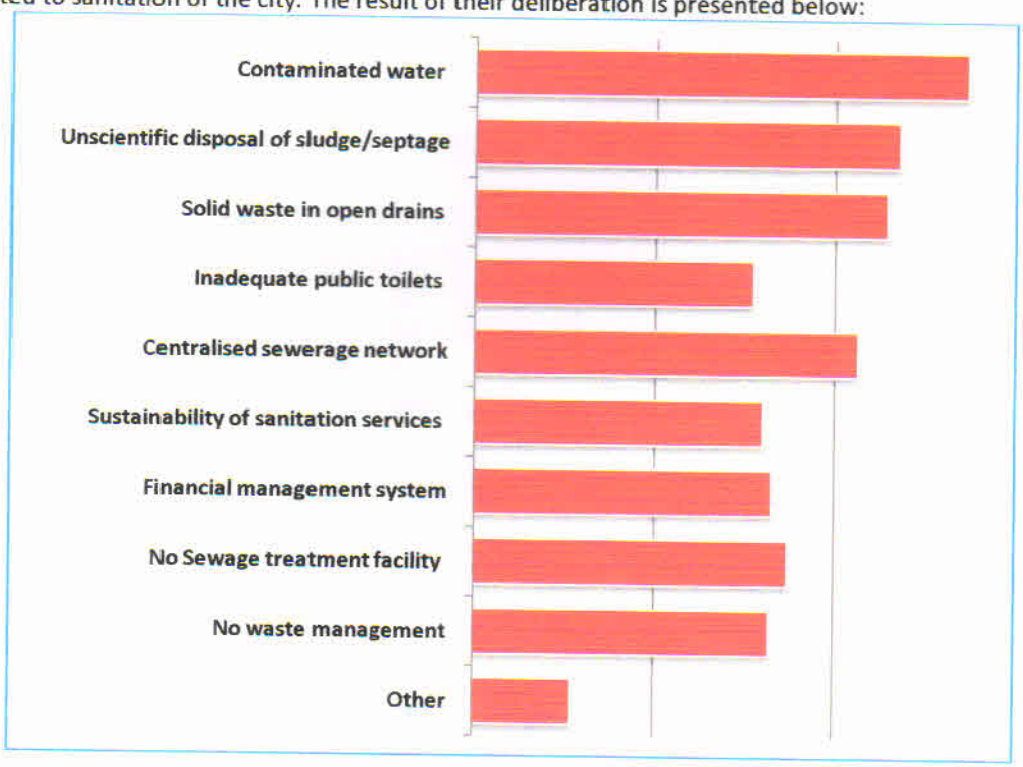
As evidenced from the figure above, 100% coverage and accessibility of sanitation services was given top most priority followed by Good public health and efficiency. Goals like Cost recovery mechanism and 3R principal were not given too much of priority.

Jaunpur lacks basic sanitation facility like a sewerage system. The city has no sewer line or treatment facility resulting disposal of waste water in river through storm water drain. Though waste collection system exists and the NPP reports 83% collection efficiency, the accessibility of the collection system is poor resulting in disposal of solid waste in drains, ponds and water body. There is no waste treatment facility in the city.

In light of above situation it is pertinent that immediate steps are taken to increase coverage and accessibility of sanitation facility.

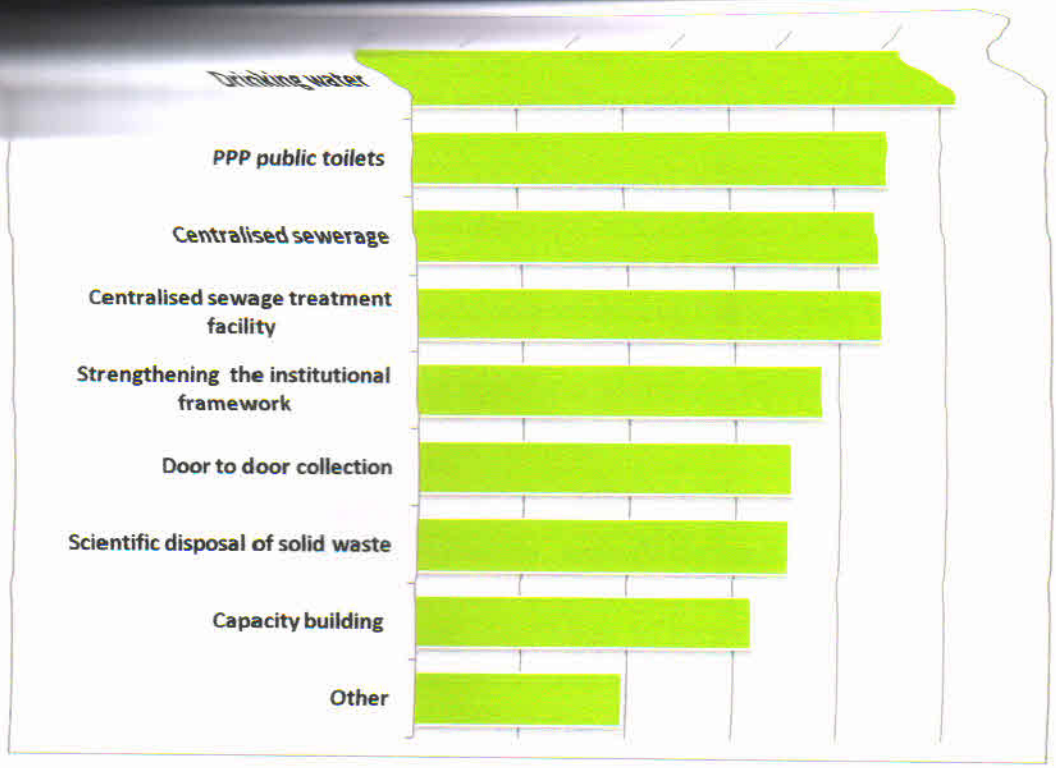
Key issues related to sanitation of the city

Members of city sanitation task force and stakeholders were requested to deliberate the key issues related to sanitation of the city. The result of their deliberation is presented below:



As evident from figure above contaminated water forms the major source of concern for the stakeholder. Jaunpur has both surface water as well as ground water as a source of drinking water. However the treatment system is old and dilapidated. This proves detrimental on the quality of water supplied in the city. The NPP is already in the process of upgrading water treatment facility of the city. Absence of centralized sewage collection network and indiscriminate dumping of solid waste in drains and water body were also identified as key issue. Both results in contamination of ground water which is the only source of water supply in the city. Hence the stakeholders felt that these practices which leads to contamination of water supply and pose health risk should be addressed immediately.

Since the basic sanitation services like a sewage network and waste treatment facility is missing in the city higher level requirement like a robust institutional framework, financial management system and sustainability of sanitation facilities were not considered to be important by the stakeholders at this level. Surprisingly the stakeholders did not feel the need for public toilet may be because NPP reports



As evident from the figure above a centralize treatment of drinking water facility followed by PPP approach for improvement of quality of public toilet was given highest priority and it was argued that these projects can be take up immediately as a short term measure.

Jaunpur already has some infrastructure with related to drinking water supply and DPR for improvement of quality of drinking water has already been prepared. Since the project has received government sanction and necessary funds are available for the implementation of project activity, the stakeholders felt that necessary action should be taken for fast track implementation of the project activity.

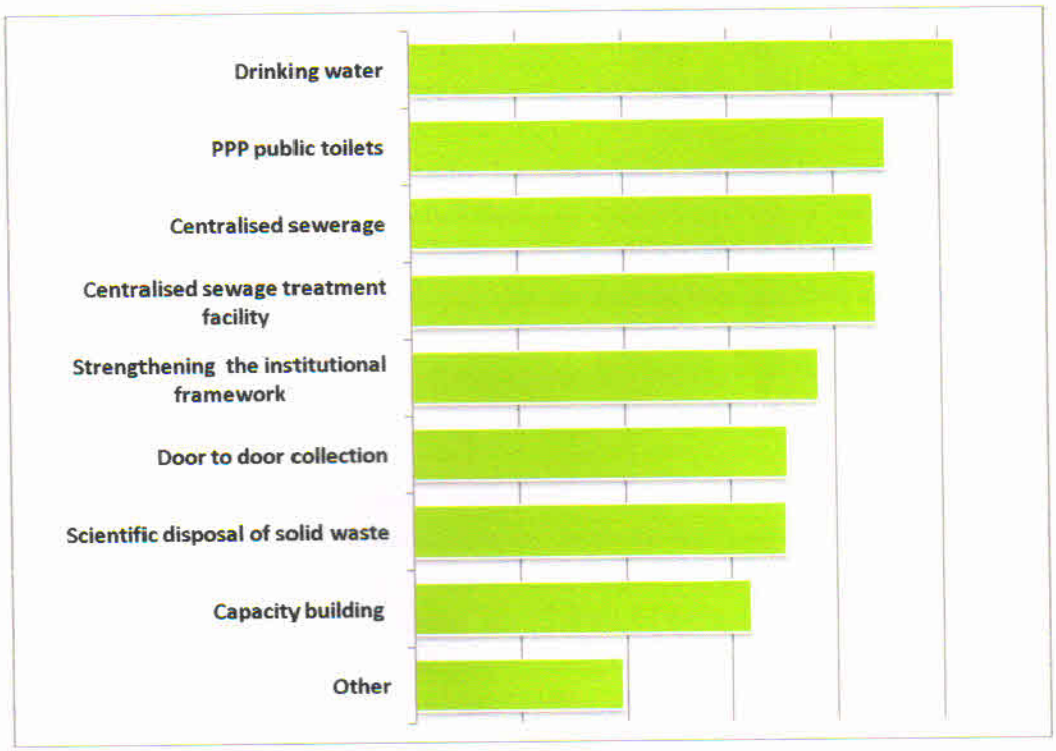
Similarly very few public toilets exist in the city and their poor maintenance discourages the user from using the facility and open defecation is common in the city. The stakeholders felt a PPP approach may not be very cost intensive and be implementation can be achieved at a relatively short period of time. This would result in achievement of one of the objective of Urban Sanitation Policy ie creating an open defecation free city.

On a medium term a sewage collection and treatment facility was recommended. Understanding that first a detailed project report needs to be prepared and necessary funds needs to be sanctioned for implementation of this large scale initiative the stakeholders agreed to keep the sewage collection and treatment facility as a medium term goal.

91% of coverage of toilet facility. However public toilets are required by urban poor and are critical for the goal of defecation free city.

Key projects linked to sanitation of the city

At the conclusion the stakeholders deliberated on the key projects that should be implemented in the city. Understanding that limited funds may be available for implementation of sanitation projects this exercise aimed at deciding on short term, medium term and long term project. The result of their deliberation is presented below :



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Under long term goal the stakeholders agreed to keep initiatives like capacity building, sustainability, institutional strengthening and solid waste treatment facilities. They argued that since the city lakes basic infrastructure there is no logic in conducting awareness campaigns, capacity buildings etc until the basic infrastructure like sewage system is in place.

8. INFORMATION, EDUCATION AND COMMUNICATION (IEC) AND CAPACITY BUILDING

The objective of IEC & Capacity Building Strategy for effective implementation of CSP in Jaunpur is to evolve an effective plan of sustainable programmes for capacity building and sensitization of implementers, education and enhanced awareness for stakeholders specifically citizens regarding sanitation activities in Jaunpur City. The strategy is designed to:

- Strengthening CSP implementation by Nagar Palika Parishad Jaunpur (NPP Jaunpur) through training and capacity building;
- Sensitize citizens for adopting water wastage minimization, segregation
- & management of solid waste and open defecation free practices through IEC campaign.
- By working at both the levels mentioned above a culture of communications and consultations are fostered leading to participation.

Communication needs assessment identified three stages for implementation of Information, Education and Communication strategy for improvement in water and sanitation services. These are 1) Awareness, 2) Process and 3) Compliance. While it is generally understood that these stages would lead to better citizen participation in the schemes, it is in fact imperative for all stakeholders to be appraised from their own specific stand points. Awareness includes an understanding of health and hygiene related education specifically directed towards slums. Equally important is an awareness of municipal officials about the problems face by all the city residents including slum & middle class households and sanitation workers. This awareness is generally taken for granted. Here, we propose that open and specific appraisals be carried out without assuming too much of prior knowledge regarding sanitation issues. Next is to create processes which are essential to maintain improved services. These could include citizen participation in community toilet maintenance etc

9. PROPOSED SANITATION PLAN

Proposed Strategy for achieving complete Household Sanitation

As far as possible individual toilets are to be promoted with subsidy support, shared toilets being the next best option followed by community & public toilets. The institutional sanitation in schools, colleges, other public places like markets, sabzimandis, bus terminal, railway station etc. & offices also needs to be addressed simultaneously.

Public Toilets

In order to achieve an ambitious goal of 100% defecation free city, public toilets will have to play an important role. Therefore the requirements for the number of public toilets for the city including the slums and public places is estimated to be 211 public toilets across the city constructed at the cost of around **15crores**. A majority of these (57%) shall be located in slums.

Design and development of Sewerage Management System for the city

Presently, the Jaunpur city does not have any sewerage system. The city being the district headquarters and with the estimated decadal population growth rate of more than 30%, should have a permanent solution for management of its waste water as a long term goal. Therefore, it is highly recommended that the NPP, Jaunpur hires consultants to prepare a detailed project report for development of Sewage management system for the city. An estimated cost of implementing a city wide sewage system is around **INR 355 crores**.

Solid Waste management

The city is currently generating nearly 100 tons of waste everyday which is expected to increase to the amount of 100 tons in the next 25 years.

The solid waste management of the city is proposed to comprise of the following components:

- Door to door waste collection services
- Bulk waste collection system using community bins
- It is proposed to sweep all the roads on daily basis manually.
- Transportation of waste from collection points using 7 m^3 capacity
- Provide integrated waste management facility comprising of compost plant and material recovery facility followed by final disposal of rejects and inerts in the scientific landfill.

The total cost of implementing an integrated SWM system for the city is estimated to be INR **12crores**
The solid waste management of the city has already been awarded under PPP mode to A2Z.

Drainage

Drain length should cover 150 % of road length. Total road length in the Jaunpur city is 168.66 Km. Hence, 253 km of drains are required out of which 110.68 km of pucca and 33 km of kuccha drain exist. Thus there is a need of construction of 109.31 km of new drain and upgrading 33 km of kuccha drain. Additionally 10 km of storm water drain is proposed. Total cost off constructing new drains and upgrading existing drains is estimated to be **INR 38.8**Crores.

Institutional Strengthening and Capacity-Building

According to the Model Municipal Law (MML) the municipal bodies should be responsible for basic facilities for the city including:

- Water supply;
- Drainage, waste management (sewerage & solid waste);
- Economic and social development plans;
- Transportation systems;
- Community health and protection of environment;
- Construction and maintenance of slaughterhouses.

Accordingly, the entire range of sanitation functions in any city should be vested in a single (well structured, capacitated, and (financially) resourced) institution. Hence, for the effective implementation of the city sanitation plan, it is very important to upgrade the existing institutional strength of the Nagar Palika of Jaunpur. Hence, restructuring of the current set up is proposed, with

an officer from UP state services of the equivalent rank of the Superintendent Engineer, as Chief Executive of the organisation. Details of the proposed administrative set up are presented below:

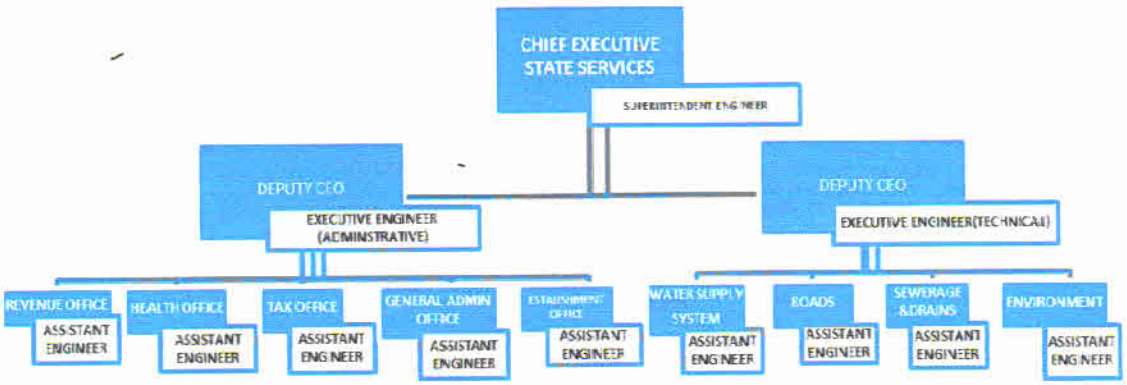


Figure 2: Proposed organization structure for NPP, Jaunpur

Personnel management and occupational health

Sanitation operations especially waste management essentially involve significant role of manpower especially sanitation workers and safaikaramcharis with most of them working on contract (temporary basis). Majority of these workers are unskilled and poorly educated. Further, the problems of low level of awareness, poor commitment, and discipline; resource diversion; absenteeism; alcoholism; drug addiction; etc. have also been commonly observed among these workers.

Further, due to the very nature of their occupation, the sanitation workers are exposed to a plethora of disease vectors at various stages of handling waste. As a result of this high exposure, typically, morbidity rate is found to be high among them, resulting in poor productivity as well as in generally high mortality.

In order to address these issues, it is recommended that NPP, Jaunpur allocate adequate resources to ensure appropriate interventions for management of personnel and their health and safety. These interventions comprise of a range of short-term training courses round the year on a regular basis for all grades of sanitation workers on the significance and importance of their work to the city to enhance self-esteem, on handling the issues of alcoholism and drug addiction and occupational health and safety aspects, personal health protection, etc.

NPP should arrange to conduct regular medical check-up of all MSW/sanitation workers with the provision of appropriate and commensurate support for curative treatment for those found to have chronic ailments.

Arrangement to provide uniforms, caps with NPP, Jaunpur logos, and personal protective equipment on a regular basis to impart a sense of identity.

Further the institutional set up and capacity for effective sanitation can be enhanced by NPP, Jaunpur by participatory approach:

- Engaging a group of NGOs and social workers with good communication skills to commence a sustainable campaign on effective sanitation practices all across the city;

- Involving civil society/ community-based organizations such as resident welfare associations, mohalla committees, market/traders associations, women's groups, and rag-pickers' groups in various municipal services & evolving a participatory monitoring system for sanitation services.
- Adopt a system of organizing regular consultations with stakeholders on the issues of, environmental sanitation, MSW management, public health and hygiene, quality of life and urban governance/development in general.

Implementation strategy

For the capacity building and increase of awareness levels in the public, it is recommended that a third party is hired by NPP, Jaunpur which is competent enough to prepare a detailed IEC plan & implement it in a phased manner.

Investment summary

Following table provides the summary of investment for various proposed works as a part of city sanitation plan of Jaunpur city. The implementation of various interventions have been further suggested to be taken up as short (1-3 year), medium(3-10 years) or long term (10-25 years) plans:

Table7: Summary of capital cost for various interventions

S. No.	Intervention	Cost (Rs., crore)	Term plan
1	Public toilets	15.6	Short term plan
2	Sludge collection & Disposal	1.5	Short term plan
3	DPR Consultancy of Sewage System	1.2	Short term plan
4	Upgradation of Kutcha drain	3.3	Short term plan
5	**Subtotal Short Term Plan**	**21.6**	
6	Laying of Sewage network	315.0	Medium term Plan
7	Construction of storm water drain	6.0	Medium term Plan
8	**Subtotal Medium Term Plan**	**321.0**	
9	Construction of 36 MLD STP	38.8	Long term plan
10	Construction of new drain	29.5	Long term plan
11	Development of SWM system for the city	12.0	Long term plan
12	Subtotal Long Term Plan	**80.3**	
13	Preparation & Implementation of IEC plan (details in Chapter 8)	2.4	Continuous
	Grand TOTAL	**425.3**	

CHAPTER 1
INTRODUCTION

1.1 BACKGROUND

The sanitation situation in India depicts a very grim picture as about 30 million* people in urban India do not have adequate sanitation facilities. This problem is compounded by the fact that as high as 70% of the waste water generated in urban areas is not treated

Realizing the vastness and implications of this serious environmental and socio economic issue, the Ministry of Urban Development, Government of India (GOI) announced the National Urban Sanitation Policy (NUSP) in December 2008. As directed by the policy, cities are to prepare City Sanitation Plans (CSPs) addressing all aspects of sanitation in the city. The Jawaharlal Nehru National Urban Renewal Mission (JNNURM) is another initiative of GOI aiming at better infrastructure service provision in selected Indian cities.

Picture 1.1: Random dumping of solid waste Jaunpur (pokhar near Amma Hospital)

Despite being one of the better served state in terms of sanitation services, according to 2001Census out of4,64,213 urban households, 33.07 percent do not have any kind of toilet facilities in the state of Uttar Pradesh.

More than 37% of the Human excreta generated in Urban India, is unsafely disposed. The loss due to diseases caused by poor sanitation to children less than 14 years in urban areas amount to Rs. 500 crore are 2001 prices (Planning commission-United Nations International Children's Emergency Fund, UNICEF,2006). Discharge of Municipal waste water has resulted in contamination of 70% of all surface water. Signatory nations of Millennium Developments Goals enjoin to extend access to improved sanitation to at least half the urban population by the 2015 and 100% access by 2025. The national urban sanitation policy was launched on November 2008.This policy outlines that each of the states develops its own specific strategy to achieve the policy goals.

FA GeoCAD Systems Pvt. Ltd. has been entrusted with the task of preparation of City Sanitation Plan for Jaunpur.

1.2 THE NATIONAL URBAN SANITATION POLICY

The National Urban Sanitation Policy (NUSP) seeks to address the gap in sanitation infrastructure and move Indian cities towards "total sanitation" through a "systems" driven approach. NUSP tries to create a more coordinated institutional roles and responsibilities to reach the poor and the un-served. Under the NUSP, Nagar Palika Parishad Jaunpur has to prepare City Sanitation Plan (CSP), with the active participation of the city level stakeholders.

VISION OF NUSP

The NUSP outlines the vision of urban sanitation as "All Indian cities and towns become totally sanitized, healthy and livable and ensure and sustain good public health and environmental outcomes for all their citizens with a special focus on hygienic and affordable sanitation facilities for the urban poor and women."[2]

1.2.1 THE OBJECTIVES OF THE POLICY

The Sanitation Policy aims at providing adequate sanitation coverage for improving the quality of life of the people of Uttar Pradesh and to provide physical environment necessary for healthy life. It also aims

- ✓ To ensure an open defecation free environment;
- ✓ To facilitate access of all citizens to basic level of services in sanitation, including installation of sanitary latrines in every house-hold, public institutions and important public places and also community latrines in densely populated areas.
- ✓ To facilitate access and use of toilets by Urban Poor and other un-served households (including slums) individual and common sanitation facilities.
- ✓ To facilitate access and use of toilets for floating and institutional population.
- ✓ To achieve no visibility of open defecation.
- ✓ To achieve safe collection, and disposed of total human excreta generation.
- ✓ To achieve safe collection treatment and disposal of total sewage generated and recycle & reuse to maximum extend.
- ✓ To achieve safe collection, transportation, segregation and treatment of Municipal Solid Waste and ensure quantity of refuse for Landfill site should not be more than 20%.
- ✓ To ensure city wastes should not cause adverse impact on surrounding areas outside city limit.
- ✓ To facilitate the provision of safe drinking water to all citizens.

[2] Ministry of Urban Development Government India, 2008, *Vision of the NUSP*, National Urban Sanitation Policy

- ✓ To facilitate adequate collection and disposal of storm water.
- ✓ To link and integrate sanitation programmes with city and regional planning policies, health, environment, housing and education.
- ✓ To develop guidelines for the evolution of an effective institutional and financial framework.
- ✓ To enhance capacity building of government agencies and other stakeholders at all levels for better sanitation, particularly avoiding incidents of water borne diseases, industrial, hazardous and hospital and clinical wastes of national, provincial and local levels, and
- ✓ To change the attitude and behavior on the use of sanitation.
- ✓ To increase mass awareness on sanitation and community mobilization.
- ✓ To improve the 'quality of life' of sanitation workers. Engage civil societies and communities (women in particular) in awareness generation, hygiene education, infrastructure and its maintenance.
- municipal staff for *meeting the challenges of technology* and management.
- ✓ To encourage Public Private Partnerships (PPPs) to ensure generation of funds and sustainable programme implementation.

1.2.2 *Uttar Pradesh Sanitation Policy*

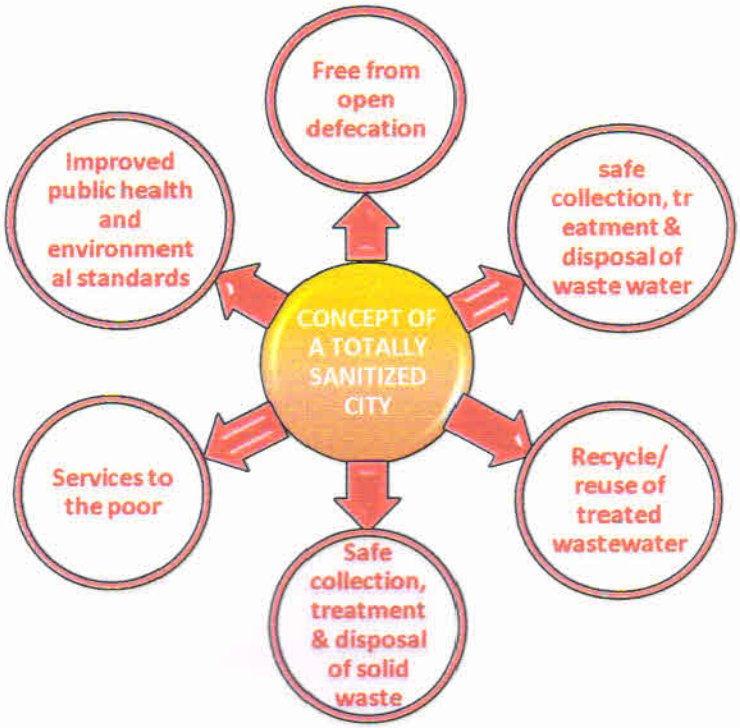
VISION

All the cities and towns become totally sanitized healthy and liveable.

KEY SANITATION ISSUES

- Poor awareness, sanitation has been given low priority and about its consequent linkage with public health.
- Social and occupational hazard faced by sanitation workers daily.
- Fragmented Institutional roles and responsibilities: - There are considerable gaps and overlaps in the institutional roles and responsibilities at the state and city levels.
- Lack of an integrated city-wide approach: - Sanitation investments are currently planned in a piece-meal and do not take into account the full cycle of safe confinement Treatment and safe disposal.
- Serving the un-served and poor.

- Lack of facilities in slums. There are no provisions for proper defecation.
- Lack of Demand Responsiveness: - sanitation has been provided in a supply manner, with little regard for demands and preferences of households as customer of sanitation services.



GOALS

A Awareness generation and behavior change

a) Generating awareness about sanitation and its related hazards amongst the communities and institutions and to encourage behavioral changes for the adoption of healthy sanitation practices.

b) Generating awareness about sanitation and its linkages with public and environmental health.

B Open Defecation free cities

a) Achieving open defecation free cities.

b) Providing safe sanitation facilities including proper disposal arrangements.

C Integrated city - wide sanitation

a) Strengthening city and local institution(Public Private & Community) to accord priority to sanitation provision, including planning, implementation and O&M Management.

b) Extending access to proper sanitation facilities for poor communities and other un-served settlement.

D Sanitary and safe disposal

a) 100% of human excreta and liquid waste from all sanitation must be disposed of safely.

b) Functioning of Sewerage Network, and ensuring connection of households.

c) Promoting Recycle & Reuse of treated water.

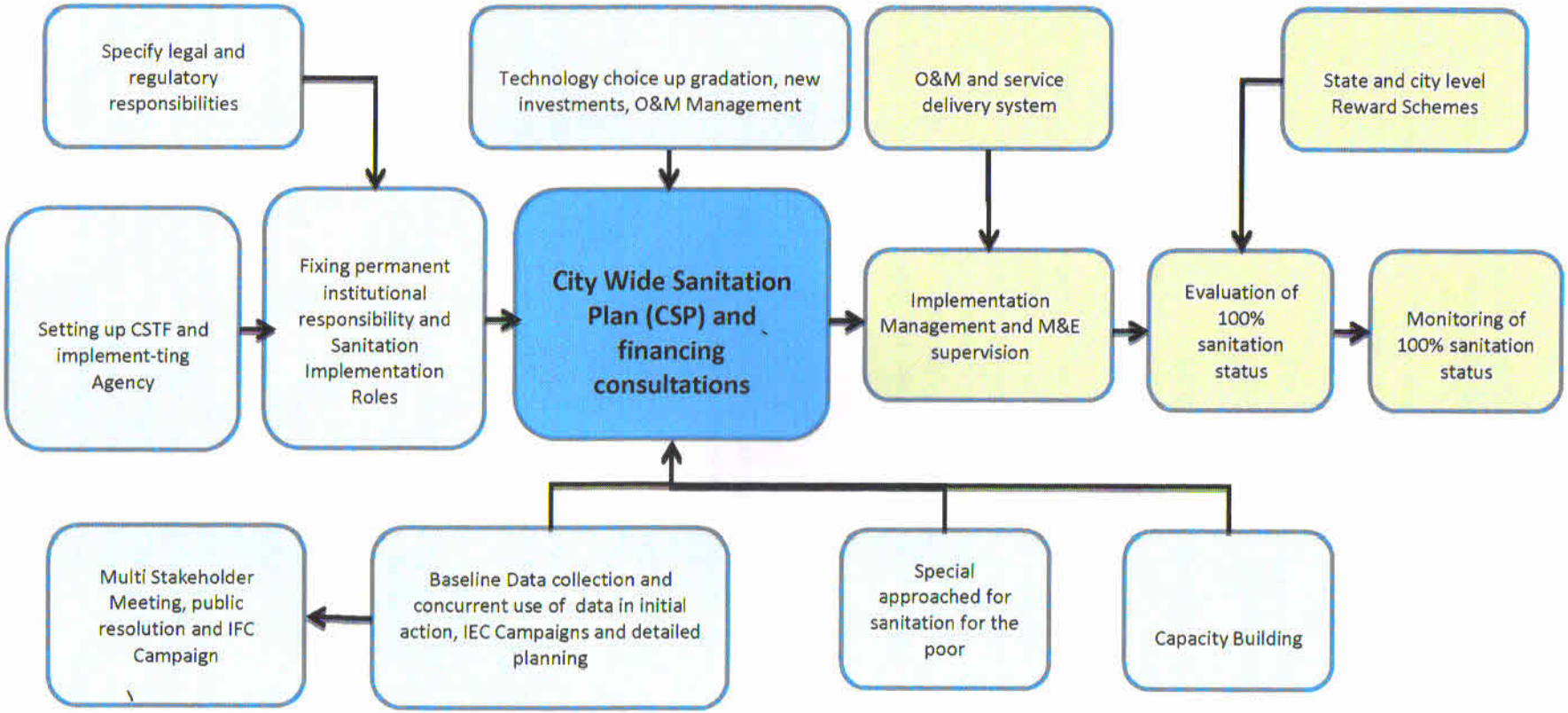
d) Promoting proper disposal and treatment of sludge.

E Implementations support strategy

All the sanitation activities and implementation come under the city level institution and stakeholders. Therefore each city needs to formulate city sanitation plan in conformity to the State Policy.

a) Promoting community - planned toilets for group of household having constraint of space and money.

b) Adequate availability and 100% up-keep of Public Sanitation Facility.


Specify legal and regulatory responsibilities
Technology choice up gradation, new investments, O&M Management
O&M and service delivery system
State and city level Reward Schemes
Setting up CSTF and implement-ting Agency
Fixing permanent institutional responsibility and Sanitation Implementation Roles
City Wide Sanitation Plan (CSP) and financing consultations
Implementation Management and M&E supervision
Evaluation of 100% sanitation status
Monitoring of 100% sanitation status
Multi Stakeholder Meeting, public resolution and IFC Campaign
Baseline Data collection and concurrent use of data in initial action, IEC Campaigns and detailed planning
Special approached for sanitation for the poor
Capacity Building

1.2.3 GOVERNMENT OF INDIA SUPPORT

Ministry of Housing and Urban Poverty Alleviation (HUPA) is supporting a centrally sponsored scheme for integrated low cost (ILCS). Under the scheme central subsidy to extent of 75%, state subsidy to the extent of 15 % and beneficiary contribution to the extent of 10% is provided for construction of latrines. The main objective of the scheme is to convert around 6 lakh dry latrines in to low cost pour flush latrines.

a. States will be encouraged to prepare State level strategies within a period of 2years. Chapter on draft framework for developing state level strategies gives an outline of the strategy.

b. Identified cities will be urged to prepare model city sanitation plans within a period of 2 years. Chapter on draft framework for a city sanitation plan gives an outline of the plan.

c. Providing assistance for the preparation of detailed project report (DPR) as per city sanitation plan as soon as requests for funding are received;

d. Promote public-private partnership in respect of key projects/activities identified in the city sanitation plan;

e. Provide technical assistance and support for awareness generation and capacity building to states and cities within this financial year.

f. Periodic rating of cities in respect of sanitation and recognition of best performers by instituting a National Award within this financial Year.

g. Funding projects wherever possible from existing schemes. The Ministry of Urban Development is implementing schemes such as the Jawaharlal Nehru National Urban Renewal Mission(UIDSSMT).Both these schemes have a time span of 7 years (2005-2012) with a budget of Rs. 1,00,000 crore of which the share of the central government is Rs. 50,000 crore. Out of 3243 projects sanctioned up to 31.03.08, 125 Pertain to sewerage, storm water drainage &solid waste management.

STATES AND CITIES CAN EXPLORE A NUMBER OF OPTIONS IN ACHIEVING SANITATION GOALS INCLUDING:

Using existing provisions with regard to sanitation in municipal and other Acts to promote compliance;

Amending municipal acts, framing of bye laws and regulations (e.g. Building and construction bye-laws) to promote sanitation by public and private agencies, prohibit discharge of untreated sewage into open areas wherever possible;

Create a system of incentives and disincentives including punitive actions and levies and charges on pollutes wherever appropriate;

HOW TO ACHIEVE GOALS

a) As mentioned above Urban local bodies suffer from constraint of finance, staff and face public who has no awareness about sanitation. Therefore, first priority is to make public aware for financial strengthening of Urban Local Bodies.

b) Poor sanitation results in many health hazards due to fly, rubbish, human excreta. Public is not aware of these hazard so they never put an effort to strengthen the local bodies. For these different seminars, meeting audio visual documentary should be organized by the ULBs and NGO's.

c) Present sanitation situation about the state of Uttar Pradesh indicates that the production of waste water in the state is about 1872.5 million daily. In the entire state only 55 towns have partial sewerage facility; and out of 51 towns having population of more than one lakh, 14 towns still do not have sewerage system at all. Sewage treatment plants constructed under different River Action Plans are grossly inadequate. The Capacity of these plants is reported to be only 795.54 million liters daily. Thus only two-fifth water generated is being treated before disposal into water bodies. Therefore, every city has to prepare its city sanitation plan and submit the plan to state as an immediate step towards achieving 100% sanitation.

Hence, a meeting was held on 9.12.2012 of all Nagar Ayuktas in U.P. for formulating City Sanitation policy as desired in State Urban Sanitation policy to achieve goals for making cities open defecation free & better Living conditions of Urban Poor.

PREPARATORY ACTIONS

City Sanitation Task Force

Mobilize Stakeholders: The first step in making the cities 100% sanitized is to elevate the consciousness about sanitation in the mind of municipal agencies, government agencies and most importantly, amongst the people of the city.

a) To achieve the aim constitute a multi-stakeholder city sanitation task force comprising representation from:

- Representative from shops and establishments,
- Representative of the large institutions in the city (e.g. Cantonment boards, housing boards, development authority Govt. of India and state Govt. Enterprise campuses, etc.
- NGO's working on water and sanitation, urban development and slums, health and environment,
- Representatives of unions of safaikaramcharies, sewerage sanitary workers etc.
- Representatives from educational and cultural institutions

indicators that included physical infrastructure, systems, processes, and outcomes related to achievement of total sanitation (Refer Box-I). The first national rating was carried out in 2009 and results were published in May, 2010(See www.urbanindia.nic.in for details.)

The rating exercise was carried out to:

- Compare intra-city and inter-city data on sanitation.
- Monitor and measure improvement of cities against standard indicators over time.
- Generate awareness on the need to create totally sanitized cities.
- Allow states and cities to use the results to identify and address areas of poor performance.
- Enable cities to think city-wide, with an emphasis on smarter planning and investments that lead to improved sanitation in the country.
- Instill a sense of healthy competition amongst cities.
- Motivate and recognize excellent performance in sanitation through national reward

Each city has been scored on 19 indicators which are divided into three categories: Output (50 points), Process (30 points) and Outcome (20 points).The methodology for the exercise was designed incorporating standardized methods for measurement and scoring and was evolved after extensive stakeholder consultations. The rating makes use of both primary data collection during field visits and secondary data from published sources such as census. Each agency was required to follow the prescribed methodology, ensuring uniformity and comparability of data. The data was collected from cities in a consultative and collaborative manner. Based on the scores for output, process and outcome indicators, cities were then classified under four color categories; red, black, blue and green.

The exercise reveals that more than half of the cities are in the Blue or Black categories. There are four cities in the blue category which have scored above 66 but less than 90 marks out of hundred. Almost all cities report complete elimination of manual scavenging. More than 50 cities have reported 90 percent or above, safe collection of human excreta. About 24 cities have been found to collect more than 80 percent of their solid wastes – another six show an outstanding performance of nearly 100 percent primary collection. While treatment is a big challenge for most, 17 cities have achieved treating at least 60 percent of their wastes. Most cities have performed well in the process indicators, especially the larger cities, but results for the output and outcome indicators are mixed.

The exercise also highlights that considerable efforts are required to improve access to community and public toilets for the urban poor and to stop open-defecation. Wastewater treatment poses considerable challenges – 380 cities collect and treat

less than 40% of their human excreta, though there are six cities that treat more than 90% of their human excreta.

- ***Jaunpur city is in red category (Rank 403) with a score of 21.26 out of 423 cities. Among 54 cities of Uttar Pradesh reviewed, Jaunpur ranks 48th.*** *(19 U.P cities are in black category with the score in the range of 33.6-60, remaining cities are in red category with the score in the range of 33.5 and below. Chandigarh ranks first with the score of 73.48.*

1.3 Objectives of the City Sanitation Plan in Jaunpur City

The City Sanitation Plan has been prepared after carrying out a situation analysis and after a structured consultation with stakeholders. The Plan attempts to achieve the following objectives:

- To adopt locally suitable methods, technology and materials, and provide necessary facilitation support to Jaunpur City Nagar Parishad.
- To encourage community and private participation and define their role in creation and maintenance of sanitation infrastructure, thereby ensuring a sense of ownership.
- To ensure coordination between various departments working in the field of water supply and sanitation, such as departments of health, education, public health and engineering, industry, environment, transport, pollution control board, etc.
- To ensure an optimum use of funds allocated by 13th Finance Commissions for solid waste management and other sanitation related projects. To coordinate various externally aided projects for their optimum results.
- To promote novel ideas in mobilization of funds, including reforms in tax regime, public private partnerships, exploring the private market, user charges, beneficiary contribution, etc.

1.4 Overview of the Scope of Work

The overall work is divided into four broad tasks. The following are the broad tasks included in the scope of work:

City-Sanitation Task Force (CSTF)

A City Sanitation Task Force (CSTF), which is a multi-stakeholder agency having representation from various walks of life, has been formed. CSTF will launch the awareness campaign and the 100% sanitation campaign for the city in addition to approving the studies and implementation works to achieve the goals of NUSP. The objectives and participants of the City Sanitation Task Force are discussed in detail in Chapter 6.

100% Sanitation Campaign

Sanitation issues and target groups are identified to formulate an action plan on awareness generation. A pilot awareness campaign has to be conducted by the City

Sanitation Task Force in Past, similar kind of campaigns would be conducted at regular intervals.

City Sanitation Plan (CSP)

The sanitation situation of the city is analysed based on the rapid land use survey, secondary data collection and consultations. A Geographic Information System (GIS) based database on sanitation in Jaunpur would be created as part of this plan. The sanitation plan and project proposals will be prepared based on the situation analysis and consultation with CSTF.

Capacity Building and Training

The existing human resources and infrastructure of the Nagar PalikaParishad is assessed for its adequateness and capacity. Based on this, training needs will be identified and workshops shall be conducted on a pilot basis.

The steps taken and deliverables as per the above mentioned Tasks is provided below:

Step 1 - Formation of City-level Implementation Committee/Cell

Formation of a city-level committee consisting of government and private sector stakeholders, for the purpose of overseeing preparation and implementation of the City Sanitation Plan.

Step 2 - Conduct 1st Consultation

Conducting a first level consultation to orient the city stakeholders on the objectives of the IUSP and NUSP, and on the process and methodology of preparing the City Sanitation Plan. This has been carried out in the form of individual meetings with key stakeholders at the start of this project.

Step 3 - Reconnaissance Survey

A detailed reconnaissance survey, to be conducted by a separate team of Motivators and Trainers.

Step 4 - Existing Situation Analysis

Preparation of a ward-wise and slum-wise situation analysis report after assessing existing secondary data, outputs of the reconnaissance survey, and conducting additional surveys, as part of this assignment. The situational analysis details out existing household sanitation arrangements, public sanitary conveniences, waste water disposal, solid waste management and water supply. It highlights the deficiencies in sanitation facilities, which particularly affect women and the urban poor. The analysis also projects the future demand for sanitation services.

Step 5 - Conduct 2nd Consultation

A second consultation workshop has been held with the city implementation cell to present the findings of the situation analysis for feedback and suggestions.

Step 6 - Preparation of Draft City Sanitation Plan

Preparation of a draft city sanitation plan for Jaunpur City for Nagar PalikaParishad, Jaunpur incorporating assessment of strategies and technology options for safe collection, transportation, treatment and disposal of both solid and liquid wastes in

the city. The analysis of options includes costs of capital investment, operation and maintenance, monitoring, and evaluation.

Step 7 - Preparation of Implementation Plan

Preparation of a strategic implementation plan including a multi-year financial plan for implementing the City Sanitation Plan for Jaunpur City for Nagar Palika Parishad, Jaunpur in a time- bound manner.

Step 8 - Conduct 3rd Consultation

The draft City Sanitation Plan for Jaunpur City for Nagar Palika Parishad, Jaunpur and implementation plan is presented to the city-level implementation committee/cell. The recommendations of the Jaunpur City CSP committee and other stakeholders have been documented for their incorporation into the final version of the City Sanitation Plan for Jaunpur City.

Step 9 - Final City Sanitation Plan

The final version of the City Sanitation Plan for Jaunpur City has been prepared after appropriately addressing all comments and suggestions of the 3rd consultation meeting of the city-level sanitation committee/cell.

CHAPTER 2
THE APPROACH & METHODOLOGY

2.1 KEY ASPECTS OF THE APPROACH

2.1.1 Achieving 100% Sanitation

The goal of the exercise is to achieve 100% sanitation in the project cities. The following are the indicators of 100% sanitation in a city:

Primary Indicators As Mandated By National Urban Sanitation Policy

- Every citizen has access to a toilet & the city is "Open Defecation Free (ODF)"
- All the sewage generated is collected, treated, and disposed off safely

Secondary Indicators

Secondary indicators are optional and are not mandated by the NUSP. However, for holistic sanitation in a city it is important that the following indicators are also addressed. We advocate the inclusion of these indicators into the city sanitation planning:

- All the solid waste generated is collected, treated, and disposed off safely
- All water bodies and drainages are preserved and kept clean
- All the storm water drains are kept clean

Every aspect of the process and infrastructure provision must integrate community participation and must be inclusive. In addition, water and wastewater management must be carried out in an environmentally sustainable manner, thus recycling and reusing the by-products as far as possible.

2.1.2 BUILDING LOCAL INSTITUTIONS AND COMMUNITY PARTICIPATION

The creation of the city sanitation task force, the 100% sanitation campaign (pilots), an integrated City Sanitation Plan, and capacity building and training are seen as the four key services to be provided by the City sanitation task force. The city sanitation task force is the institutional structure that holds the vision of "Total sanitation" for the project cities. Within this context it shall ensure the successful implementation of the 100% sanitation campaign as well as oversee the plan and project formulation, implementation and operations. The four key tasks are divided into sub-components as follows:

2.1.3 METHODOLOGY

Each of the key services has been broken down into a series of executable tasks as follows. These tasks are not linear and many of the activities are happening in a parallel and iterative manner.

2.1.4 THE CITY SANITATION TASK FORCE (CSTF)

To achieve the goals of NUSP, the government encourages cities to introduce a city sanitation task force (CSTF) at city level. The CSTF is conceptualized as a multi stakeholder platform for monitoring and evaluation of the interventions pertaining to city sanitation. The Nagar Palika Parishad, Jaunpur formally appointed a CSTF and intimated to the Implementing Agency. The process of setting up a CSTF and aspects required for institutional functioning are described in this section:

PICTURE2.1: STAKEHOLDER CONSULTAITON MEETING OF CSTF

- Stakeholder mapping and interaction
- Defining agenda, institutional structure, roles and responsibilities for the CSTF
- Conducting the CSTF formation meeting

- Preparing the Operations Manual
  - Detailed roles and responsibilities of the various entities involved
  - Standard operating procedures for meetings, decision making, carrying out of other functions etc.

PICTURE2.2: STAKEHOLDER CONSULTAITON MEETING OF CSTF

- Preparation of Guidelines
  - For updating city sanitation GIS and data base
  - For facilitating and overseeing the implementation of awareness generation programs and meeting relevant stakeholders from time to time
  - For facilitating and overseeing implementation of CSP proposals, managing bids and selection of consultants and contractors
  - For facilitating and overseeing periodic capacity building activities

- Preparing the Monitoring and Evaluation (M & E) Manual
  - Procedures for evaluating CSP proposal
  - Procedures for periodically evaluating 100% sanitation status based on set of objective indicators of outputs, processes and outcomes
  - Procedures for monitoring sanitation status from time to time based on similar indicators in addition to preparing the material required for functioning of the CSTF.

Minutes of Meeting of the stakeholder consultations conducted during the process of preparation of the city sanitation plan, are presented in Annexure 1

2.1.5 THE 100% SANITATION CAMPAIGN

- Mapping of sanitation issues & target groups
- Formulating an action plan for awareness generation
- Preparation of target specific Information and Education Campaign (IEC) material
- Conducting awareness generation programs
- Formulation of community based information system

2.2 CITY SANITATION PLAN

2.2.1 PREPARATION OF BASE MAP

A good base map is required for effective representation of the ground situation and subsequent planning and implementation of infrastructure interventions. The base map of Jaunpur City has been prepared using satellite images and

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maps as provided by the Nagar Parishad. The mapping is done on GIS platform. This helps in overlaying multiple layers of information and conducting a detailed analysis. The following layers have been digitized for preparing the base map from the Nagar Palika Parishad boundary and ward boundary map and Survey of India topo-sheets

- Administrative boundaries – Nagar Palika Parishad boundary and ward boundaries
- Transportation network – roads and railways
- Water bodies and natural drainage

Table 2.1: Layers used for base map preparation

S. No.	Layer	Source	Data Type
1	Locations	Landmarks have been extracted from NPP, satellite data, Survey of India Map and identified locations during survey.	Point
2	Jaunpur Municipal Boundary	Municipal boundary has been extracted from NPP Jaunpur administration.	Polygon
3	Ward boundaries	Ward boundaries have been digitized according to Ward councilors and existing maps from NPP Jaunpur.	Polygon
4	National and State Highways	Existing Highways have been extracted from NPP, Survey of India Map and NPP Jaunpur administration map	Line
5	Major District Road, City Main Road and Streets, Rail road	Existing District roads have been extracted from NPP, satellite data, Survey of India Map and NPP Jaunpur administration map.	Line
6	Nallah/water bodies/drains/ponds	Existing Nallah/water bodies/drains/ponds have been extracted from NPP, jalnigam, Survey of India Map and identified from satellite image.	Line
7	Landuse map	Landuse map has been extracted from prescribed govt. authority of the state of U.P.	Polygon

2.2.2 *Land-use and Sanitation Survey*

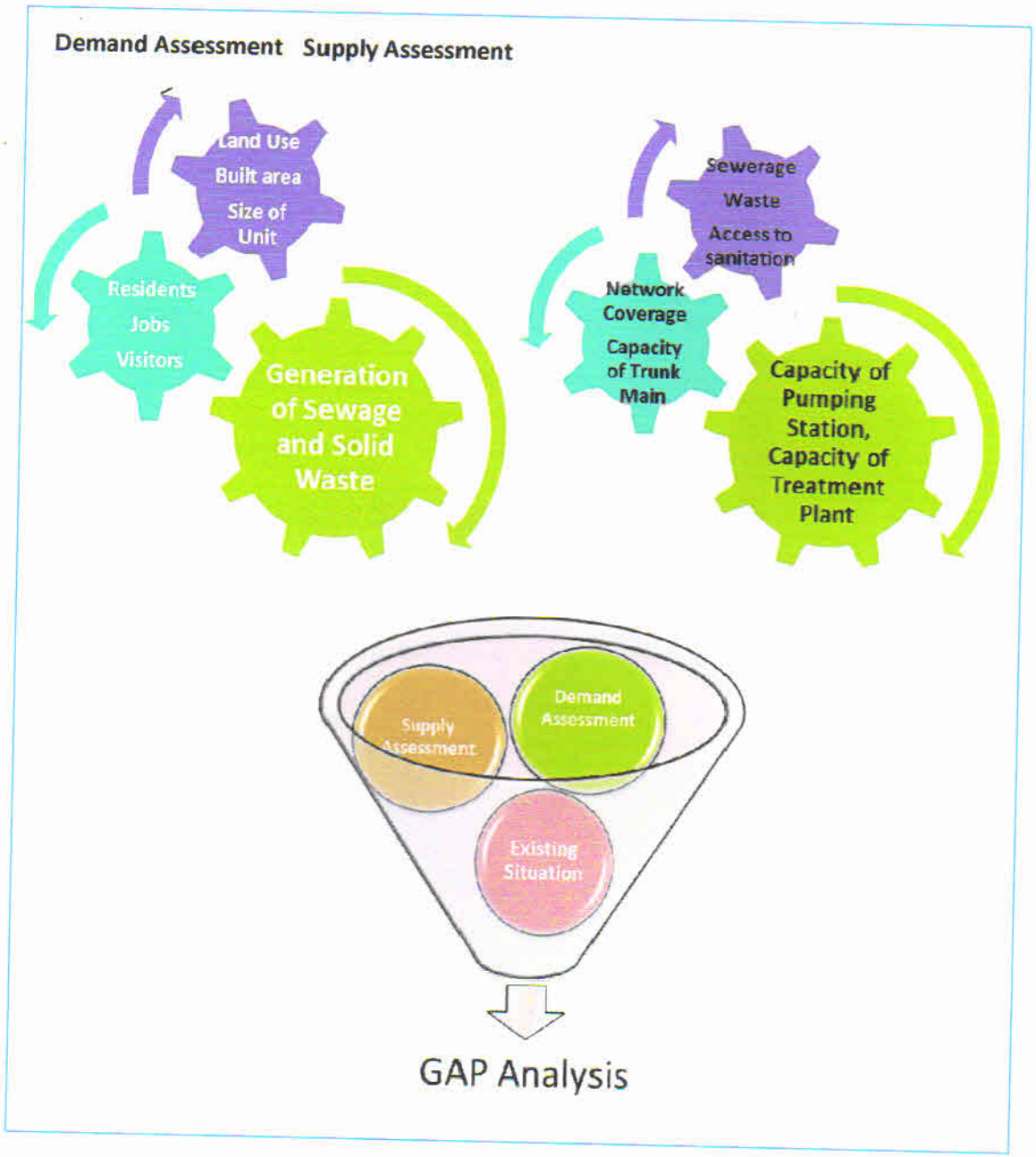
The data available from the city authorities regarding existing water supply system, sewerage system, solid waste management system and public sanitation is mostly in an aggregated form. If micro level planning has to be done at the ward level, the

present level information available is not sufficient. For more accurate assessment of the ground situation and effective planning thereafter, it is necessary to have data at sub ward level (disaggregated data). For determining the existing sanitation condition at disaggregate level,a survey was conducted to know the existing land use pattern, built up density in different areas and the urban form, current sanitation condition, and infrastructure facilities available for sanitation. A detailed questionnaire (Annexure-2) was designed to capture information on access to water supply, access to sewerage system, solid waste management, access to public sanitation, willingness to pay for the basic services etc. The surveyors were oriented on the need and purpose of the survey and the methodology of conducting the same. Maps and the questionnaires were used to conduct the survey. The city was divided into several survey blocks based on the road and ward boundaries. The surveyors went through the area to understand the various land uses. Each survey block is further divided into building blocks demonstrating homogeneous land use and built typology. The survey was conducted in each building block capturing the land use and sanitation information. The homogeneous land uses were identified based on use (e.g. residential, commercial etc.), built characteristics (e.g. number of floors, type of construction), and socio-economic characteristics (e.g. Middle Income Group (MIG) residential apartments, residential villas, slums etc.).

Open land parcels and water bodies are also marked on the map and information was entered in the questionnaire. The information collected from the survey is entered in a structured format.

2.2.3 *Demand – Supply Gap Assessment*

This includes the assessment of the demand for sanitation infrastructure which is determined by the extent of water required for daily activities, waste water and solid waste generated. The assessment of the supply of sanitation infrastructure is determined by the aggregate of Sewage and Solid Waste collected, transported and safely disposed.



2.2.4 CONSULTATION WITH THE CSTF

After the assessment of demand supply situation and the gap analysis, a consultation meeting is organised with the CSTF members to share the findings.

2.2.5 ASSESSING TECHNOLOGY OPTIONS

Based on the situation analysis an internal workshop has been organised to discuss possible strategies and approaches for solving the sanitation issues. Here technology options has been discussed and decided upon by the experts in the team. Based on this discussion, schematic designs has been prepared.

2.2.6 *Strategies and Project Formulation*

Strategies and solutions is prepared for all the unserved areas in the city. In addition, a strategy to address the sanitation needs of future population growth is formulated through project solutions as well as recommendations to policy and legislation.

2.2.7 *Draft City Sanitation Plan*

Based on the situation analysis, strategy formulation and technology selection, a draft city sanitation plan has been prepared for Jaunpur. This includes schematic designs, broad cost estimates and an implementation strategy.

2.2.8 *Final City Sanitation Plan*

In consultation with the CSTF, the city sanitation plan is finalised.

2.3 Capacity Building & Training Needs Assessment

- Benchmarking of capacities of the Nagar Parishad
- Training needs assessment
- Formation of a Technical Core Group & Training Workshop Series

CHAPTER 3
AN INTRODUCTION TO JAUNPUR

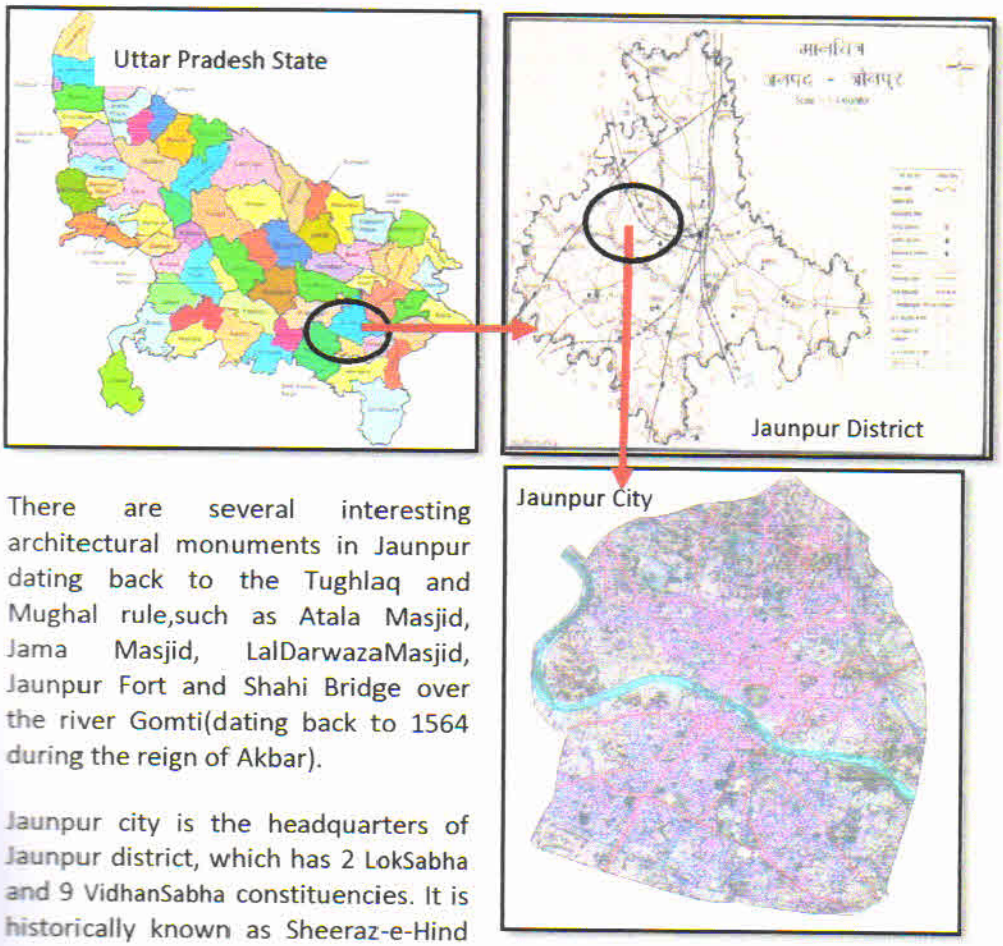
3.1 LOCATION AND KEY CHARACTERISTICS

Jaunpur is a city located on 25° 46' N latitude and 82° 44' E longitude, to the northwest of the district of Varanasi in the eastern part of the North Indian state of Uttar Pradesh (Figure 3.1). Jaunpur is bordered by the districts of Allahabad, SantRavidas Nagar and Varanasi in the South, Pratapgarh in the West, and Sultanpur and Azamgarh in the North and East respectively.

Jaunpur's notable history dates from 1388 during the Tughlaq rule, when it was a major center of Urdu and Sufi knowledge and culture.

Jaunpur is well-connected with all major cities of India by railways. It has three major railway stations namely Jaunpur City Station, Jaunpur Junction and Shahganj Junction. Jaunpur is well connected by roads to Lucknow, Varanasi, Allahabad and other cities like Azamgarh, Mirzapur, Bhadohi, Sultanpur and Ghazipur. Varanasi International Airport is just a 45-minute drive from Jaunpur city on National Highway 56.

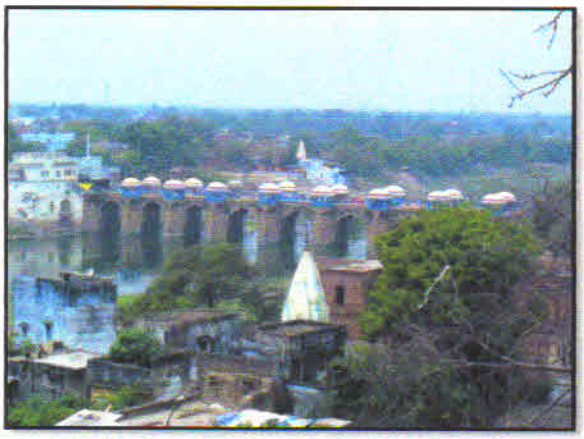
Figure 3.1: Map of Jaunpur showing its location in U.P.



There are several interesting architectural monuments in Jaunpur dating back to the Tughlaq and Mughal rule,such as Atala Masjid, Jama Masjid, LalDarwazaMasjid, Jaunpur Fort and Shahi Bridge over the river Gomti(dating back to 1564 during the reign of Akbar).

Jaunpur city is the headquarters of Jaunpur district, which has 2 LokSabha and 9 VidhanSabha constituencies. It is historically known as Sheeraz-e-Hind

having its historical dates from 1359, when the city was founded by the Sultan of Delhi Feroz Shah Tughlaq and named in memory of his cousin, Muhammad bin Tughluq, whose given name was Jauna Khan.



PICTURE 3.1: SHAHI BRIDGE ON GOMTO RIVER

Jaunpur city is a Municipal Board, covering an area of 25.25 sq. km. It has been divided into **31 wards (Figure 3.2).** City administration is headed by the Nagar Palika Chairman and Executive Officer, who are the heads of the Municipal legislature and executive wings respectively. The urban area of the city can be classified into two categories. The Old City is the economic centre of the city. The new city is a low density area with wide tree-lined avenues. It houses major educational institutions, offices, gardens and the Cantonment area. Gomti River divides the city into 2 parts and the city spreads on both sides of the river. **Figure 3.3** shows the map of Jaunpur city with major road network.

Figure 3.2: Ward wise boundary map of Jaunpur city

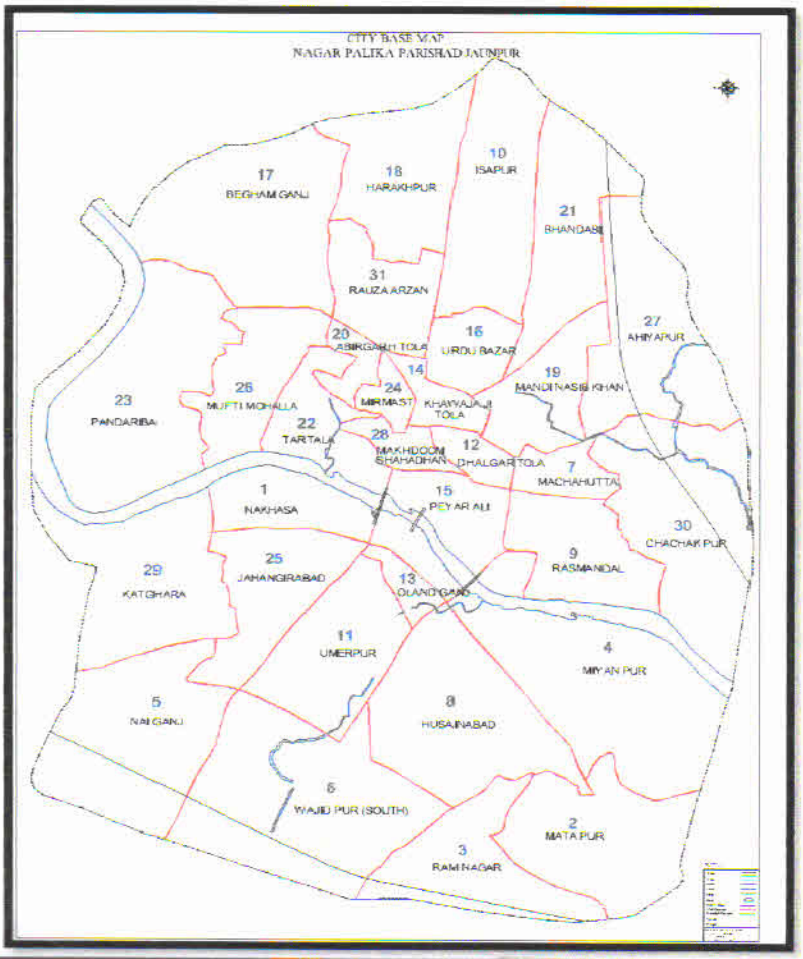
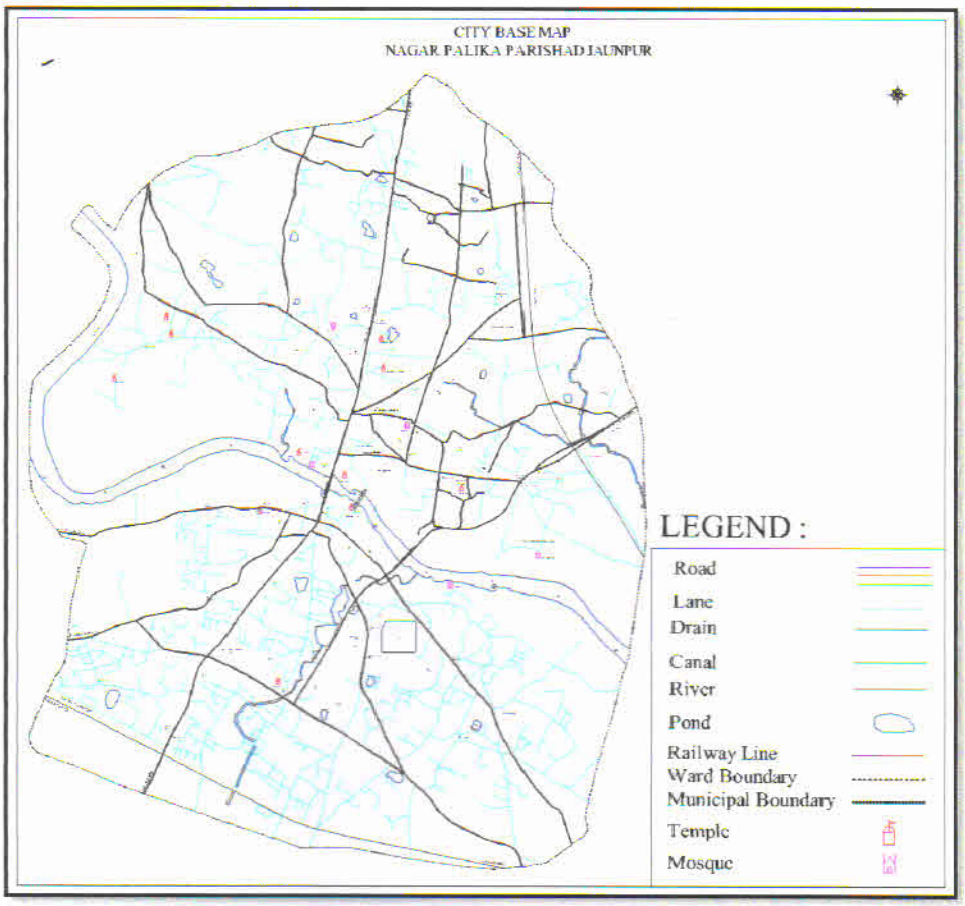


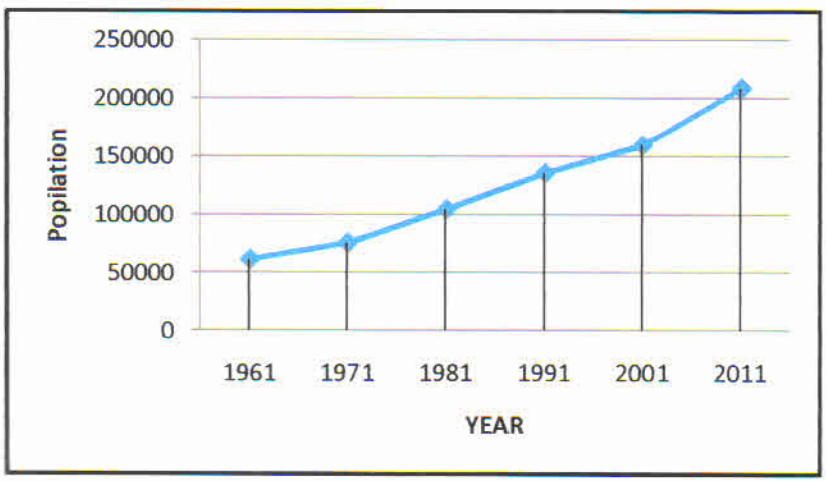
Figure 3.3: Ward wise boundary map of Jaunpur city



3.2 DEMOGRAPHY

The total population of Nagar Palika Parishad, Jaunpur during Census 2001 was counted as 1,60,055 persons, which increased to 2,08,459 persons during Census 2011 (Figure 3.4). Thus, there is a net accretion of 48,404persons during 2001 -11 decade, which is about 30% during the decade.Annual growth rate has increased from 1.8% to 3% during the last decade.

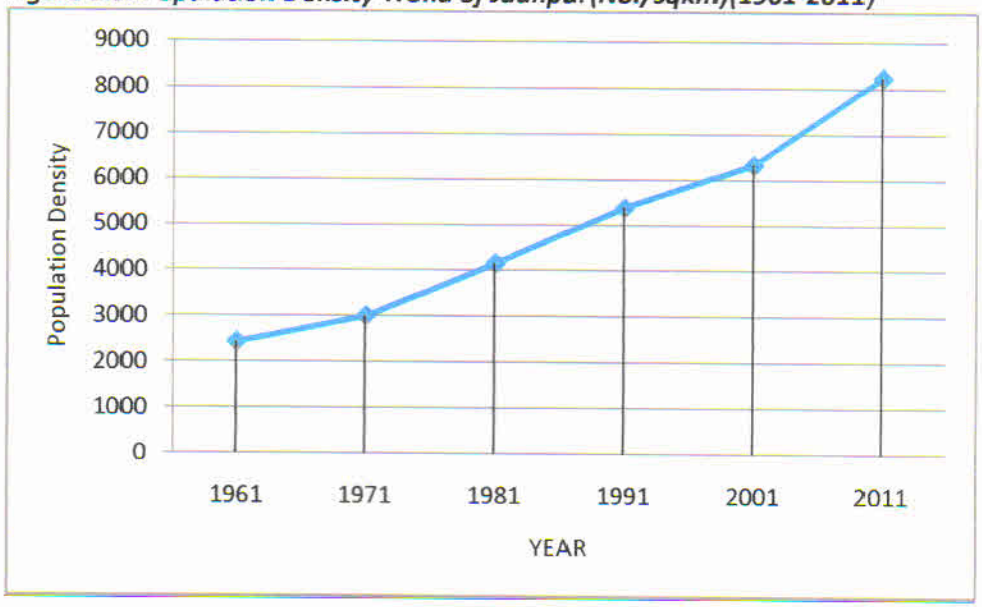
Figure 3.4: Population trend of Jaunpur city (1961-2011)



3.3 POPULATION DENSITY

The population density of Jaunpur during 2011 has been observed to be about8256 persons per square kilometer, which was about 6339 during the year 2001. The increase in density of population has been observed to be about 1917 person/ $km^2$with respect to the year 2001which indicates that 1917 persons have been added on one square kilometer area during 2001 – 2011 decade. The population density trend for Jaunpur during the last 50 years has been presented in Figure 3.5.

Figure 3.5: Population Density Trend of Jaunpur(No./sqkm)(1961-2011)



3.4 SEX RATIO

Sex ration denotes the number of females per 1000 males. Whereas the Jaunpur district has 1018 females per 1000 males in 2011 census, Jaunpur city has 895female per 1000 male. The sex ratio of the city is even less than state average of 908 and national average of 940.

3.5 LITERACY

Literacy is one of the important social indicators to measure the development of its inhabitants. It affects the different population dynamics. The total literacy rate in NPP, Jaunpur has been observed to be growing at the rate of 2.27% p.a. and has been recorded in Census 2011 as82 %. Overall, the entire district of Jaunpur has shown the increasing trend of literacy rate, which jumped from 59.98% in 2001 to 82% in 2011.

Rise in female literacy is a healthy phenomenon for the society and city. It is noted that total female literacy during Census 2011 for Jaunpur city was recorded as 77.98% as against the state female literacy rate of59.26%.

3.6 GEOGRAPHY AND CLIMATE

Jaunpur has an extreme tropical climate, with maximumsummer temperatures reaching 44º C and wintertemperatures dipping to 3º C. The average annualrainfall is around 1000 mm, received mostly in themonsoon season from July-September.

Figure 3.6: Average Temperature trend in Jaunpur[3]

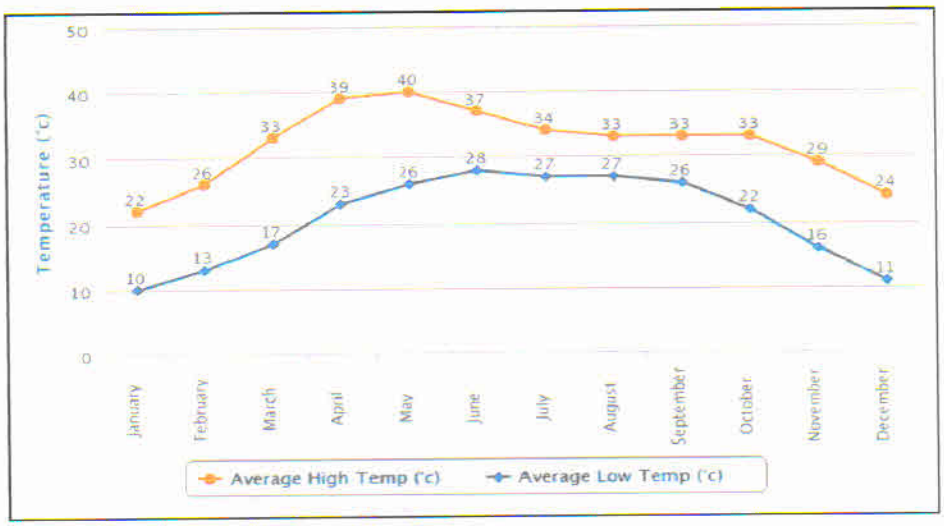
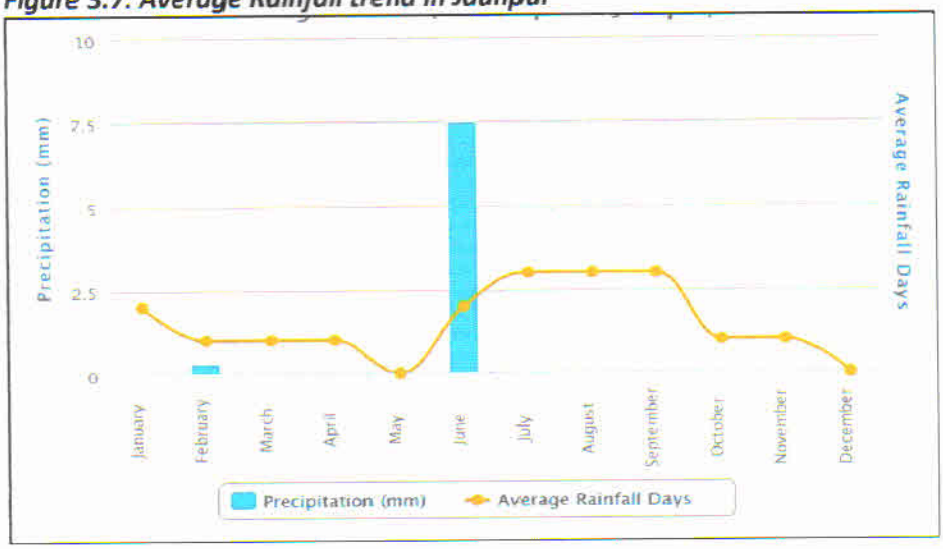


Figure 3.7: Average Rainfall trend in Jaunpur[4]



[3] http://www.worldweatheronline.com/Jaunpur-weather-averages/Uttar-Pradesh/IN.aspx
[4] http://www.worldweatheronline.com/Jaunpur-weather-averages/Uttar-Pradesh/IN.aspx

Chapter 4
POPULATION PROJECTIONS

4.1 CITY LEVEL POPULATION PROJECTIONS

The population is one of the major factors in determining future patterns of progress and development of the city. As per Census 2011, NPP, Jaunpur has population of 208,459 persons. The population of NPP, Jaunpur has increased from 160,055persons in 2001 to 208,459in 2011, recording a decadal growth rate of 30 percent.

Table 4-1: Decadal population growth

Year	Population	increase	% Increase	Incremental increase
1961	61900			
1971	76000	14,100	23%	
1981	105,140	29,140	38%	15,040
1991	136,062	30,922	29%	1,782
2001	160,055	23,993	18%	-6,929
2011	208,459	48,404	30%	24,411
Average		29,312	28%	8,576

The population projection for Jaunpur city has been carried out using 3 commonly used methods as listed below

ARITHMETIC INCREASE METHOD:

In this method, the rate of growth of population is assumed to be constant. This method a low estimate, and can be adopted for forecasting populations of large cities which have achieved saturation conditions. The average decadal increase in population from 1961 – 2011 as shown in table 4-1 is 46,052. This forms the basis of projections.

GEOMETRIC INCREASE METHOD:

This method assumes that the percentage of increase in population from decade to decade is constant. This method gives high results, as the percentage increase gradually drops when the growth of the cities reach the saturation point. This method is useful for cities which have unlimited scope for expansion and where a constant rate of growth is anticipated. Since the density of Jaunpur is low and there is huge scope of expansion if provided with right kind of infrastructure, the geometric increase method may influence the population growth of the city. As evident from table 4.1, the decadal growth of Jaunpur city has been observed between 18% - 30%, with the average being 28%. Hence a decadal growth rate of 42% forms the basis of population projection under geometric method.

INCREMENTAL INCREASE METHOD: (METHOD OF VARYING INCREMENT)

In this technique, the average of the increase in the population is taken as per arithmetic method and to this, is added the average of the net incremental increase, one for every future decade whose population figure is to be estimated. In this method, a progressive increasing or decreasing rate rather than constant rate is adopted. As analyzed in table 4.1 the average increase in population 1961 – 2011 is 29,312 net increment in Jaunpur's population between 1961 – 2011 is 8,576, this forms the basis of population under Incremental increase method.

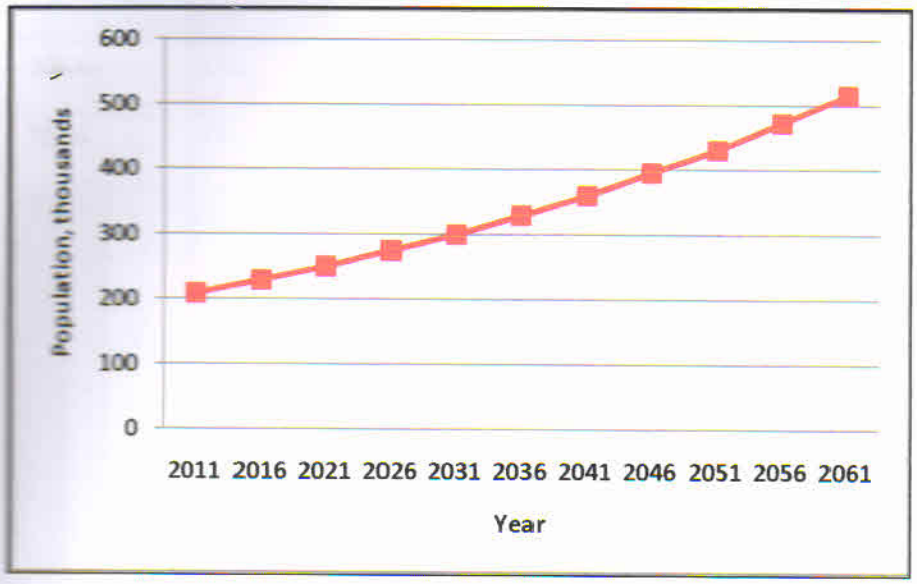
The population projection has been carried out for 50 years at an interval of 5 years and result are summarized in Table 4.2

Table 4-2: Average of different population projection methods

Year	Arithmetic	Geometric	Incremental	Average
2011	208,459	208,459	208,459	208,459
2016	223,115	237,311	226,331	228,919
2021	237,771	266,163	246,347	250,094
2026	252,427	303,002	268,507	274,645
2031	267,083	339,841	292,811	299,911
2036	281,739	386,878	319,259	329,292
2041	296,394	433,914	347,850	359,386
2046	311,050	493,971	378,586	394,536
2051	325,706	554,028	411,466	430,400
2056	340,362	630,709	446,490	472,520
2061	355,018	707,390	483,658	515,355

For the purpose of population estimation at CSP level the average of all the 3 methods was considered as the final figure. The resultant year wise population is provided in Figure 4.1.

Figure 4.1: Projected population of Jaunpur



4.2 Projections of Water Demand, Solid Waste & Sewage Generation

As per recommendations of Section 2.2.8.3 of the CPHEEO Manual, city level water demand has been projected considering 135 LPCD for residential population and sewage generation as 80% of the water demand. Solid waste generation is taken as 350 gm. per capita as prescribed by CPHEEO. Considering the projected population per capita water demand, per capita sewage and solid waste generation, the total water demand, sewage and solid waste generated is calculated for Jaunpur City as mentioned in Table 4-5.

Table 4-3: Summary of City Level Infrastructure Demand

Year	Population in Thousand	Water (MLD)	Sewage (MLD)	Solid Waste (TPD)
2011	208	28	23	73
2016	229	31	25	80
2021	250	34	27	88
2026	275	37	30	96
2031	300	40	32	105
2036	329	44	36	115
2041	359	49	39	126
2046	395	53	43	138

Year	Population in Thousand	Water (MLD)	Sewage (MLD)	Solid Waste (TPD)
2051	430	58	46	151
2056	473	64	51	165
2061	515	70	56	180

CHAPTER 5
SITUATION ANALYSIS

Jaunpur City is well-connected with all major cities of India by Indian Railways network. It has three major railway stations namely Jaunpur City Station (JOP), Shahganj Junction (SHG) and Kerakat Station (KKT). Mughal Sarai, Varanasi and Allahabad railway stations are also easily reachable from here. Daily connectivity for metro cities like Mumbai and Delhi is available. Figure 3 shows the railway network passing through the Jaunpur City, where maximum slums of the city are located.

Jaunpur city is having good road network. NH-56, Allahabad Gorakhpur Road and Nawab Yusuf Road are the main roads of the city connecting it to other cities. Total length of cemented/concrete roads in Jaunpur is 77. 27 km, whereas length of road made up of Coal tar is 66.44 Km. Length of mud roads in city is 24.95 Km.

There are two district hospitals, one postpartum centre, one urban health post and total 59 maternity/ Nursing homes are available in Jaunpur city.

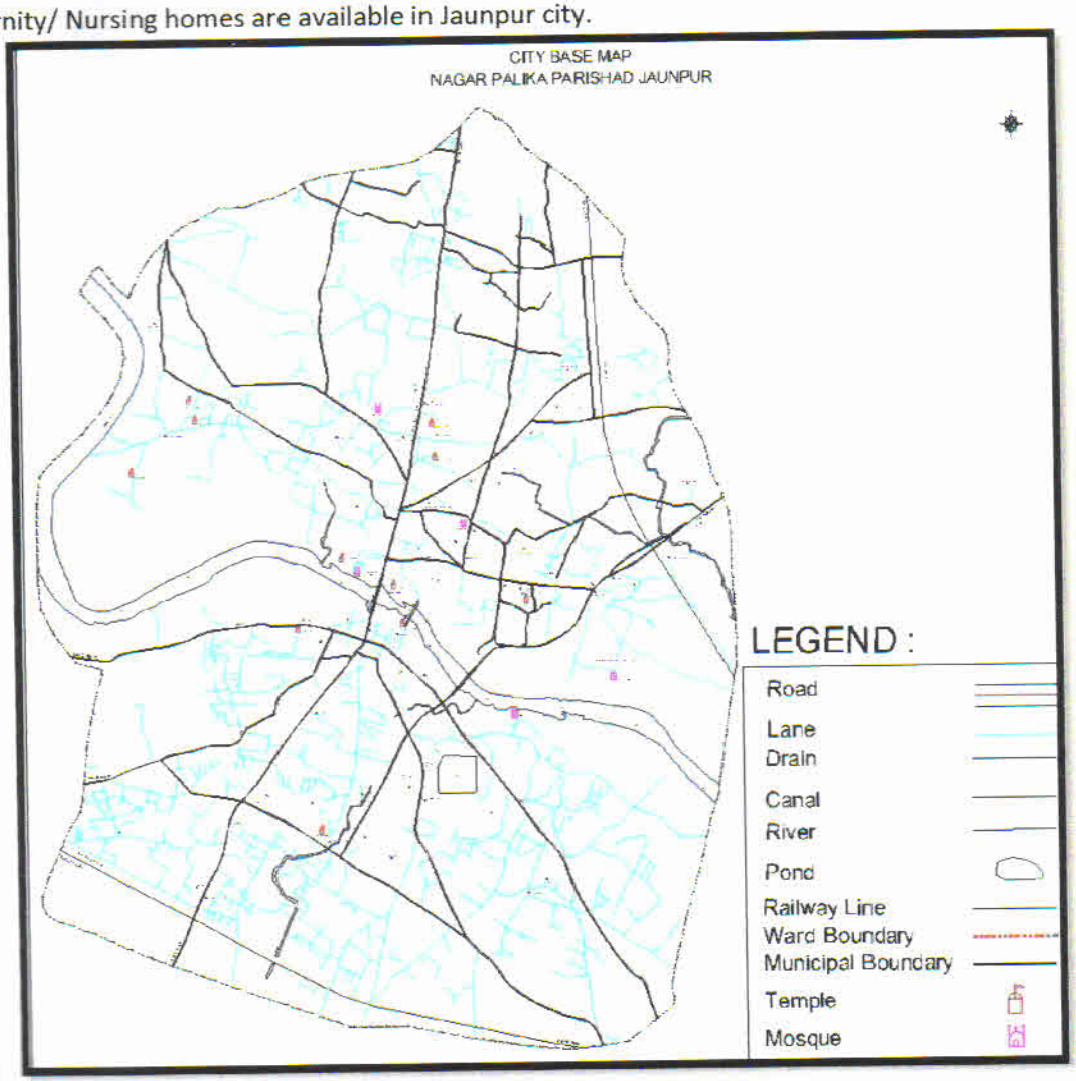


Figure 5.1: Map of Jaunpur

During the past three years Jaunpur city has experienced a growing corporate presence in financial services as well as in the organized retail sector. There are currently no major industries operating in the Jaunpur city, and traditional industries such as perfume making have become increasingly unviable. SIDA (Satharia Industrial Development Authority) was established in November 1989 by the Govt. of Uttar Pradesh, under U.P. Industrial Area Development Act, 1976 to facilitate concentrated effort on Industrial development of eastern Uttar Pradesh. Virtually all kind of industrial, commercial and social infrastructural facilities, such as Medical, Educational, Residential, Roads, Transportation, drainage, Telecommunication, dedicated industrial power 33/11 KV supply, post office, bank, water supply, community center, shopping center, field hostel etc., have been fully established and are operative.

Jaunpur district has more than 50 Graduate and post graduate institutes and more than 200 undergraduate colleges and more than 300 colleges up to high school. In recent years, some professional and Management institute opened such as Prasad Engineering, IPM etc. The Veer Bahadur Singh Purvanchal university in Jaunpur City is famous throughout the state of Uttar Pradesh .

There are a number of tourist attractions in Jaunpur. Every year thousands of visitors come from every corner of the world to visit Jaunpur. The tourist attractions in Jaunpur include monuments, museums, and holy places. Shahi Bridge, ShahiQuilaJaunpur Fort, Sadbhavana Bridge, Kalluka Imam-bada are the main monuments of the city. Almost 16-17 holy places, like Masjid and temple are also part of the city.

Most of the Hotels in Jaunpur, India are located in the heart of the city. Main 12 hotels are in the city and many more restaurants.

5.1 WATER SUPPLY AND UTILIZATION ASSESSMENT

Sewage generation depends on the water supplied and it is generally considered as 80% of the water supply. It is essential to look at the water supply situation within NPP, Jaunpur to assess sewage generation.

5.1.1 WATER SUPPLY SYSTEM

Sources of water

Jaunpur city consumes 16 MLD of water out of which 5 MLD is from surface sources and remaining 11 MLD is from ground water sources

Picture 5.1: OHT plays a crucial role in water supply system of the city

The departments responsible for water supply in Jaunpur are Irrigation and Public Health Department (I&PH) and Nagar Palika Parishad Jaunpur (NPP, Jaunpur). I&PH is responsible for providing bulk water supply treatment of water, whereas NPP,

Jaunpur is responsible for city level water distribution, pumping, metering and billing for domestic and commercial connection.

SERVICE LEVEL BENCHMARK FOR WATER SUPPLY[5]

Table 5.1: Water Supply Benchmark v/s Status

Performance Indicator	Benchmark	Current (2011 – 12)	Target (2012-13)
Coverage of water supply connections	100 %	44	46
Per capita supply of water	135 lpcd	63	66
Extent of metering of water connections	100%	……	……
Extent of non-revenue water	20%	21	20
Continuity of water supply	24 hrs	7	8
Quality of water supplied	100%	84	88
Efficiency in redressal of customer complaints	80%	81	81
Cost recovery in water supply services	100%	98.1	100
Efficiency in collection of water supply related	90%	91.1	91

Table 5.2 shows the performance of NPP, Jaunpur in the area of water supply against benchmark. While the desired coverage of water supply scheme is 100% NPP, Jaunpur covers only 42% of the area. The per capita water supply at 63LPCD is also lower than 135 LPCD. The system of metering is totally absent in the city. However the non-revenue water which is reported as 22% as against desired 20%. While 24 X 7 water supply is desired NPP, Jaunpur is able to provide water only 6 hours a day with low efficiency in redressal of customer complain. The quality of water supplied is stated to be 80% however, it may be noted that the tested water quality parameter is only

Picture 5.2: Ground water pumping system at Jaunpur (near ShahiQila)

[5] http://localbodies.up.nic.in/new%20GOs/SLB%20Gaz_noti_31-03-12.pdf

residual chlorine. Jaunpur reports high cost recovery mechanism for water services with good efficiency in collection of water supply related charges.

5.1.2 Existing Transmission, Distribution and Storage Capacities

Most of the pipenetwork is in satisfactory condition but pipelines leakage /wastages occur because of illegal tapings and connections.

5.1.3 Water Production Capacity

Ground water pumped using power pumps is 11.0 MLD while surface water supplies 5 MLD.

5.1.4 Water Supply Network

Jaunpur has nine water storage facility two underground and seven overhead storage facility with a total capacity of nine thousand four hundred kilo liters out of which three thousand six hundred is underground and the overhead storage constitute of five thousand eight hundred kilo liters. Considering current population the water storage infrastructure is highly inadequate and substantial enhancement in capacity especially with regards to overhead tank in downtown area is required.

Table 5.2: Water Supply Network

S.No.	Item	Quantity
1	Underground Storage	2
2	Overhead Storage	7
3	Capacity of underground storage	3600 KL
4	Capacity of Over head storage	5800 KL
5	Water pipe length	44KM
6	Public taps	25
7	Electric Pump	25
8	Hand Pump	980
9	Un serviced population	20,000
10	Un serviced household	4495

***Source**: Service Level bench Marking –General information of city*

With a total pipe length of forty four kilometers Jaunpur has twenty five electric pumps and twenty five public taps. The water supply network is complemented with nine hundred eighty hand pumps. Considering current road network in excess of 168 Km in the city the water pipe network is highly inadequate and at least four foul increase in water network is required to satisfactorily service the city. Jaunpur has twenty thousand un serviced population who live in four thousand four hundred and ninety five household as per it's report to service level benchmarking exercise.

5.1.5 GAP ANALYSIS

- Varying quantum of water availability at source, Water supply is erratic; especially during summer.
- Proximity of water supply network is a critical issue.
- Shortage of manpower
- Poor maintenance of water sources and infrastructure
- Water theft and illegal connections
- Ineffective land zoning and building regulations
- Lack of proper consumer data

5.2 NATURAL DRAINS AND STORM WATER DRAINAGE

Jaunpur City has 2 natural drains, also referred to as Nallahs (including major and minor drains). Some of these drains are also carrier of wastewater and solid waste. Public Works Department (PWD) is responsible for construction of storm water drains along the major road network in Jaunpur City. Cross drainage works in form of culverts and bridges is also under PWD, who also is responsible for its maintenance. The periodical maintenance of open streams and street side drains is the responsibility of NPP, Jaunpur.

PICTURE 5.2: DISPOSAL OF SOLID WASTE IN STORM WATER DRAIN

The condition of small drains in the city is generally satisfactory. The city does not witness any serious problem of water logging or overflows during monsoon and water gets drained out very quickly. However, the conditions of big drains/nallahs are bad being very old and generally get damaged during annual cleaning process by JCBs. The storm water drains within the city are constructed of natural stones while those towards the outskirts are made of earth (kuchha drains).

Major problem in the city is cleaning of nallahs as most of nallahs are encroached upon. Residents have constructed houses/terrace on the nallahs that hamper the proper cleaning and maintenance. This has been a serious problem over a period of time and needs immediate attention of the concerned authority.

Table 5.3:Length of pucca/kutcha/storm water drains

S.No.	Type	Length (Km)
1	Length of Pucca drains	110.68
2	Length of Kutcha Drains	33
3	Length of storm water drains	17.3
4	Total	161

***Source**: Service Level bench Marking –General Information of City*

The city reports around one hundred forty three kilometers of pucca and kuccha drain. Considering a road network of in excess of hundred and sixty kilometers at least two hundred fifty two kilometers of drains should be constructed.

Around 3 incident of water level logging is reported in a year and NPP Jaunpur reports twenty five thousand un serviced population. Jaunpur city reports 46% coverage of storm water drainage network against desired 100%

5.2.1 GAP ANALYSIS

- Poor O&M of storm water drains along the major roads, streets and natural drains is a major issue of concern.

- At many places the natural drains have been encroached and solid waste is randomly being dumped. This is major cause of concern in core city areas. A lot of waste (packing material, vegetable waste, meat waste etc.) finds its way into the road side drains leading to its blockage. Also in periphery areas dumping of waste on natural drains causes nuisance and contamination of natural water streams in downstream areas.

Picture 5.3: Disposal of Solid waste in Drains in the city area

- It has been observed that the local residents dump their domestic solid waste in the nearby drains. There is no regular arrangement of cleaning of these drains.

- In most cases, the overflow from septic tanks and soak pits finds its way into natural drains leading to siltation. The wastewater flow in the drains causes unpleasant odor.

- Use of storm water drains for laying water pipes and other utilities resulting in blockages and also possibility of contamination of water supply.

- All existing drains need to be widened

- Kuccha drains needs to be converted to pucca to prevent contamination of ground water.

5.3 SEWERAGE SYSTEM

5.3.1 WASTE WATER GENERATION

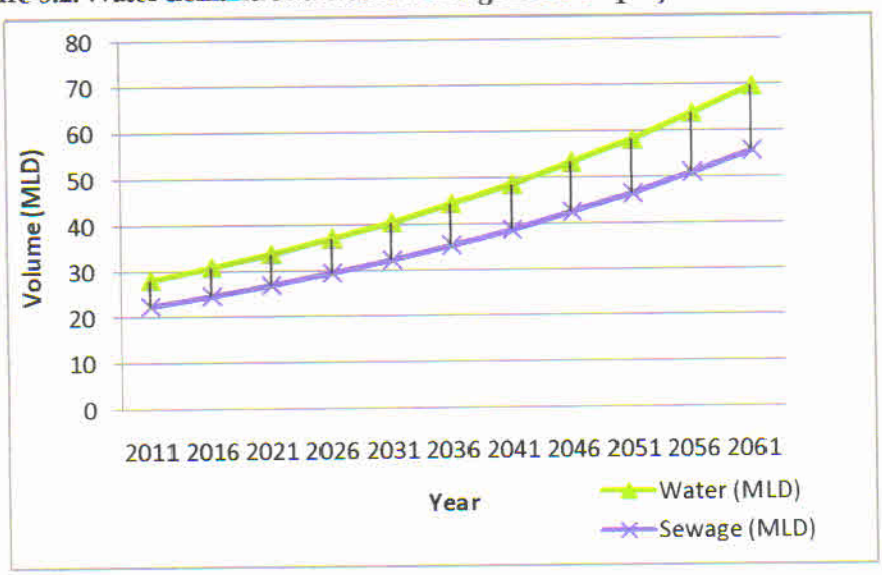
The total estimated wastewater generated is 12.8 MLD in Jaunpur city. The total water supplied is 16 MLD.

Currently there is no waste water treatment facility in Jaunpur. Indiscriminate disposal of waste water through storm water drain is detrimental to environment and public health.

The wastewater generated is calculated based on the sewage return factor taken as 0.8 which indicates that 80% of water supplied returns as sewage.

Based on population projection and average consumption of 135 LPCD the year wise waste water generation is projected below.

Figure 5.2: Water demand and waste water generation projection



5.3.2 SEWAGE COLLECTION AND CONVEYANCE

Presently, the city has the system of septic tank connections at house hold level/ community level and there is no sewage collection network in the city. The waste water overflows from the septic tanks mix into the drain and poses the problem of ground water contamination. Many a time the night soil is directly discharged in storm water drains without any treatment.

5.3.3 SEWAGE TREATMENT AND DISPOSAL

OFFSITE TREATMENT SYSTEM

Currently the city has no sewerage system hence no offsite treatment of water is happening.

ONSITE TREATMENT SYSTEM

There are many households in NPP, Jaunpur which discharge their black water (from toilets) into septic tanks and soak pits. The grey water from kitchens and bathrooms is discharged into open drains without treatment. At present the extent of households relying on the septic tank for wastewater disposal is not known. NPP, Jaunpur is in the process of collecting information on number of toilet seats, mode of wastewater disposal for each of the properties in Jaunpur City. However based on the survey conducted by JT Urja, it is estimated that most of the households are using soak pits, septic tanks combined with soak pits or septic tanks alone. During discussions with the communities, it was observed that most of the houses construct septic tanks based on the available space rather than following the norms of CPHEEO. The concept of community level septic tanks, wherein several houses are connected to a common septic tank is also in practice, at few places. Based on the field visits, it was observed that the appearance of septic tank varies in size, length varying from 6-10 feet, width 3-6 feet and depth upto 10 feet. The de-sludging interval was reported in the range of 5-15 years depending upon the size and usage. The desludging process involves pumping the clear wastewater from the septic tank into the open drain and the slurry at the bottom is sucked using small size pumps and collected in containers. At present the containers are manually transported for disposal. The desludging is usually done during night time. NPP, Jaunpur does not have proper equipment and adequate staff for desludging. This work is usually done by the private operators. Typically the cost of desludging has been reported in the range of Rs.8000-10,000.

SERVICE LEVEL BENCHMARK FOR SEWERAGE SYSTEM

As mentioned in the table 5-11, against the benchmark of 100% coverage, NPP, JAUNPUR has 87% coverage (not mentioned whether area covered or population covered). The city however reports 30,000 (thirty thousand) flush toilet and twelve community toilet. In terms of installed sewage treatment capacities, presently the city has no treatment capacity.

Table 5.4: Service level benchmark for Sewerage system

Performance Indicator	Benchmark	Status 2011-12	Target 2012-13
Coverage of Toilets	100%	91	96
Coverage of Sewerage Network	100%	n.a.	0
Coll. Eff. of Sewerage Network	100%	n.a.	0
Adequacy of Sewage Treatment Capacity	100%	n.a.	0
Quality of Sewage Treatment	100%	n.a.	0
Extent of Reuse and Recycling of Sewage	20%	n.a.	0
Extent of cost recovery	100%	n.a.	0
Eff. in re-dressal of customer complaints	80%	n.a.	0
Eff. in Collection of Sewage Water Charges	90%	n.a.	0

ISSUES PERTAINING TO SEWERAGE SYSTEM

- The city does not have any sewage management system.
- Jaunpur City does not have adequate and proper facilities for septage management, most of the time the overflow from the septic tank is discharged directly into the open drains. Also the sludge removed from the tanks is disposed into the drains without proper treatment.
- Due to haphazard development activities, proper planning of waste management is not happening.

5.3.4 *GAP ANALYSIS*

Currently there is no Sewerage network or a sewage treatment facility in the city. All waste water is either treated in septic tank or discharged directly in storm water drain. Over next 20 years at least 32 MLD of sewage treatment facility needs to be installed in the city.

5.4 SOLID WASTE MANAGEMENT

Solid Waste Management is a critical issue in NPP, Jaunpur due to urbanization and high influx of population in the region.

Picture 5.5: Disposal of Solid waste at baluaghat

Presently NPP, Jaunpur is responsible for collection, transportation, and disposal of solid waste in NPP, Jaunpur limits. Based on the population of the city, and CPHEEO factor it is estimated that the City generates approximately 80 MT of solid waste per day out of which 60 MT is collected.

Picture 5.6: Poor condition of waste bins

There is no Door collection facility in the city however the NPP has 126 vehicles to collect waste from common disposal point in city. Currently there is no waste treatment facility or designated disposal site in the city and the waste is disposed randomly in low lying areas or local pond areas/ near the Gomtiriver. Current practices of disposal of waste in low lying land, drains, river and water body is causing contamination of ground water and health hazard.

The bins placed by NPP at various locations in the city for waste collection are in bad shape and overflow with the waste, most of the times. The NPP,

Jaunpur has recently awarded the wok for solid waste management to a private party for implementation.

SERVICE LEVEL BENCHMARK FOR SOLID WASTE DISPOSAL

Table 5.5: Service Benchmark for Solid Waste Management

Performance Indicator	Benchmark	Current (2011-12)	Target (2012-13)
Household Level Coverage	100%	0	0
Eff. in Collection of Solid Waste	100%	83	91
Extent of Segregation of MSW	100%	0	0
Extent of MSW Recovered	80%	0	0
Extent of Scientific Disposal of MSW	100%	0	0
Extent of Cost Recovery	100%	0	0
Eff. in Re-dressal of Customer Complaints	80%	0	0
Eff. in Collection of SWM Charges	90%	0	0

5.4.1 SEGREGATION OF WASTE

There is no segregation of waste at source practiced in Jaunpur.

5.4.2 WASTE PROCESSING AND DISPOSAL MECHANISMS

This section describes the waste processing and disposal methods for each type of wastes adopted in Jaunpur city. Various types of wastes were identified in city-recyclables, bio-degradable wastes, and non-biodegradable wastes.

Recyclable Wastes

The recyclable wastes (polythene, plastics, paper, cartons, etc.) are segregated manually by ragpickers. The rag-pickers in turn sell the same to scrap dealers (kabadiwalas) at the nominal rates. However, ragpickers do not exploit the recyclable waste to the maximum extent, thereby allowing them to be a part of the dumpsite waste.

Bio-degradable Wastes

Bio-degradable waste is not segregated either at the primary or secondary collection points or at dumping sites. Most of the bio-degradable waste is found to be grazed upon by cattle at temporary open dumps resulting in waste being littered here and there, thereby leading to unhygienic and dirty conditions.

Picture 5.5: Overflowing dumpers in Jaunur

Street sweepings and drain silt is a major constituent of the non-biodegradable wastes. This waste is disposed off at the dumping sites along with other wastes without any prior processing.

Dump site

The existing SWM system for Jaunpur does not have a designated engineered sanitary landfill for disposal of solid waste. The waste collected from secondary collection points is dumped in an unorganized manner at the various locations, mostly low lying areas, in the city. Around 60MT/day is dumped at these dump sites while the total waste generated.

However, a 10.74 acre of site at Kulhan Mau (~5km from the city) has been identified by the NPP, Jaunpur for development of sanitary landfill.

5.4.3 GAP ANALYSIS

- Absence of waste treatment facility resulting in health and environmental hazard.
- Door to door collection and transportation is not effectively happening.
- Some of the dumper bins for waste collection are broken, resulting in littering of waste while transporting to the dumping site. Also there are not enough numbers to cater to the quantum of waste generated daily in Jaunpur. The dumpers are usually overflowing with waste and clearance frequency is inadequate.
- Storm water drains and natural drains get choked due to random disposal of the solid waste.
- The waste segregation and door to door collection is not being practiced effectively due to lack of awareness and willingness of the citizen and commercial establishments.
- *Non-availability of adequate staff for door to door waste collection.*

CHAPTER 6
CITY SANITATION TASK FORCE

The first step in making the cities 100% sanitized is to elevate the consciousness about sanitation in the mind of municipal agencies, government agencies and most importantly, amongst the people of the city. Hence, it is one of the main recommendations and pre-requisites for the preparation of the city sanitation plan, under the National and state policy framework that a city sanitation task force (CSTF) is formulated at city level. The CSTF is involved in the preparation and execution of the sanitation plan from the very initial stage of the planning and conceptualization.

6.1 CITY SANITATION TASK FORCE MEMBERS

The City sanitation task force (CSTF) should comprise of representative from diversified sectors of the society:

- Agencies directly responsible for sanitation including on- site sanitation, sewerage, water supply, solid waste, drainage, etc. including the different divisions and departments of the ULB, PHED, etc.,
- Agencies indirectly involved in or impacted by sanitation conditions includingrepresentatives from the civil society, colonies, floating population slum areas,apartment buildings, etc.,
- Eminent persons and practitioners in civic affairs, health, urban poverty,
- Representatives from shops, industries and establishments,
- Representatives of other large institutions in the city (e.g. Cantonment Boards, Govt. of India or State Govt. Enterprise campuses, etc.),
- NGOs working on water and sanitation, urban development and slums, health and environment,
- Representatives of unions of safaikaramcharies, sewerage sanitary, recycling agents/ kabaries etc.,
- Representatives from private firms/ contractors formally or informally working in the sanitation sector (e.g. garbage collectors, septic tank de-sludging firms etc.),
- Representatives from educational and cultural institutions,
- any other significant or interested stakeholders

Some of the elected Members of the Nagar Palika Parishad must be members of the Task Force. The Task Force should be headed by the Mayor / Chairman with the executive head (e.g. Municipal commissioner / Executive Officer) as the Convener. Cities can also choose to appoint, as a part of the Task force, City Sanitation

Ambassadors chosen from eminent people who enjoy outstanding credibility and influence amongst the city's leadership and population.

Political leadership must be involved from all political parties and persuasions so that the sanitation campaign has the full support of all stakeholders and no opposition from any group. One of the things to be considered by the Task Force is to organize a multi stakeholder, multi- party meeting in the preparatory stage, and take a formal resolution to make the city 100% Sanitized, and publicize the same, with all signatories.

6.2 RESPONSIBILITIES OF CSTF

- ✓ Launching the City 100% Sanitation Campaign
- ✓ Generating awareness amongst the city's citizens and stakeholders
- ✓ Approving materials and progress reports provided by the implementing agency, other public agencies as well as NGOs and private parties contracted by the implementing Agency, for different aspects of implementation
- ✓ Approving the City Sanitation Plan for the city prepared by the Sanitation Implementation Agency after consultations with citizens
- ✓ Implementation of Information System Improvement Plan (ISIP)
- ✓ Undertaking field visits from time to time to supervise progress
- ✓ Issue briefings to the press/ media and state government about progress
- ✓ Providing overall guidance to the Implementation- Agency
- ✓ Implementation of Performance Improvement Plan (PIP)
- ✓ Recommend to the ULB fixing of responsibilities for city- wide sanitation on a permanent basis

The Task Force should meet formally frequently (at least once in two months) in the initial stages to monitor and guide the process of planning and implementation. At a later stage, meetings and field visits can be on an as- needed basis. In some cities, the City Sanitation Task Force may divide up roles and responsibilities amongst smaller sub- committees to focus on different aspects closely while keeping the overall character of the Task Force intact.

(a) The Task Force should appoint one of the key agencies, preferably the urban local body (ULBs), to become the City Sanitation Implementing Agency for the CSP for the city. This agency will be responsible for day to day coordination, management and implementation of the sanitation programmes on a city- wide basis. The agency will coordinate with and agree on joint actions with other public agencies, and contract in and supervise the services of NGOs (through Memorandum of Understanding) and private parties (through contracts) for preparing and disseminating materials for IEC, conducting baseline surveys and

stakeholder consultations, maintaining a comprehensive GIS- based database of better reliability, implementing the Performance Improvement Plan (PIP) and physical works, letting out and supervising O&M management contracts, etc.The Nagar PalikaParishadJaunpurformally appointed City Sanitation Task Force and intimated to the Implementing Agency.List of members is available in Annexure 1 with the minutes of the meeting.

(b) Assign Institutional Responsibilities:
One of the key gaps in urban sanitation is lack of clear and complementary institutional responsibilities. This comprises two aspects: a) roles and responsibilities institutionalized on a permanent basis; and b) roles and responsibilities for the immediate campaign, planning and implementation of the City's Sanitation Plan based on which the former can be outlined experimented with, and finally institutionalized.

The Sanitation Task Force will recommend the assigning of permanent responsibilities for city- wide sanitation to the ULB including the following aspects:

- ✓ The ULB to have final overall responsibility for city- wide sanitation, including devolving power, functions functionaries and funds to them
- ✓ Planning and Financing including State Government and Govt. of India schemes
- ✓ Asset creation including improvement, augmentation
- ✓ Operations and Management(O&M) Arrangements for all network, on -site, individual, community and public sanitation facilities and systems(including transportation up to final treatment and disposal of wastes)
- ✓ Fixing tariffs and revenue collections in order to make O&M sustainable
- ✓ Improving access and instituting special O&M arrangements for the urban poor and unserved populations in slum areas and in mixed areas
- ✓ Adopting standards- for
    - Environment Outcomes (e.g. State pollution Control Board standards on effluent parameters).
    - Public- Health Outcomes(e.g. State Health Departments),
    - Processes(e.g. safe disposal of on- site septage)
    - Infrastructure(e.g. design standards and criteria) (PHEDs/ Parastatals)
    - Service Delivery standards(e.g. by Urban Development departments)
- ✓ Adoption of Regulatory roles including environmental standards (e.g. State pollution Control Boards), Health outcomes (e.g. Health Departments).

- ✓ Measures in case specific stakeholders do not discharge their responsibilities properly
- ✓ Training and Capacity Buildingof implementing agency and related personnel - Redressal of public complaints regarding sanitation, water supply and solid wastemanagement.
- ✓ Monitoring of 100% Sanitation involving multiple stakeholders. The roles and responsibilities for the Sanitation Plan implementation will also be the task of the City Sanitation Task Force.

Picture 6.1: Meeting of CSTF in Jaunpur

Minutes of meeting of CSTF stakeholder consultation, along with the list of members are provided in Annexure 1.

- ✓ Measures in case specific stakeholders do not discharge their responsibilities properly
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- ✓ Monitoring of 100% Sanitation involving multiple stakeholders. The roles and responsibilities for the Sanitation Plan implementation will also be the task of the City Sanitation Task Force.

Picture 6.1: Meeting of CSTF in Jaunpur

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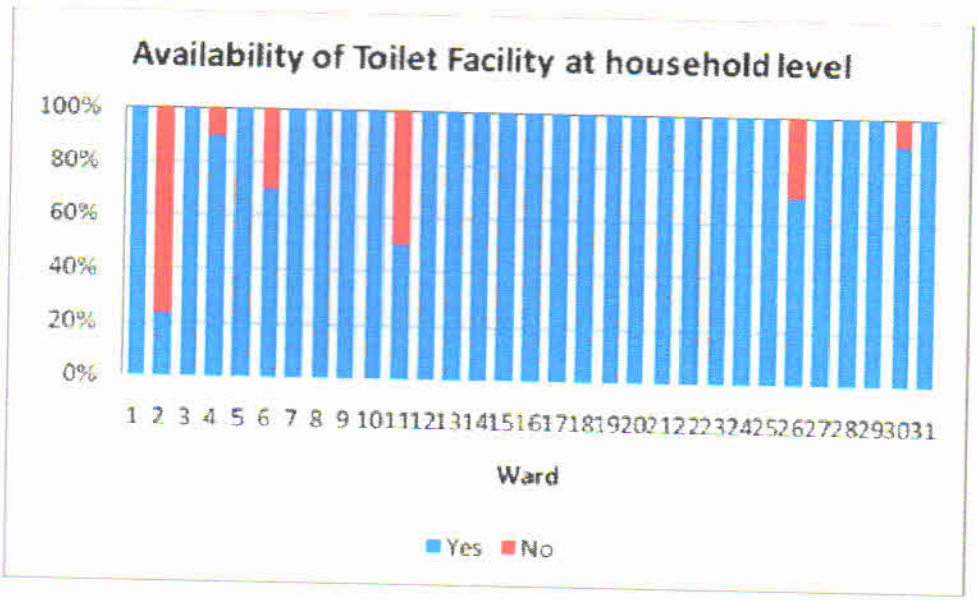
Chapter 7
FINDINGS FROM PRIMARY SURVEY& PRIORITIZATION WORKSHOP

7.1 PRIMARY SURVEY

More than 300 primary survey was carried out across all the wards of Jaunpur and results of the primary survey are presented below. The survey predominantly concentrated on availability of water and sanitation facility in the city like toilet facility, MSW facility, water source and quality etc. A willingness to pay was also carried out as a part of primary survey

Figure 7.1: Availability of Toilet Facility at household level



As can be witnessed above, most of the respondents reported presence of toilet facility at household level except few respondents in wards 2, 4, 6, 11, 26, and 30. Community toilet should be given a priority in these wards.

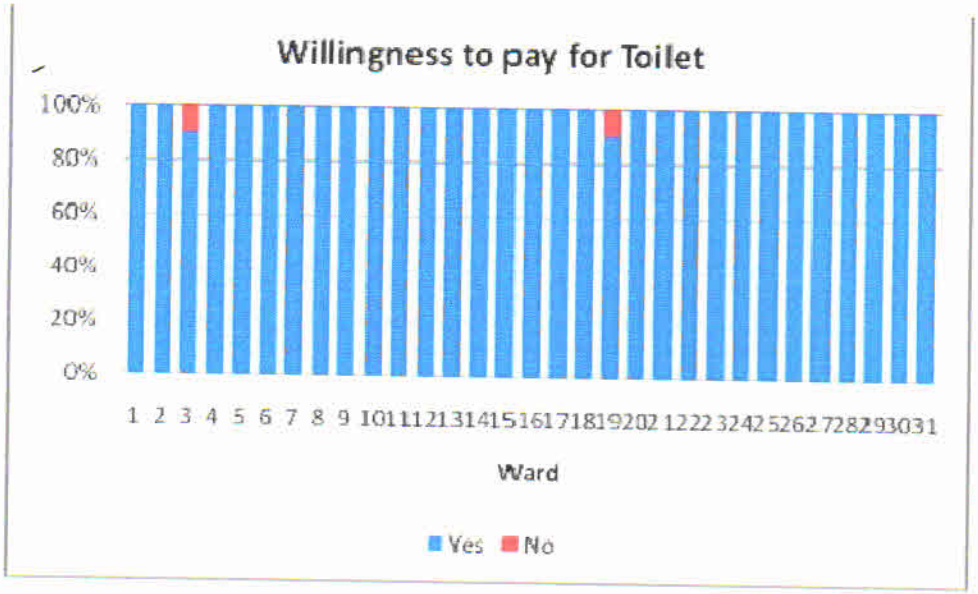
Figure 7.2: Desired Facility in the event toilet facility not available

Since most of the respondents surveyed have reported access to individual toilet, a majority of them do not desire any toilet facility. However individual toilet facility was desired by some respondent in wards 2, 4, 6, 9, 11, 17, 22,23,24,26,28,29and 30.

Figure 7.3: Presence of Community Toilet in locality

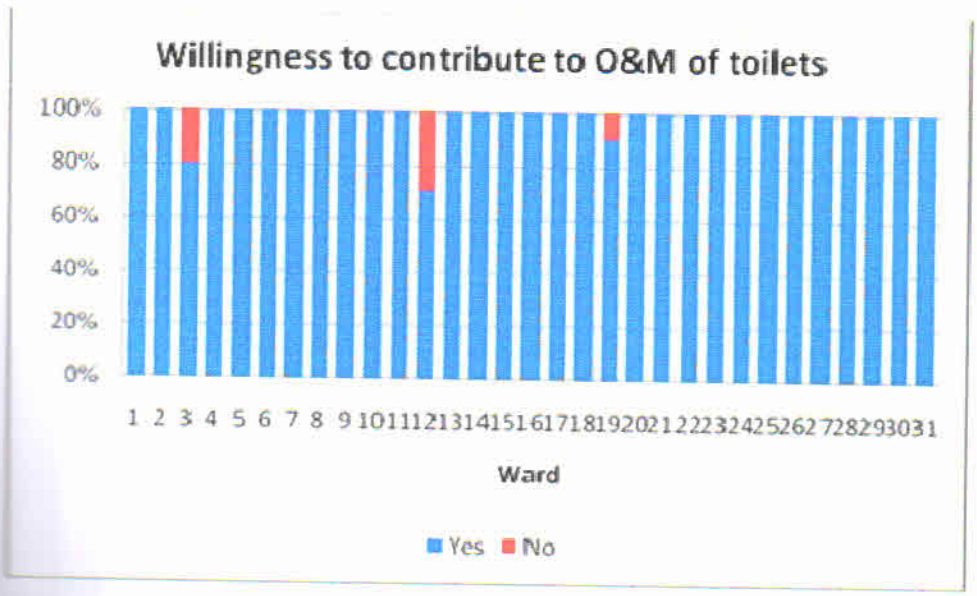
As evident from figure above most of the respondents reported absence of community toilet facility. For a 2 lak plus population town there are only 12 community toilets ie less than 1 toilet per 16 thousand individual. Community toilets are critical for reaching the goal of open defecation free city.

Figure 7.4: Willingness to pay for construction of Toilet



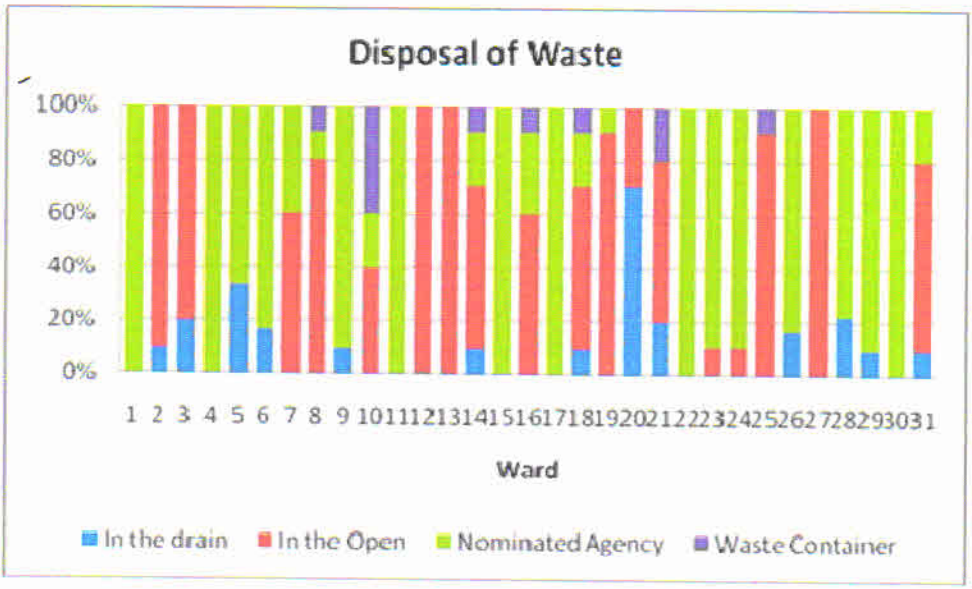
As evident from the graph above a number of respondents expressed willingness to pay for community toilet facility. Hence a Public Private Partnership approach may be explored for construction of community toilets in the city.

Figure 7.5: Willingness to contribute to O&M of toilets



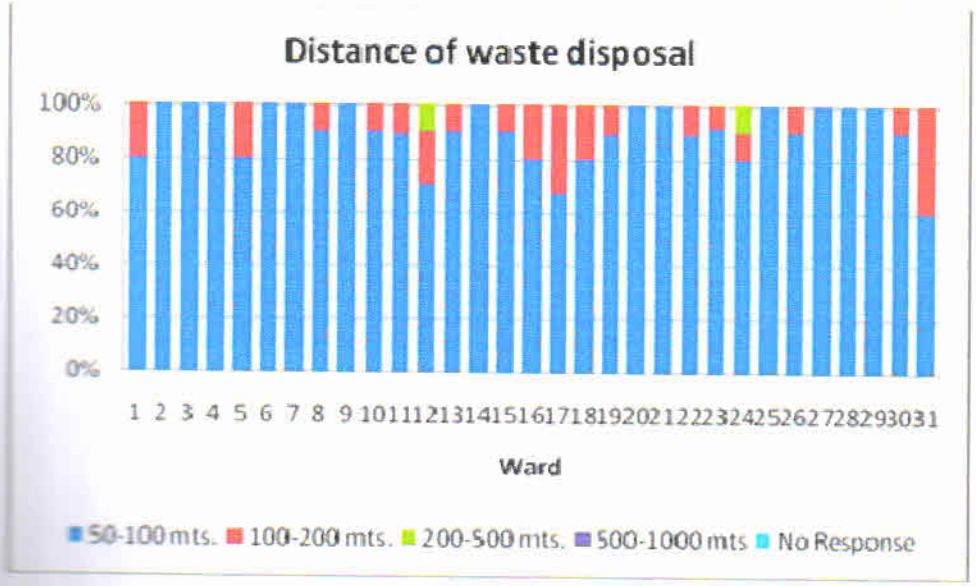
As evident from the graph above a number of respondents expressed willingness to contribute towards maintenance of toilet facility. Hence, a Public Private Partnership approach may be explored for maintenance of toilets in the city.

Figure 7.6: Method of Disposal of MSW



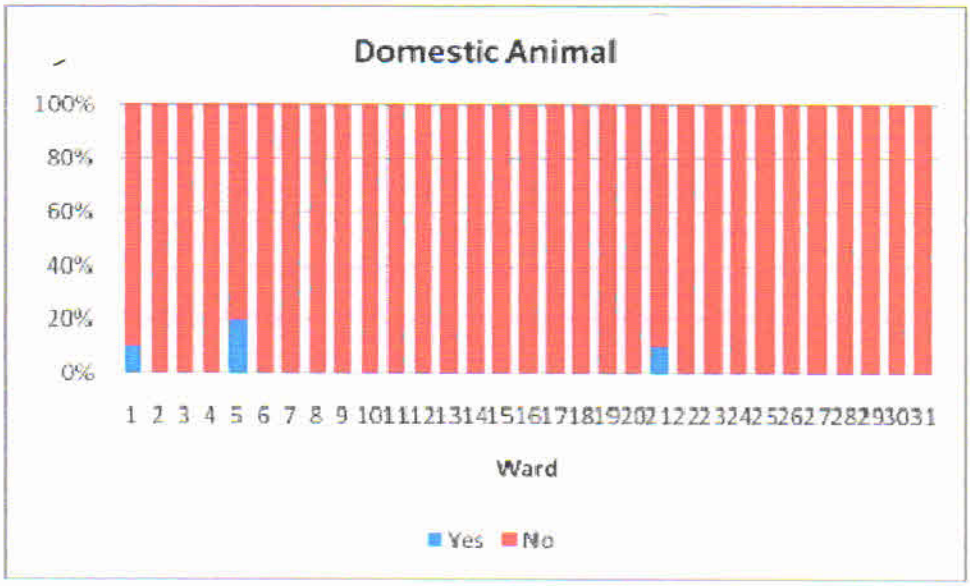
A number of respondent accepted disposing waste to nominated agency.Disposal of Municipal Solid waste in Open is common in city. This may cause environmental and health hazard. The waste disposed in open finds it's way in storm water drain and water bodies. Most of the time waste is disposed in low lying areas and on surface water system causing contamination of ground and surface water. Proper waste collection system needs to be designed for the city to prevent this.

Figure 7.7: Distance of Waste Disposal Site



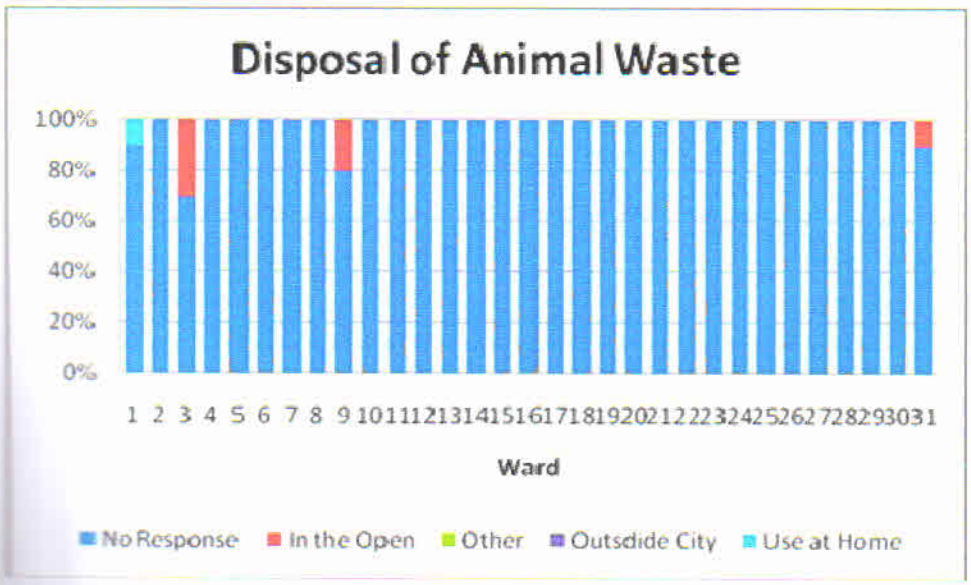
A number of respondent reported waste disposal site to be less than 100 meters. Though these are open dumping sites not covered under municipal waste collection system, in absence of a designated waste disposal area it is common for citizen to dispose waste in nearby areas.

Figure 7.8: Presence of Domestic Animal



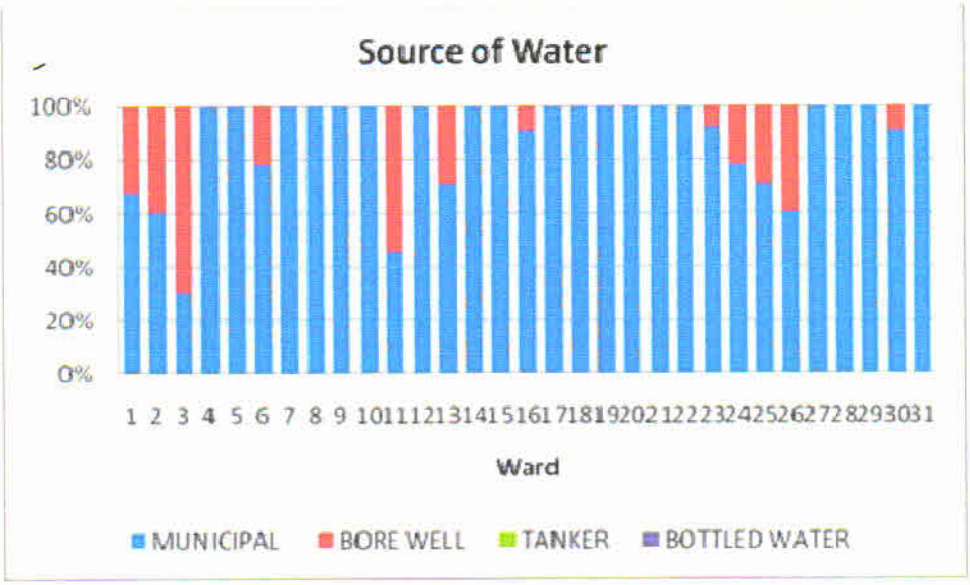
A majority of respondent revealed absence of domestic animal in their household hence a separate animal waste management system may not be required for the city. Whatever limited amount of animal waste is generated, the same can be collected and treated along with municipal solid waste generated in the city.

Figure 7.9: Location of Disposal of Animal Waste



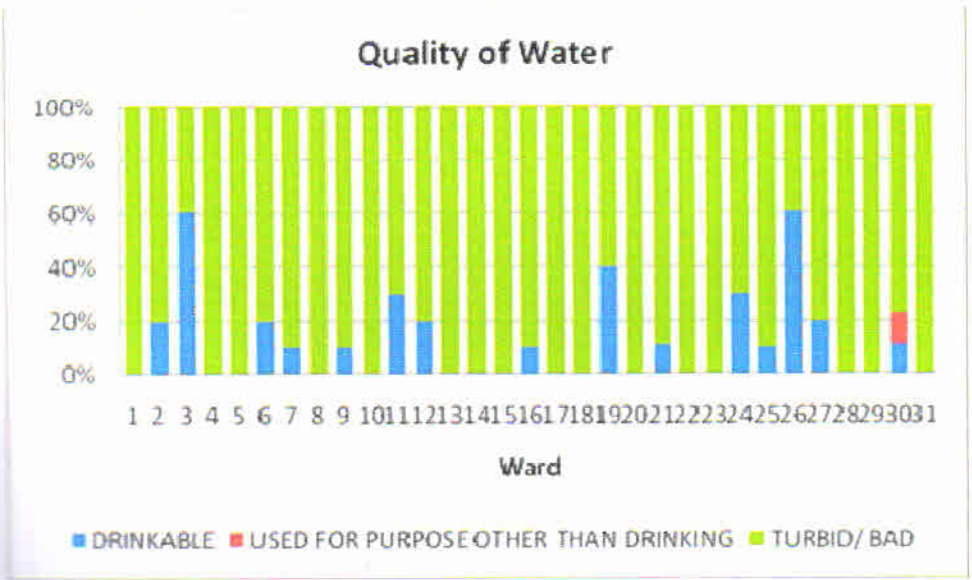
Since a majority of respondent do not own animal, they did not respond to location of animal waste disposal facility. The remainder reported that whatever animal waste is generated, it's disposed in open.

Figure 7.10: Source of Water



Bore well and municipal supply forms the major source of water in Jaunpur. Even a majority f Municipal supply of water is extracted from ground water. The current sanitation and waste management practice in Jaunpur as witnessed earlier is highly detrimental to ground water quality and there is immediate threat of contamination of ground water if preventive measures are not taken. Thus the CSP should focus on avoiding contamination of ground water and preventing outbreak of epidemic by suggesting proper management practices for waste water and Municipal solid waste in the city.

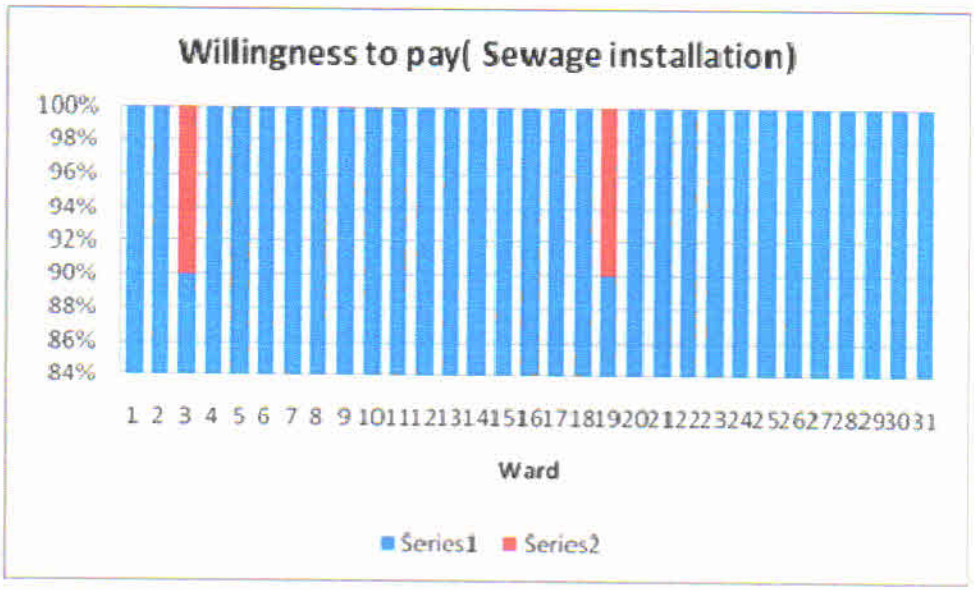
Figure 7.11: Quality of Water



Most of the respondents reported turbid or bad quality of water. This is an area of concern. Indiscriminate disposal of solid waste and waste water in low lying areas and surface water source has created the problem in the city. In the event immediate steps are not taken to improve sanitation and waste treatment aspect of

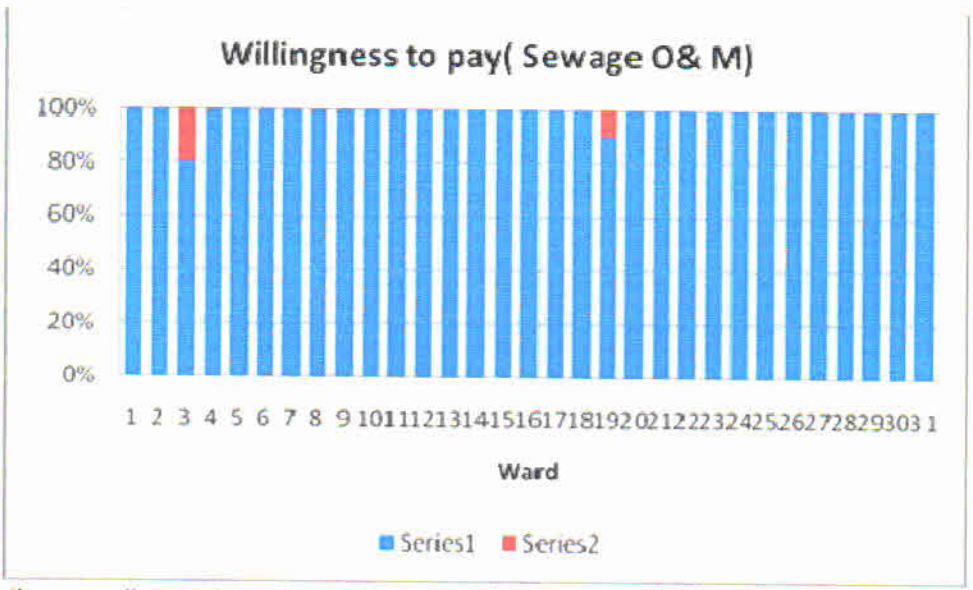
the city, the city health is expected to deteriorate further and major outbreak of epidemic is expected.

Figure 7.12: Willingness to pay for sewerage system (installation)



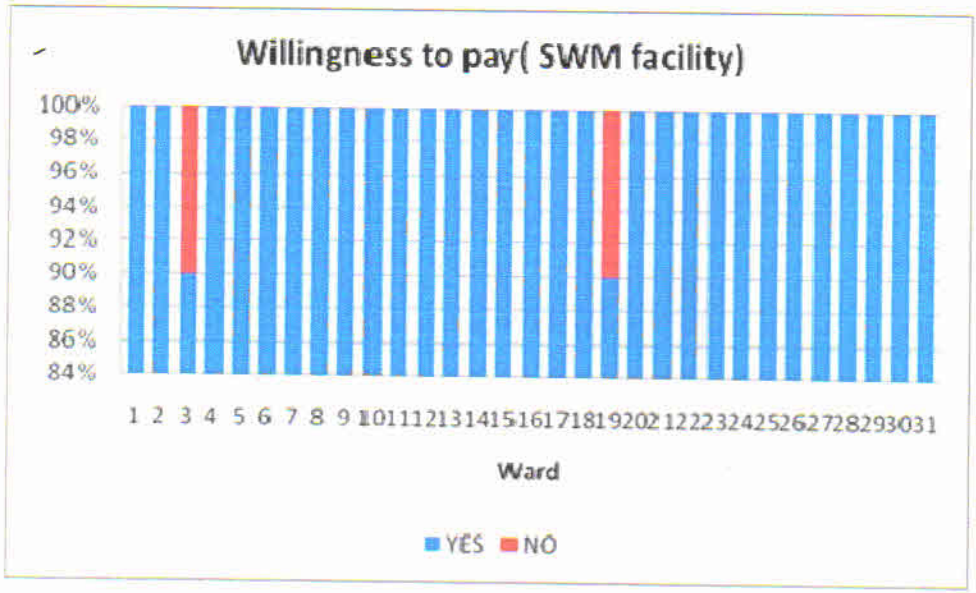
Most of the respondents were willing to pay for installation of a sewerage system of the city thus possibility of a PPP approach. The authorities thus need to explore other source of funding for the project for example grant from central and or state government.

Figure 7.13: Willingness to pay for sewerage system (O&M)



Similar to willingness to pay for installation, the willingness to pay for O&M of a sewerage system is also high as per the primary survey.

Figure 7.14: Solid waste Disposal System



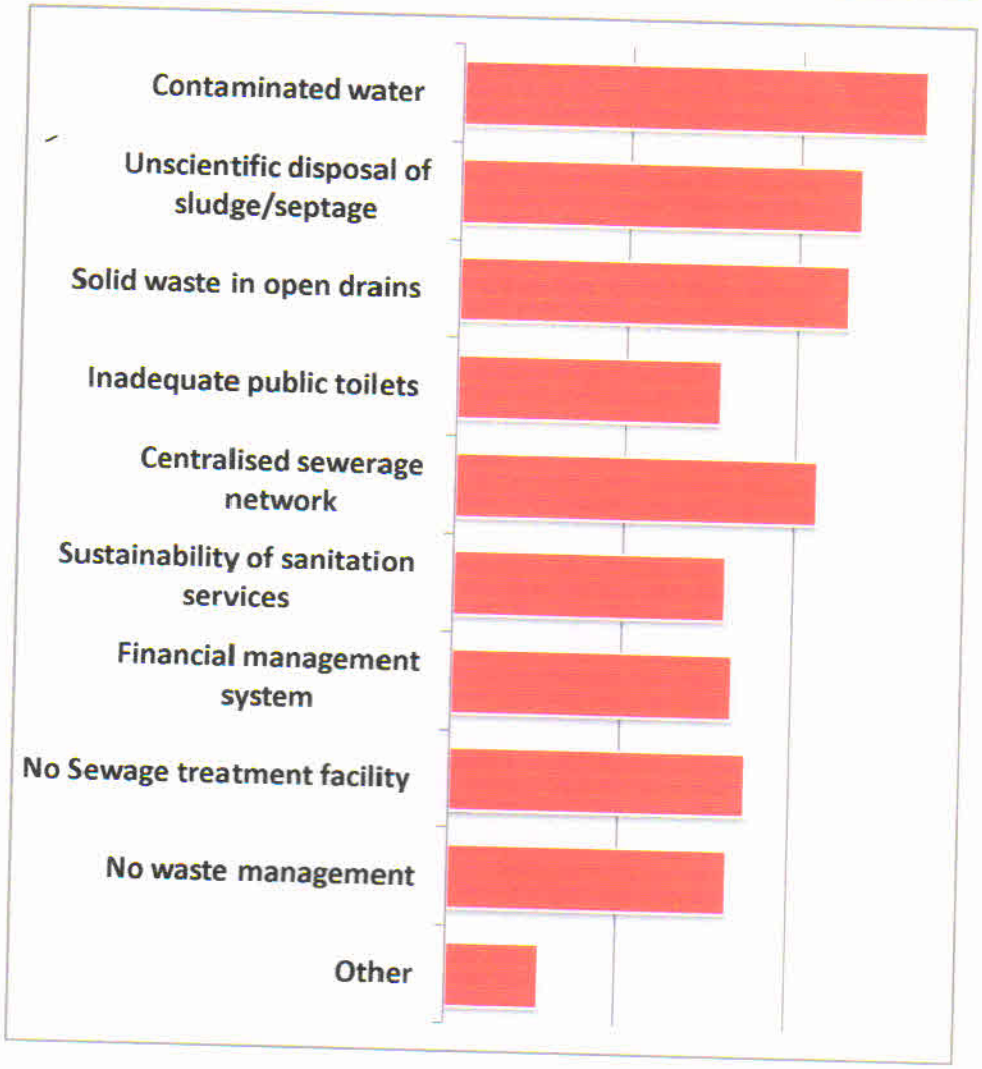
High willingness to pay for SWM facility indicates a possible PPP approach. It is understood that Solid Waste Management under PPP mode is already awarded to a private entity "A2Z" for the city

7.2 RESULTS OF PRIORITIZATION WORKSHOP

A workshop was conducted by the city sanitation task force to priorities the goal of CSP, the key issues linked to sanitation situation of the city and the key projects that should be taken up in the city on a priority basis. The workshop was backstopped by the CSP consultants. The Key findings of the workshop is presented below

GOAL OF CITY SANITATION PLAN IN JAUNPUR

Before finalizing the CSP of Jaunpur, it is critical for the stakeholders to agree on the key goals of the CSP of the CSP. The results of discussions are presented below:



As evidenced from the figure above, 100% coverage and accessibility of sanitation services was given top most priority followed by Good public health and and efficiency. Goals like Cost recovery mechanism and 3R principal were not given too much of priority.

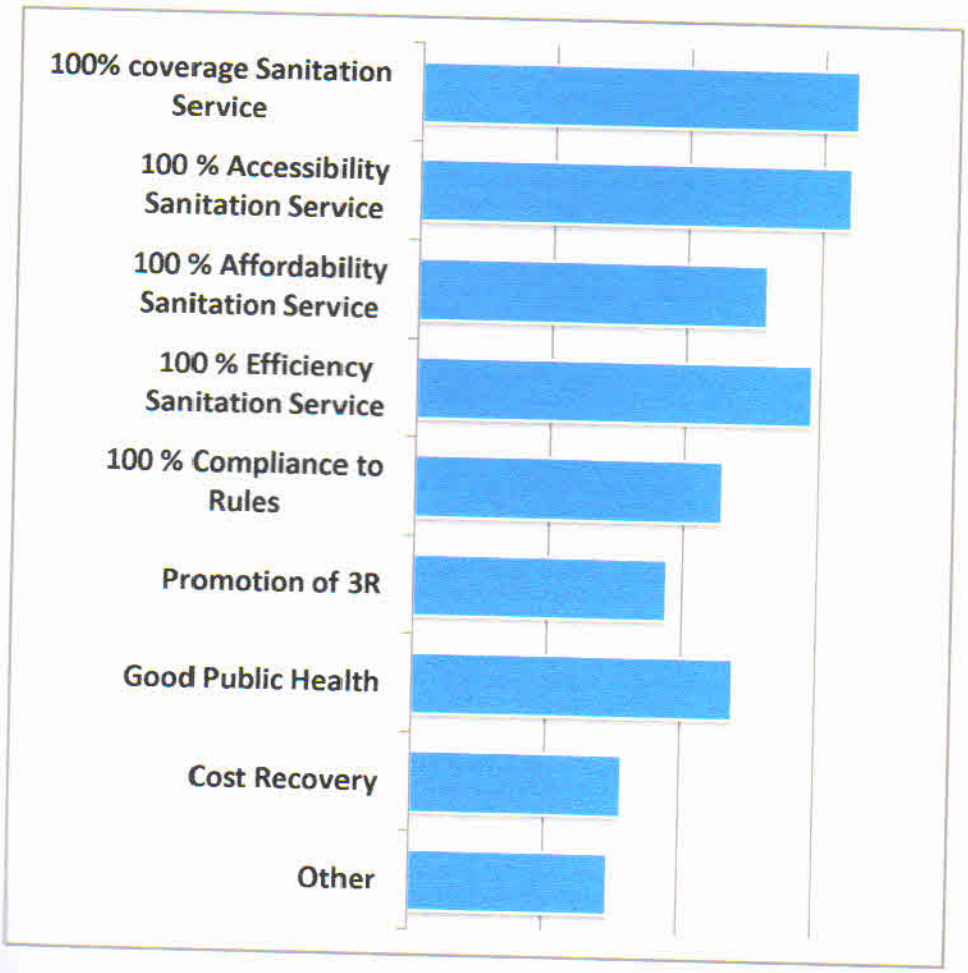
Jaunpur lacks basic sanitation facility like a sewerage system. The city has no sewer line or treatment facility resulting disposal of waste water in river through storm water drain. Though waste collection system exists and the NPP reports 83% collection efficiency, the accessibility of the collection system is poor resulting in disposal of solid waste in drains, ponds and water body. There is no waste treatment facility in the city.

In light of above situation it is pertinent that immediate steps are taken to increase coverage and accessibility of sanitation facility.

KEY ISSUES RELATED TO SANITATION OF THE CITY

Members of city sanitation task force and stakeholders were requested to deliberate the key issues related to sanitation of the city. The result of their deliberation is presented below:

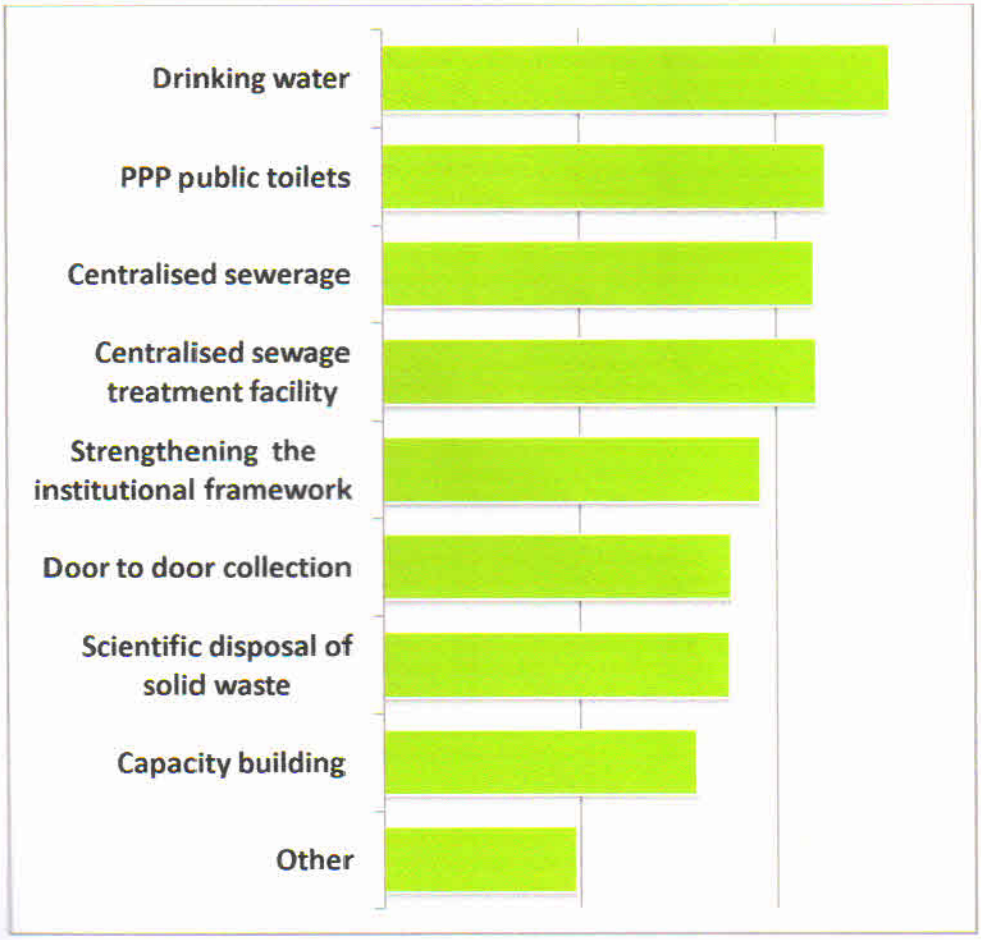
As evident from figure above contaminated water forms the major source of concern for the stakeholder. Jaunpur has both surface water as well as ground water as a source of drinking water. However the treatment system is old and dilapidated. This proves detrimental on the quality of water supplied in the city. The NPP is already in the process of upgrading water treatment facility of the city. Absence of centralized sewage collection network and indiscriminate dumping of solid waste in drains and water body were also identified as key issue. Both results in contamination of ground water which is the only source of water supply in the city. Hence the stakeholders felt that these practices which leads to contamination of water supply and pose health risk should be addressed immediately.



Since the basic sanitation services like a sewage network and waste treatment facility is missing in the city higher level requirement like a robust institutional framework, financial management system and sustainability of sanitation facilities were not considered to be important by the stakeholders at this level. Surprisingly the stakeholders did not feel the need for public toilet may be because NPP reports 92% of coverage of toilet facility. However public toilets are required by urban poor and are critical for the goal of defecation free city.

KEY PROJECTS LINKED TO SANITATION OF THE CITY

At the conclusion the stakeholders deliberated on the key projects that should be implemented in the city. Understanding that limited funds may be available for implementation of sanitation projects this exercise aimed at deciding on short term, medium term and long term project. The result of their deliberation is presented below :



As evident from the figure above a centralize treatment of drinking water facility followed by PPP approach for improvement of quality of public toilet was given highest priority and it was argued that these projects can be take up immediately as a short term measure.

Jaunpur already has some infrastructure with related to drinking water supply and DPR for improvement of quality of drinking water has already been prepared. Since the project has received Government sanction and necessary funds are available for the implementation of project activity, the stakeholders felt that necessary action should be taken for fast track implementation of the project activity.

Similarly veryfew public toilets exist in the city and their poor maintenance discourages the user from using the facility and open defecation is common in the city. The stakeholders felt a PPP approach may not be very cost intensive and be implementation can be achieved at a relatively short period of time. This would

result in achievement of one of the objective of Urban Sanitation Policy ie creating an open defecation free city.

On a medium term a sewage collection and treatment facility was recommended. Understanding that first a detailed project report needs to be prepared and necessary funds needs to be sanctioned for implementation of this large scale initiative the stakeholders agreed to keep the sewage collection and treatment facility as a medium term goal.

Under long term goal the stakeholders agreed to keep initiatives like capacity building, sustainability, institutional strengthening and solid waste treatment facilities. They argued that since the city lakes basic infrastructure there is no logic in conducting awareness campaigns, capacity buildings etc until the basic infrastructure like sewage system is in place.

CHAPTER 8
INFORMATION, EDUCATION AND COMMUNICATION (IEC) AND CAPACITY BUILDING

8.1 INTRODUCTION

Awareness generation, promotion of cultural & social shifts are the major component for success of planning process. The required objective of CSP Jaunpur can only be achieved when the citizens are educated, conscious, responsive and adaptive. These should be supported by a strong institutional reform including capacity building and an equally strong enforcement mechanism.

Information, Education and Communication (IEC) & Capacity Building strategy are integral to the core issue of developing the City Sanitation Plan. In fact it will lead to development of robust yet effective awareness and communication strategy for promoting hygiene & sanitation in the city to trigger behavior change and demand for sanitation. The strategy will aim for citizen participation in improving city sanitation specifically reaching out to the slum dwellers and urban poor in the city. It will evolve a methods, tools & techniques, and use of various media (interpersonal, print, electronic, folk etc) including advocacy with opinion leaders, NGOs/CBOs and other stakeholders to deliver awareness strategy in the city.

8.2 OBJECTIVES

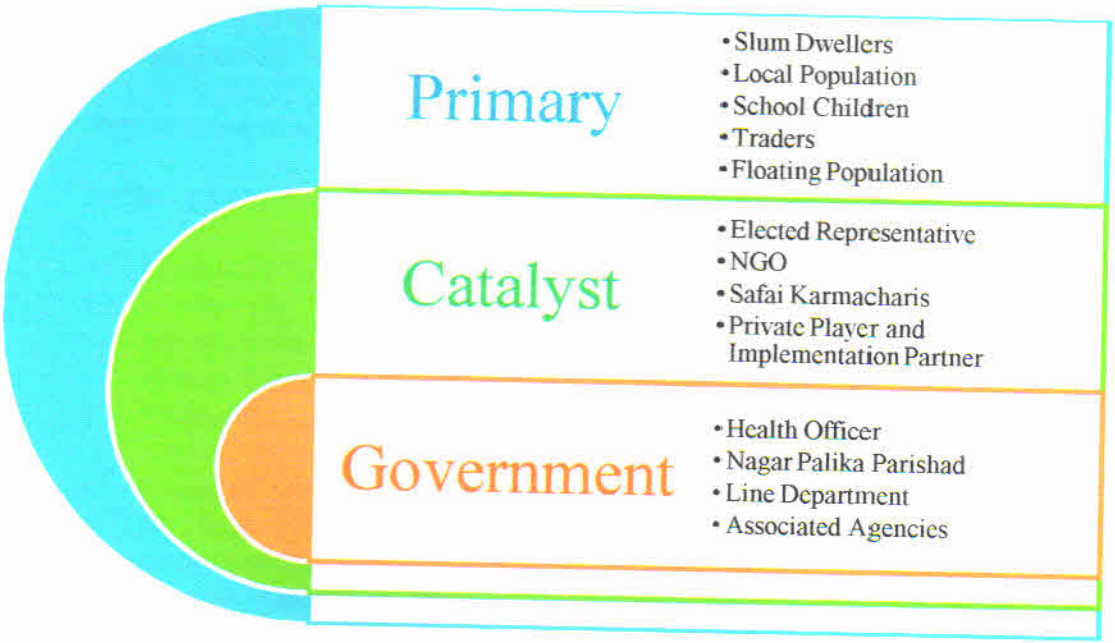
The objective of IEC & Capacity Building Strategy for effective implementation of CSP in Jaunpur is to evolve an effective plan of sustainable programmes for capacity building and sensitization of implementers, education and enhanced awareness for stakeholders specifically citizens regarding sanitation activities in Jaunpur City. The strategy is designed to:

- Strengthening CSP implementation by Nagar Palika Parishad Jaunpur (NPP Jaunpur) through training and capacity building;
- Sensitize citizens for adopting water wastage minimization, segregation;
- & management of solid waste and open defecation free practices through IEC campaign; and
- By working at both the levels mentioned above a culture of communications and consultations are fostered leading to participation.

Communication needs assessment identified three stages for implementation of Information, Education and Communication strategy for improvement in water and sanitation services. These are 1) Awareness, 2) Process and 3) Compliance. While it is generally understood that these stages would lead to better citizen participation in the schemes, it is in fact imperative for all stakeholders to be appraised from their own specific stand points. Awareness includes an understanding of health and hygiene related education specifically directed towards slums. Equally important is an awareness of municipal officials about the problems face by all the city residents including slum & middle class households and sanitation workers. This awareness is

generally taken for granted. Here, we propose that open and specific appraisals be carried out without assuming too much of prior knowledge regarding sanitation issues. Next is to create processes which are essential to maintain improved services. These could include citizen participation in community toilet maintenance etc.

8.3 KEY STAKEHOLDERS



Approach

- Generating awareness about sanitation
- Promoting sanitation linking with personal health
- Use a range of media vehicles and messages
- Target external, internal and intermediary stakeholders
- Underpin high level commitment of government backed by robust enforcement mechanism
- Periodic review for effective implementation of strategy

Message

- Better city sanitation means better personal health
- Improved sanitation means healthier and happy family
- Access to facilities for better sanitation is easy i.e clear signage; there is a toilet around the corner
- It costs next to nothing to adopt better sanitation practices
- Benefits far outweigh user fees
- Cost of non compliance is high

Effective Mix & Media Planning

- Media relations
- Self sticking posters
- Print media advertisements

- Radio Spots
- Street play
- Direct Mailers
- Project meetings

8.4 IMPLEMENTATION STRATEGY

Implementation strategy has been divided in 4 phases starting from immediate to Long term (till 2045). Different actions and resultant awareness generation is detailed below:

Phase I immediate (till 2015)

Action at NPP level

- Finalise the Sanitation Vision for Jaunpur approved by the Council;
- Initiate the establishment of a permanent management representative responsible for sanitation management;
- Finalize the Inventory of all relevant regulations;
- Initiate the assessment of the training needs regularly and to develop training calendar and program to impart trainings to staff across all categories;
- Budget allocation for training and sanitation activities;
- Initiate the creation of a training database capturing a record of the name, position and function of the employee as well as the content, duration and date of the training programme participated in including participant feedback about the relevance and efficiency of the course to the roles and responsibilities;
- To implement an internal and external communication protocol and train the ULB staff in accordance to the plan;
- Develop Staffing Plan & Strategy and initiate recruitment in accordance;
- Initiate the development of Knowledge Exchange Mechanism among cities using the web based knowledge platform
- Sanitation Awareness Workshop for the ULB staff and elected representatives resulting in identification and prioritisation of all sanitation aspects;
- Prepare a City level CSP

Awareness Generation at City Level

- Pilot awareness campaign to be conducted in two (2) wards
- Awareness Campaign strategy to be developed
- Prepare effective IEC material for awareness campaign
- Initiate School Sanitation Workshops
- Initiate workshops on sanitation and related infrastructure
- Involve NGOs to work continuously with the community to bring about change.
- Institutionalize the role of CSTF to disseminate the information on sanitation issues, projects undertaken and progress of each component
- Press release of sanitation scenario of the city

Phase II Short Term (2015- 2020)

Action at NPP level

- Finalize the Formulation of HR Policy for the ULB and finalize the Induction Training Curriculum; Finalization institutional reform to strengthen sanitation department;
- Finalize the Knowledge Exchange System;
- Preparation of Annual Training Calendar and Undertake institutional review;
- State level Steering Committee meeting to finalise steps to be taken for strengthening ULBs
- Training Programme and training on Urban Management for the ULB
- Update the City level CSP
- Initiate and finalise DPR for Sewage and Waste Management system for the city.
- Finalise funding mechanism for city wide Sewage system and MSW collection and treatment system

Awareness Generation at City Level

- Involve media in demonstrating healthy sanitation practices
- Finalize school sanitation program – train school children and make them aware of the sanitation situation and need for healthy sanitation practices.
- Social mobilization by creating women's group and sensitise them about sanitation related issues
- Create area sabhas/community groups specifically targeting their sanitation needs
- Interpersonal Communication (IPC) to be used to reach out larger public
- Build up institutional capacity of NPP Jaunpur to conduct awareness campaigns as part of their agenda
- Address the tenure security issues of urban poor which in turn help them build basic services of permanent nature
- Develop Information Management System

Phase III Medium Term (2020- 2030)

Action at NPP level

- Implement city wide Sewage collection and treatment system
- Implement city wide MSW collection and treatment system
- Update and upgrade Training Calendar and Training Programs
- Conduct sanitation Workshops
- Update the CSP
- Create Monitoring & Evaluation Systems for air and water quality
- Create Monitoring & Evaluation Systems for effective implementation and achievement of Goals of CSP

Awareness Generation at City Level

- NPP Jaunpur and the CSTF have to periodically take feedback from the community groups and provide necessary support.
- Update IEC material and the sanitation awareness programs
- Periodically hold awareness campaign
- Monitor and feedback on sewage and MSW system
- Source segregation of MSW Campaign

Phase IV Long-term (2030 – 2045)

Action at NPP level

- Update and upgrade Training Calendar and Training Programs
- Update the HR Policies and incentive programs
- Conduct Sanitation Workshops
- Update the CSP
- Update and upgrade Monitoring & Evaluation Systems
- Awareness Generation at City Level
- A long term and permanent effect on awareness can be made by sustained effort from the NPP Jaunpur and community.
- The CSTF is recognized as a body holding the sanitation campaign for Jaunpur. The CSTF will also ensure long term influence in the sanitation scenario of Jaunpur
- NPP Jaunpur and the CSTF have to periodically take feedback from the community groups and provide necessary support.

8.5 Cost of IEC activity

S. No.	Description	Cost in Lakhs INR
1.	Strategy finalisation	3
2.	Personal contact drive	25
3.	Print advertisements	50
4.	Posters and flyers	25
5.	Events and workshops	40
6.	Media relations	5
7.	Street theatre	15
8.	Audio visual for promotion in fairs	10
9.	Flex boards and hoardings	30
10.	Supervision	20
11.	Documentation and surveys	10
12.	Creative	5
13.	Training & Capacity Building	2
14.	Total	240

CHAPTER 9
PROPOSED SANITATION PLAN

9.1 WASTE WATER MANAGEMENT

A sanitation strategy should be environmentally sound, appropriate to local conditions and affordable to those that must pay for the services. Its application dependent on local factors: physical and social. Physical factors include land availability, topography, climate, soil, availability of energy and existing land use. Social factors include population density, community resources (funds, skills), affordability and willingness to pay for the technology and its operation and maintenance, etc. Thus, the strategy and the technology should fit to the local conditions: environmental, economic, cultural and institutional (UNEP/GPA, 2000).

The quantity of waste water generation for any city is related to the water supply to the city. The strategy for waste water management is suggested with a consideration of an adequate system of water supply for the Jaunpur city with 100% coverage and improved management resulting in low NRW (Non-revenue water). For the waste water management, the concept has been formulated with the objective to provide 100% access to toilets to all residents and at public places.

Considering the existing situation of waste water management in Jaunpur city and other local factors including its topography and population distribution, the suggested strategy for achieving 100% sanitation is provided in the following section.

As far as possible individual toilets are to be promoted with subsidy support, shared toilets being the next best option followed by community & public toilets. The institutional sanitation in schools, colleges, other public places like markets, sabzimandis, bus terminal, railway station etc. & offices also needs to be addressed simultaneously.

9.2 PROPOSED STRATEGY FOR ACHIEVING COMPLETE HOUSEHOLD SANITATION

(i) **The objective, of an open defecation free city, can be** achieved through the following *Toilet Access Options* ***(Figure 9.1)*** :

Integrated Low Cost Sanitation (ILCS) Scheme

(a) *To convert the existing dry latrines into low-cost pour-flush latrines and to construct new ones where none exist;*
(b) *To convert/construct low-cost sanitation units to suit local conditions where EWS households have no latrines and follow open defecation;*
(c) *"All town" coverage basis scheme;*
(d) *Funding pattern: Central Subsidy - 75%, State Subsidy - 15%, and beneficiary share - 10%.*
(e) *The upper ceiling cost of Rs. 10,000 for a two-pit pour-flush single complete unit of latrine;*
(f) *Implementing agency : Ministry of Housing*

a. Provide public/community toilets in slum areas of the city, where individual toilets are not feasible. The system has many advantages including lesser cost per seat as compared to individual toilets, no burden on individual household for its operation & maintenance, easily affordable.

b. Promote up-gradation of existing low cost sanitation system and construction of new ones, wherever needed at house hold level and convert existing dry latrines into water flush latrines at house hold level. This objective can be achieved by implementing the concerned regulation made by state govt. i.e. prohibition of dry latrine(as perEmployment of Manual Scavengers' and Construction of Dry Latrines (Prohibition) Act. 1993) in the city andproviding incentives for encouraging individual toilets to people who can afford and available space; supporting subsidies for individual toilets for low income households. However, it is suggested that NPP, Jaunpur should conduct a detailed study and prepare a list for households that require individual toilets and are ready to have their own individual toilets. For economically weak sections (EWSs) of the society, NPP, Jaunpur can take the benefit of the ILCS Scheme. NPP, Jaunpur can get two-pit pour-flush toilets constructed under the ILCS Scheme

c. Provide adequate number of public/community toilets at public places including

markets, bus- stand, railway station and in institutions like schools, colleges, offices, shopping complex etc.

Figure 9.1:*Toilet Access options for complete household sanitation*

d. Introduce systems for management of community/public toilets at community level and encourage cost recovery

According to the proposed plan, the requirements for the number of public toilets for the city including the slums and public places are provided in the following table for the base year as the current year. It may be noted the estimated value is in addition to the existing 12 (twelve) public toilets in the city:

Table 9.1: Public toilets requirements in Jaunpur city

S.No.	Description	Unit	No. of public toilets
1	Public toilets in Slums	No.	100
2	Public toilets in Public places	No.	20
3	Public toilets on Gomti river side	No.	5
4	Public toilet in other area of city (1 in each ward)	No	31
4	**Total number of public toilets**	**No.**	**156**
5	Cost of one community toilet (10 seater), connected to septic tank	Rs.	1000,000
6	***Total capital investment***	***Rs., cr***	***15.6***

Implementation strategy

The proposed options for construction of water flush latrine in individual houses and public toilets on PPP basis may be immediately taken up by the NPP, Jaunpur, as a short term goal, to be achieved within the time period of 1-3 years.

The works of operations & maintenance of the public toilets can be carried out in PPP mode, by hiring private operators. For the EWS and slums, the user fee can be subsidised by NPP partially, over and above the affordability of the slum dwellers. The other option could be cross subsidy of public toilets at commercial places and public places with that in slum area.

Provide an adequate waste collection & transportation system to ensure cleaning and pumping out of solids from the septic tank/soak pits at regular interval so that overflow does not go into surface drains. The collected waste may be taken up to the nearest treatment plant for its proper treatment and disposal. Domestic waste water generated at the household level, including the waste from toilets, can be managed either on-site or off-site or a combination of both.

In order to overcome the problem of collecting sludge from septic tanks located on narrow streets of Jaunpur city, it is recommended to use a device with a vacuum pump discharging into a 500-L tank fitted onto a wheelbase with a small engine for driving it around. Modified system

Desludging Operations

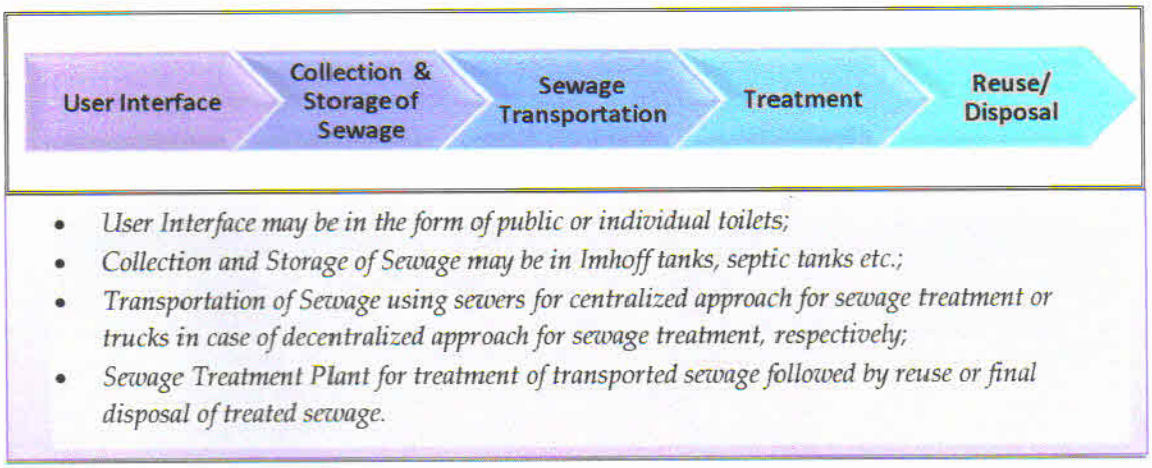
De-sludging frequency: twice in a year for domestic septic tank

Recommended Sewage(sludge) collection option for narrow road localities: truck mounted lorry of smaller capacity, vacuum pump driven system

The machine creates a vacuum within the tank and, through a plastic hose, sucks the human waste sludge from the pit or septic tank. The tank is then wheeled to an end disposal site, a pressure created within the tank, and the waste pushed out of the tank into the end disposal site.

The lorry capacity may vary from 0.5 cum-5 cum. Suggested capacity for slum areas: 0.5 cum

(known as Vacutug Mark II) has also been suggested for Lucknow as a pilot project, being implemented in Dhaka, Bangladesh, which has a larger capacity tank on a trailer that is pulled by a vehicle. The machine can be effectively used in high-density informal settlements with narrow lanes where conventional vacuum trucks are unavailable or vehicular access is difficult.



- *User Interface may be in the form of public or individual toilets;*
- *Collection and Storage of Sewage may be in Imhoff tanks, septic tanks etc.;*
- *Transportation of Sewage using sewers for centralized approach for sewage treatment or trucks in case of decentralized approach for sewage treatment, respectively;*
- *Sewage Treatment Plant for treatment of transported sewage followed by reuse or final disposal of treated sewage.*

Table 9.2: Infrastructure requirement for C&T of waste from soak pits

S.No.	Description	Requirement
1	No. of soak pits to be cleaned per annum (consider all public toilets and 50% of households)	17000
2	Frequency of cleaning soak pits	Twice in a year
3	No. of desludging machines with small engine required (engine mounted tank with the capacity of 0.5cum) @ 2 single seat toilets/daily, 90% capacity, 300 days in a year	33
4	Waste disposal and treatment plant for removed sludge	within 5 km periphery
5	Cost of one unit of de-sludging machine	4.5 lakh, Rs.
6	**Capital cost estimate**	**1.5 crore, Rs**

Implementation strategy

The proposed options may be immediately taken up by the NPP, Jaunpur, as a short term goal, to be achieved within the time period of 1-3 years.

The works of de-sludging activity can be carried out in PPP mode, by private operators. NPP, Jaunpur can provide a list of de-sludging operators to the public and fix the rates for de-sludging activity. Some local NGOs can be involved to increase the public awareness about the need to get the de-sludging of soak pits at regular interval.

(ii) Design and development of sewerage management system for the city

Presently, the Jaunpur city does not have any sewerage system. The city being the district headquarters and with the estimated decadal population growth rate of more than 30%, should have a permanent solution for management of its waste water as a long term goal. Therefore, it is highly recommended that the NPP, Jaunpur hires consultants to prepare a detailed project report for development of Sewage management system for the city.

Table 9.3 Implementation of centralised sewage treatment plant in Jaunpur

S.no	Item	Unit
1	Length of sewage Network @ 1.25 times the road network	210 Km
2	Capacity of waste water treatement facility (Based on expected anount of waste water to be generated in 25 years)	36 MLD
3	Cost for complete laying of sewers lines/km (300mm dia NP2 at shallow depth	150 Lakh
4	Capital Cost per MLD, STP	Rs.108 lakh
5	Cost of Laying sewer line	315 Crores
6	Cost of centralized STP	38.8 Crores
7	DPR consultancy and detailed drawings	1.2 Crore
8	**Total cost**	**355 Crores**

IMPLEMENTATION STRATEGY

The city being the district headquarters and with the estimated decadal population growth rate of more than 30%, should have a permanent solution for management of its waste water as a long term goal. Therefore, it is highly recommended that the Nagar Palika Parishad hires consultants to prepare a detailed project report for development of Sewage management system for the city. Based on the outcomes of the project report, the project implementation can be further taken up. Currently, there are various government schemes (like JnNURM, UIDSSMT etc.), which can be availed by NPP, Jaunpur for execution of this project. A brief of few schemes is provided in Annexure 3.

9.3 SOLID WASTE MANAGEMENT

Solid Waste Management (SWM) includes all activities that seek to minimize the health, environmental and aesthetic impacts of solid wastes. Despite a robust and legislative framework for municipal solid waste management in the country, the implementation of solid waste management systems and facilities has been lackadaisical even in the big cities. There have been numerous implications of the poor management of the wastes including impacts on public health, poor sanitation

conditions, deterioration of water quality, social concerns relating to the rag pickers and greenhouse gas emissions.

In order to comply with MSW rules, 2000 and in tune to the existing waste management policy being adapted in India, an integrated plan comprising of all the elements of solid waste management for Jaunpur city has to be developed.

The strategy for the solid waste management of Jaunpur city is suggested keeping into considerations the following design criteria:

- Compliance to the MSW handling rules (2000) for waste collection, transportation, treatment & disposal;
- Providing Door to door collection of waste from households in segregated manner with the introduction of 2-bin system (one for green waste and other for dry waste);
- Introduction of an efficient primary and secondary waste collection & transportation system using autos, refuse collectors etc.
- Environmental Sustainability by adapting the 3Rs principal of waste minimization through reduction, recycle and reuse, hence, proposed a mechanism for recovery of recyclables at the processing facility and waste reuse through composting of food waste and other green waste;
- Final disposal of only rejects/inerts at the scientifically developed landfill with an attempt to dispose minimum waste quantity at the landfill.
- Avoidance of adverse environmental, social and health impacts usually associated with SWM

Technology Assessment for waste processing

There are various technologies available for processing of waste in an environmentally sound manner.

These technologies depend upon the categories of waste, i.e., the technology appropriate to treat Municipal Solid Waste may not be suitable for treatment of hazardous industrial waste. Technology also depends upon the end objective, i.e., whether energy generation is considered from the waste or material recovery is required. Broad categories of available technologies for processing solid waste are mentioned below:

- Thermal Processing Technologies
- Biological Processing Technologies
- Physical Processing Technologies

Table 9.5 shows the technologies expressed in terms of the three major groups (thermal, biological & physical) that have been considered for evaluation purpose

for processing solid waste for Jaunpur city. A summary of various technologies being used worldwide for waste processing is provided in Annexure 4.

Table 9.4: List of Identified MSW Processing Technologies

Waste Processing Technology Group	*Waste Processing Technology*
Thermal Processing Technologies	Incineration (Mass burn)
	Pyrolysis
	Pyrolysis / Gasification
	Plasma Arc Gasification
Biological Processing Technologies	Aerobic Digestion (Composting)
	Anaerobic Digestion (Biomethanation)
	Landfill as Bioreactor (Bioreactor Landfill)
Physical Processing Technologies	Refuse-Derived Fuel (RDF)
	Densification / Pelletisation
	Mechanical Separation
	Size reduction

However, a technology suitable for one may not be appropriate for others.
The following technology assessment criteria have been used to propose appropriate technologies for processing of waste of Jaunpur city:

- ***Technology Reliability***: Reliable technologies that could be considered without reservations for processing of waste generated in the Jaunpur city and which have been used successfully in India in the past. Among various available & reliable technologies for waste processing, Composting has been found to be a very suitable option in India for the past many years and is also in compliance with the MSW handling and management rules, 2000.

- ***Waste Suitability***: Technologies that are suitable for the given waste characteristics and that require value addition of the MSW chain for sustainability.

    - High organic content & moisture content of the waste of Jaunpur city are promising indicators for use of composting as a waste processing option for the city.

    - The typical waste composition of the city also indicates that significant amount of waste can be recycled and sold in the market.

- ***Economic and Commercial Viability:*** Technologies that are sustainable economically with respect to the scale of capital investment and operational costs and that can generate good revenue stream for the end product, considering the prevailing local conditions.

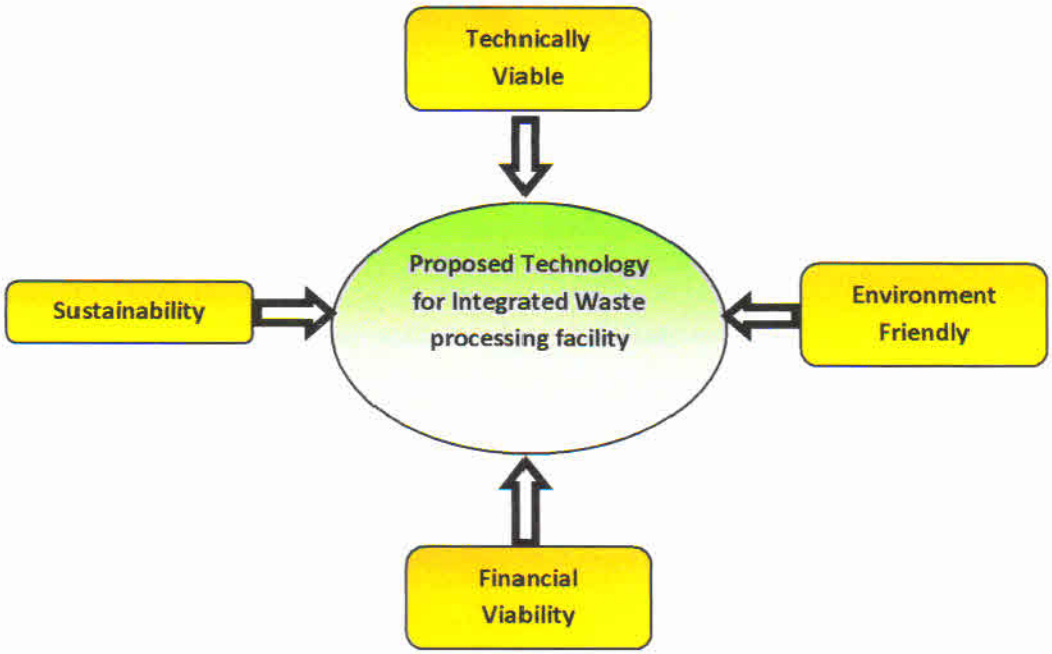


Figure 9.2: *Choice of technology for waste processing facility*

Based on the waste characteristics and its quantity and other factors, as mentioned above, it is recommended to opt for composting for organic waste after recovery of recyclables. The proposed concept is also in synchronization with the market demand and has revenue generation potential from the sale of recyclables and compost.

Proposed Strategy

As already discussed in the previous chapter, the city is currently generating nearly 100 tons of waste everyday which is expected to increase to the amount of 140 tons in the next 25 years (Table 9.6).

Table 9.5: Solid Waste Generation for Jaunpur city

S. No.	Year	Estimated waste quantity (TPD)
1	Present	80
2	2016	80
3	2021	88
4	2026	96
5	2031	105
6	2036	115

The solid waste management of the city is proposed to comprise of the following components (Figure 9.3) :

- Door to door waste collection services for residential areas using auto tippers / tricycle rickshaws, with the active involvement of the citizens, NGOs and private entrepreneurs. Besides introduction of equipment and vehicles for waste minimization and segregation, awareness creation should also be a key focus area for developing an effective solid waste management plan.

- Bulk waste collection system using community bins of 1100 litre capacity for waste collection from other areas including institutional, commercial, markets etc.

- It is proposed to sweep all the roads on daily basis manually.

- Transportation of waste from collection points using 7 m^3 capacity Refuse Collectors to the integrated waste management facility

- Provide integrated waste management facility comprising of compost plant and material recovery facility followed by final disposal of rejects and inerts in the scientific landfill

- Composting is one of the most recommended and successful options for processing of MSW in India. Composting is a form of recycling. Like other recycling effort, the composting of municipal solid waste can help decrease the amount of solid waste that must be sent to a landfill thereby reducing disposal costs. At the same time, composting yields a valuable product that can be used by farmers, landscapers, horticulturists, government agencies, and property owners as a soil amendment. The compost product improves the condition of solid reduces erosion, and help suppress plant diseases

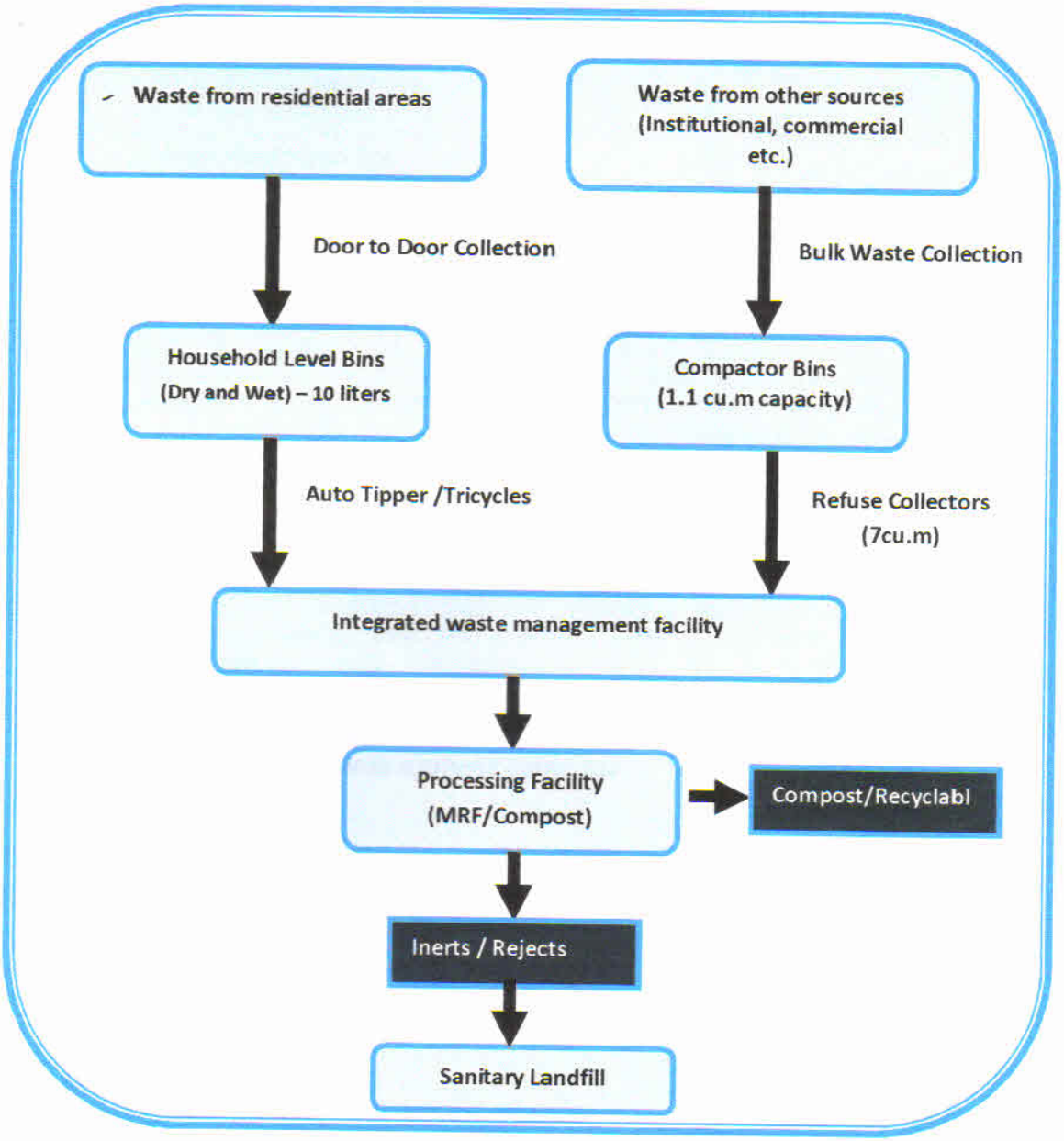


Figure 9.3: Proposed Solid waste management system for Jaunpur city

Table 9.6: Salient features of the proposed SWM system

S.No.	Description	Number
1	Minimum design period for SWM	20 years
2	Design Waste quantity	100 TPD
3	Infrastructure required for Collection & transportation of waste	Auto tippers, tricycle rickshaws, collection bins (1.1 cum), refuse collectors (7cum), tipper trucks for street silt
4	Integrated waste management facility (IWMF)	Compost plant with Material recovery facility (100 TPD capacity) and sanitary landfill(for 20% rejects)
5	Land required for IWMF (2 ha for waste processing + 2 ha for SLF) – 20 year project life	4 ha
6	Estimated Capital cost for ISWM + C&T equipment	12crore INR

It is understood the Solid Waste Management for the city has already been awarded under PPP mode to a private entity A2Z.

9.4 DRAINAGE

Assumption drain length should cover 150 % of road length. Total road length in the Jaunpur city is 168.66 Km, as provided below:

***Table 9.7** :Road Network in Jaunpur*

S. No.	Type	Length (Km)
1	Total Length of concrete Road Network	77.27
2	Total Length of Dammar Road Network	66.44
3	Total Length of Kutcha Road Network	24.95
	Total	**168.66**

***Source**: Service Level bench Marking –General information of city*

Hence, 253 km of drains are required out of which 110.68 km of pucca and 33 km of kuccha drain exist. Thus there is a need of construction of 109.31 km of new drain and upgrading 33 km of kuccha drain. Additionally 10 km of storm water drain is proposed

***Table 9.8** :Cost estimate for Drainage Improvement*

S.no	Item	Km	Rate (INR Lakh/Km)	Total Cost (INR Cr.)	Term
1	Construction of new drain	109.3	27	**29.5**	**Long**
2	Upgradation of Kutcha drain	33	10	**3.3**	**short**
3	Construction of storm water drain	10	60	**6.0**	**medium**
	Total			**38.8**	

9.5 INSTITUTIONAL STRENGTHENING AND CAPACITY-BUILDING

Jaunpur is constantly plagued by the issues of irregular absenteeism, sub-standard work practices, non-compliance with occupation health and safety rules, non-cooperation with communities and several disciplinary issues.

Jaunpur also lacks the training programs to orient the workers towards best management practices, service delivery methods, and general code of conduct.

Jaunpur's municipal service management is further affected adversely owing to the vacancies in its department with respect to key positions.

Large absenteeism, disciplinary issues, non -compliance to best management practices, occupational health and safety rules, lack of training, regular vacancies in Jaunpur department are evidently the major issues.

PROPOSED STRUCTURE

According to the Model Municipal Law (MML) the municipal bodies should be responsible for basic facilities for the city including:

- Water supply;
- Drainage, waste management (sewerage & solid waste);
- Economic and social development plans;
- Transportation systems;
- Community health and protection of environment;
- Construction and maintenance of slaughterhouses.

Accordingly, the entire range of sanitation functions in any city should be vested in a single (well structured, capacitated, and (financially) resourced) institution. Hence, for the effective implementation of the city sanitation plan, it is very important to upgrade the existing institutional strength of the Nagar Palika of Jaunpur. Hence, restructuring of the current set up is proposed, with an officer from UP state services of the equivalent rank of the Superintendent Engineer, as Chief Executive of the organisation. Details of the proposed administrative set up are presented below:

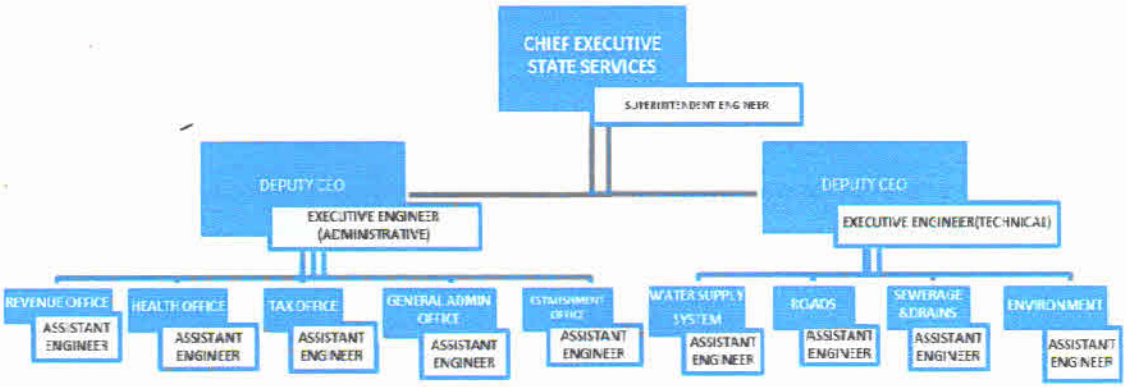


Figure 9.4: Proposed Organisation structure for NPP, Jaunpur

PERSONNEL MANAGEMENT AND OCCUPATIONAL HEALTH

Sanitation operations especially waste management essentially involve significant role of manpower especially sanitation workers and safaikaramcharis with most of them working on contract (temporary basis). Majority of these workers are unskilled and poorly educated. Further, the problems of low level of awareness, poor commitment, and discipline; resource diversion; absenteeism; alcoholism; drug addiction; etc. have also been commonly observed among these workers.

Further, due to the very nature of their occupation, the sanitation workers are exposed to a plethora of disease vectors at various stages of handling waste. As a result of this high exposure, typically, morbidity rate is found to be high among them, resulting in poor productivity as well as in generally high mortality.

In order to address these issues, it is recommended that NPP, Jaunpur allocate adequate resources to ensure appropriate interventions for management of personnel and their health and safety. These interventions comprise of a range of short-term training courses round the year on a regular basis for all grades of sanitation workers on the significance and importance of their work to the city to enhance self-esteem, on handling the issues of alcoholism and drug addiction and occupational health and safety aspects, personal health protection, etc.

NPP should arrange to conduct regular medical check-up of all MSW/sanitation workers with the provision of appropriate and commensurate support for curative treatment for those found to have chronic ailments.

Arrangement to provide uniforms, caps with NPP, Jaunpur logos, and personal protective equipment on a regular basis to impart a sense of identity.

Further the institutional set up and capacity for effective sanitation can be enhanced by NPP, Jaunpur by participatory approach:

- Engaging a group of NGOs and social workers with good communication skills to commence a sustainable campaign on effective sanitation practices all across the city;

- Involving civil society/ community-based organizations such as resident welfare associations, mohalla committees, market/traders associations, women's groups, and rag-pickers' groups in various municipal services & evolving a participatory monitoring system for sanitation services.

- Adopt a system of organizing regular consultations with stakeholders on the issues of, environmental sanitation, MSW management, public health and hygiene, quality of life and urban governance/development in general.

IMPLEMENTATION STRATEGY

For the capacity building and increase of awareness levels in the public, it is recommended that a third party is hired by NPP, Jaunpur which is competent enough to prepare a detailed IEC plan & implement it in a phased manner.

9.6 INVESTMENT SUMMARY

Following table 9.9 provides the summary of investment for various proposed works as a part of city sanitation plan of Jaunpur city. The implementation of various interventions have been further suggested to be taken up as short (1-3 year), medium(3-10 years) or long term (10-25 years) plans:

Table 9.9: Summary of capital cost for various interventions

S. No.	Intervention	Cost (Rs., crore)	Term plan
1	Public toilets	15.6	Short term plan
2	Sludge collection & Disposal	1.5	Short term plan
3	DPR Consultancy of Sewage System	1.2	Short term plan
4	Upgradation of Kutcha drain	3.3	Short term plan
5	**Subtotal Short Term Plan**	**21.6**	
6	Laying of Sewage network	315.0	Medium term Plan
7	Construction of storm water drain	6.0	Medium term Plan
8	**Subtotal Medium Term Plan**	**321.0**	
9	Construction of 36 MLD STP	38.8	Long term plan
10	Construction of new drain	29.5	Long term plan
11	Development of SWM system for the city	12.0	Long term plan
12	Subtotal Long Term Plan	**80.3**	
13	Preparation & Implementation of IEC plan (*details in Chapter 8*)	2.4	Continuous
	Grand TOTAL	**425.3**	

ANNEXURES

ANNEXURE-1

MINUTES OF MEETING OF STAKEHOLDERS CONSULTATION

Date : 06 May 2013

Time : 02:00 p.m. – 4:30 p.m.

Venue : Conference Hall, Jaunpur city

The meeting was convened by Mr. Mushir Ahmad, EO, NPP Jaunpur. The chairman, Sh. Dinesh Tandon introduced the consultants and explained the process of City Sanitation Plan. Dr. Awasthi gave the presentation on situation analysis based on the survey results and analysis conducted by the survey team. Mr. Javed Ahmad explained the prioritization setting exercise as proposed to be carried out at the conclusion of the meeting.

Comments of stakeholders:

- Animal bathing should not be allowed in the Gomati river
- Idol disposal in the river should be avoided.
- The cleanliness of the city should be given the top priority. For this, waste management should be taken up in an efficient manner by the Nagar Palika and awareness programmes should be conducted at regular basis.
- The Chairman responded that NPP, Jaunpur has already awarded the task of waste management has already been taken up as a PPP project and the work has been awarded to a private party, A2Z Ltd. For implementation.
- Sh. Diwakar Singh, president of drug association expressed his concerns about disposal of waste on river side and Drains carrying black and grey water discharges itself directly in the river without any treatment, there is no STP in the city which should be given top priority. If possible the option of constructive wetland for treatment of sewage should be explored.60% of health problem is due to contaminated water. Infections like diarrhea, dysentery, jaundice, typhoid are all caused due to contaminated water and thereby causing loss of valuable man days.
- Same concerns about river cleaning and solid waste management for the city were raised by Dr. Uday Veer Singh, Principal and ShRamjivanji, President of Health association and ShRajnath Gupta another, CSTF member. The members further proposed for construction of public toilets in the city.
- Dr. P.C. Vishwakarma appreciated the CSP process and proposed that projects for disposal of waste water and sewage treatment plant and should be given top priority, followed by de-silting of river.
- One of the citizens, Sh Sajid Khan mentioned about the quality of water supplied to the city and proposed for the water supply project and sewage management project as the priority projects. Installation of a centralized sewerage system and provision of clean drinking water forms the need of the hour. He mentioned that the process should not stop at planning stage but implementation should be given due importance.

- Stakeholders explained that only treating waste water and solid waste will not lead to sanitation, clean drinking water is also required in the city. The concerns were raised by many stakeholders including Sh Yogesh, reporter of Dianik Jagran and Smt. Renu Singh, Councellor of Jaunpur NPP. Sh Yogesh also mentioned about "Shakti Gomti Abhiyaan", an initiative of Dainik Jagran for cleaning of river Gomti.

- Dr. Kamal Abbas, Sh. B.D.Singh (Advocate) and Sh. Arshad Qureshi mentioned about the status of solid waste management in the city. They raised their concerns about the inadequate manpower of NPP and blockage of storm water drains due to unsystematic growth of the city. Bins are placed but people do not throw waste into them. Hence, there is a great need for awareness campaign for city cleaning.

- Indiscriminate disposal of solid waste and waste water in low lying areas will lead to contamination of ground water and the same should be checked immediately.

- EO expended his thanks to all present for participating and emphasized the need for planning process and systematic development. He explained the need for integrated planning and funding process. Cautioned against over taxation of marginalized citizens and emphasized the need for modern technology in development process. The need to clean Gomti river was emphasized.

The chairman thanked the stakeholders for their participation and proceeded with prioritization exercise.

LIST OF CSTF MEMEBERS

कार्यालय नगरपालिका परिषद जौनपुर।

पत्र संख्याः– 106 /सीन-टास्क / न0पा0परि0जौनपुर–2013–2014 दिनांकः–4 मई, 2013

कार्यालय–ज्ञाप

सिटी सैनीटेशन के उच्चीकरण हेतु शहरी विकास मंत्रालय भारत सरकार के नेशनल अरबन सैनीटेशन कार्यक्रम के अन्तर्गत नगर जौनपुर का सिटी सैनीटेशन प्लान तैयार किये जाने हेतु विकास तथा अनुश्रवण पर चर्चा किये जाने तथा सुझाव आमंत्रित किये जाने हेतु निम्नानुसार टास्क फोर्स का गठन किया जाता है।

क्र० सं०	सिटी सैनीटेशन प्लान तैयार किये जाने हेतु टास्क फोर्स समिति के पदाधिकारी एवं सदस्यों के नाम	पदनाम	मोबाईल नं०
1	श्री दिनेश टण्डन, अध्यक्ष नगरपालिका परिषद, जौनपुर।	अध्यक्ष	
2	श्री मुशीर अहमद, अधिशासी अधिकारी, नगरपालिका परिषद जौनपुर।	सचिव	
3	जिलाधिकारी महोदय द्वारा नामित	सदस्य	
4	पुलिस अधीक्षक महोदय द्वारा नामित	सदस्य	
5	मुख्य चिकित्साधिकारी	सदस्य	
6	नगर स्वास्थ्य अधिकारी	सदस्य	
7	अधिशासी अभियन्ता, पी0डब्लू0डी0	सदस्य	
8	अधिशासी अभियन्ता, जल निगम	सदस्य	
9	अधिशासी अभियन्ता, विद्युत वितरण खण्ड	सदस्य	
10	श्री शैलेश कुमार गर्ग, जलकल अभियन्ता	सदस्य	
11	श्री अशोक कुमार सरोज, कर निर्धारण अधिकारी	सदस्य	
12	श्री शमशाद जुबैर, कर अधीक्षक	सदस्य	
13	श्री हरिशचन्द्र यादव, सफाई निरीक्षक	सदस्य	
14	श्री ओमकार पटेल, अवर अभियन्ता	सदस्य	
15	श्री श्रीप्रकाश तिवारी, अवर अभियन्ता	सदस्य	
16	श्री बीरेन्द्र कुमार श्रीवास्तव, अवर अभियन्ता	सदस्य	
17	श्री तारकेश्वर नाथ सिंह, लेखाकार	सदस्य	
18	प्रोफेसर आर0एन0 तिवारी, टी0डी0 कालेज	सदस्य	
19	श्री उदय नरायन सिंह, प्रधानाचार्य, नगरपालिका इण्टर कालेज	सदस्य	
20	श्री ओमप्रकाश सिंह, सम्पादक ब्यूरो चीफ दैनिक जागरण	सदस्य	
21	श्री राजेन्द्र प्रताप सिंह, ब्यूरो चीफ हिन्दुस्तान	सदस्य	
22	ब्यूरो चीफ अमर उजाला	सदस्य	
23	श्री शशि मोहन सिंह 'क्षेम' ब्यूरो चीफ जन सन्देश	सदस्य	
24	श्री फूलचन्द्र यादव, ब्यूरो चीफ दैनिक मान्यवर	सदस्य	
25	श्री दुष्यन्त सिंह, एडवोकेट	सदस्य	
26	श्री बी0डी0 सिंह, एडवोकेट	सदस्य	
27	श्री सुरेश मिश्रा, एडवोकेट	सदस्य	
28	श्री रामजी जायसवाल, ब्यूरो चीफ, तेजस टुडे	सदस्य	✓
29	श्री सुशील वर्मा, एडवोकेट	सदस्य	
30	श्री रामजीयावन यादव, सभासद नगरपालिका परिषद, जौनपुर।	सदस्य	

31	श्रीमती अनुशा पटेल, सभासद, नगरपालिका परिषद, जौनपुर।	सदस्य	
32	श्री बसन्त प्रजापति, सभासद नगरपालिका परिषद, जौनपुर।	सदस्य	
33	श्रीमती बिन्दु यादव, सभासद नगरपालिका परिषद, जौनपुर।	सदस्य	
34	श्री फैजी खां, सभासद नगरपालिका परिषद जौनपुर।	सदस्य	
35	श्री राजेश कुमार चौधरी, सभासद नगरपालिका परिषद, जौनपुर।	सदस्य	
36	श्रीमती रितु सिंह, सभासद नगरपालिका परिषद, जौनपुर।	सदस्य	
37	श्री रवि मेघलानी, महामंत्री जिला उद्योग व्यापार	सदस्य	
38	श्री दिवाकर सिंह, प्रदेश अध्यक्ष इग्स व्यापार	सदस्य	✓ Views received
39	श्री सन्तोष अग्रहरि, अध्यक्ष जिला युवा व्यापार	सदस्य	
40	श्री राजनाथ गुप्ता, अध्यक्ष नगर व्यापार	सदस्य	✓
41	श्री अरशद कुरैशी, अध्यक्ष नगर समाजवादी पार्टी	सदस्य	
42	श्री संजीव यादव	सदस्य	✓
43	श्री सोमेश्वर केसरवानी	सदस्य	
44	श्री पारसनाथ साहू	सदस्य	
45	श्री शीतला प्रसाद तिवारी	सदस्य	
46	डा0 पी0सी0 विश्वकर्मा	सदस्य	
47	डा0 अजीत कपूर	सदस्य	
48	डा0 क्षितिज शर्मा	सदस्य	✓
49	डा0 कमर अब्बास	सदस्य	✓
50	डा0 बी0एस0 उपाध्याय	सदस्य	
51	डा0 राघेरमण जायसवाल, जे0सी0आई0	सदस्य	
52	श्री जितेन्द्र यादव, रिवर व्यू होटल	सदस्य	
53	Sajid		

(दिनेश टण्डन)
अध्यक्ष
नगरपालिका परिषद,
जौनपुर।

प्रतिलिपिः—समस्त सम्बन्धितगण।

(दिनेश टण्डन)
अध्यक्ष
नगरपालिका परिषद,
जौनपुर।

ANNEXURE-2
SURVEY QUESTIONNAIRE

Personal information

Name: _____ H. No.:_____ No. of members in the household:_____
Ward No.:_____ Employment Type: _____ Zone: ___ Income Category: _____

Q. No.	Questions	Responses	Count
I.	**Sanitation System**		
1.	Is there toilet facility available in house?	Yes	
		No	
		Total	
	Type of Toilet (Wet-Flush/dry- soak pit)		
2	If yes. a. How many members of household use it? b. Is the toilet shared by houses OR Individuals?		
3	If No, do you use a public/community toilet OR defecate openly?		
4.	Are there community toilets/ Urinals in your locality?	Yes	
		No	
		Total	
4a	**If Yes:**		
	What is the condition of the public toilet?		
	Who is responsible for maintenance of the public toilet?		
	Is there any user fee/charges for the usage of public toilet?		
	If yes, what are the charges?		
	How many people use the public toilet (average daily number of visitors)		
	Any toilet for physically disabled persons in your community		
4b.	**If Not**, are you willing to contribute to such facilities?	Yes	
		No	
		Total	
6.	Will you also contribute to O&M of such facilities?	Yes	
		No	
		Total	
7.	What type of toilet do you use and where the waste is disposed?	Open drains	
		Manual Scavenging	
		Septic Tank (if yes, go to section ...)	
		Connected to sewerage system (if yes, go to section II)	
II.	**Sewerage System**		
1.	Do you have sewer connection?	Yes	
		No	

2.	If yes, what is the cost of the connection you paid?		
	Any monthly fee?		
3.	If no, are you willing to pay for sewerage connection and how much?	Yes	
		No	
4.	Do you face any problem with your sewer connection?	Chocking	
		Frequent leakage/rupture	
		Foul smell	
		Overflowing in rainy season	
5.	Who is responsible for cleaning the sewerage system of your locality?	Pvt./ Municipality/any other agency	
6.	How often the corporation people visit you for health/sewerage purpose	Quarterly	
		Half yearly	
		Annually	
		Need base	
		When complaint is made	
	Where does the sewage go from your place	STP/open drains/storm drain/river/any other	
III.	**Septic Tanks**		
1.	Are you connected to individual septic tank or community septic tank?		
2.	Who manages the septic tanks?	Municipal corporations	
		Community initiatives	
		Individuals	
		No One	
3.	How often do you get the septic tank cleaned?	Once in a year	
		Once in two years	
		Once in three years	
		Not yet done	
4.	How much do you pay for septic tank cleaning to MC or community initiatives?		
5.	Where is septic tank waste disposed off?	STP	
		Open drain/ open space	
		Don't know	

IV.	**Water Supply**		
1.	What is the source of water supply?	Municipal corporation	
		Bore –well	
		Private tankers	
		others	
2.	What is the frequency of water supply?	< 2 hours	
		2-4 hours	
		4-8 hours	
		>8 hours	
3.	What is the quality of water supplied?	Always poor	
		Occasionally poor	
		Good	
4.	Do you have your own house water connection?	Yes	
		No	
5.	What is the adequacy of water supply?	Sufficient	
		Not sufficient	
V.	**Solid Waste Management**		
1.	Where do you dispose your household solid waste?	In drain	
		In open	
		To nominated agency/ scheduled collection	
		Waste containers/ community bins	
2.	How far is the place, where Solid waste is dumped?	< 100 mts	
		100-200 mts	
		200-500 mts	
		>500 mts	
3.	How often the garbage is collected by ULBs?	Once in a day	
		Once in two days	
		Once in three days	
		Never picked up	
4.	Do you have domestic animals?	Yes	
		No	
5.	Where do you dispose the animal waste?	In open	
		Use at home	
		Dispose with other waste	
		Outside the city	

ANNEXURE-3
DETAILS OF VARIOUS SCHEMES FOR IMPLEMENTATION OF CITY SANITATION PROJECTS

ValmikiAmbedkarAwasYojana's component - Nirmal Bharat Abhiyan

Though the National Slum Policy was never finalized, yet on 15 August 2001 the Prime Minister of India announced a new Centrally Sponsored Scheme called the ValmikiAmbedkarAwasYojana (VAMBAY), to ameliorate the conditions of the urban slum dwellers living below the poverty line. The main objective being to provide shelter or upgrade the existing shelter for people living below the poverty line in urban slums in a march towards the goal of slum less cities with a healthy and enabling urban environment. The guidelines of the scheme say: "Another very important basic amenity for slum dwellers especially in congested metropolitan cities is the lack of rudimentary toilet facilities. A new National City Sanitation Project under the title of 'Nirmal Bharat Abhiyan' is an integral sub component of VAMBAY. 20% of the total allocation under VAMBAY will be used for the same. The State Governments/ Local Bodies will be free to supplement the Government of India subsidy with their own grant.

Integrated Low Cost Sanitation (ILCS) Scheme, 2008

The Centrally Sponsored Scheme of Low Cost Sanitation for Liberation of Scavengers started from 1980-81 initially through the Ministry of Home Affairs and later on through the Ministry of Welfare. From 1989-90, it was operated through the Ministry of Urban Development and later on through Ministry of Urban Employment and Poverty Alleviation now titled Ministry of Housing & Urban Poverty Alleviation. A revised set of guidelines were released in January 2008. (The scheme is now called the "Integrated Low Cost Sanitation" Scheme)

The main objectives of the Scheme are to convert the existing dry latrines into low cost pour flush latrines and to construct new ones where EWS (Economically Weaker Section) households have no latrines and follow open defecation practices.

The scheme is on an 'All Town' coverage basis. The proposal can be submitted by the urban local body duly authorized by the State Government to the State Urban Development Authority for undertaking the programme. The concerned urban local body/ organisation has to give an undertaking prohibiting dry latrines in the towns thereafter.

The programme can be implemented by any state selected local NGO having adequate experience in this field , with the maximum funding of 15% over and above the total project cost to be borne by the Centre and States based on the ratio of 5:1 at different stages of implementation.

Further, the NGO shall be given the responsibility to look after operation and maintenance of the converted units, and organise training/ seminars for preparation of project reports and estimates by the ULBs/Development Authorities (DAs) after ensuring willingness of identified beneficiaries.

Table 5.1

S. No.	Projects proposed	Schemes/ Plans	Funding agency
1	Waste water management system (laying of sewers and development of STP)	Water for Asian Cities programme, 2006 of UN-HABITAT: Water and Sanitation trust Fund	Asian Development Bank (ADB)
		Small scale finance for water and sanitation (WATSEN) scheme	Department for International Development (DFID), UK

S. No.	Projects proposed	Schemes/ Plans	Funding agency
		Sewerage PPPs: PPPs on urban infrastructure under AusAID-WB partnership project scheme for South Asia	AusAID –World Bank
		Integrated Low Cost Sanitation (ILCS) Scheme, 2008, under NUSP	Ministry of Housing & Urban Poverty Alleviation (HUPA), Govt. of India
		UIDSSMT started in 2005-6, under JNNURM of MoUD	Ministry of Urban development, Govt. of India
		UP Urban Sanitation policy,	State Govt. U.P.
		Total sanitation Campaign (TSC) Budget	U.P. state Govt. funds
		PPP initiatives scheme	Central/ State govt. of India
2.	Solid waste management system including collection, transportation, treatment (composting plant) and disposal system	UIDSSMT started in 2005-6, under JNNURM of MoUD	Ministry of Urban Development (MoUD), Govt. of India
		Under MSW (management and handling) rules, 2000	CPCB, MoEF, Govt. of India
		PPP initiatives scheme/support to NGOs	Ministry of Finance, Govt. of India
		Under District/city planning scheme, 2008	Planning Commission, Govt. of India
		Federal grant schemes for SWM	EPA'S Indian Health Service, U.S. Department of Interior Bureau of Indian Affairs (BIA)
3	Water supply system for the city including development of source i.e basic treatment of groundwater, reservoirs, pump houses and laying of supply pipelines, household connections	Revised National Water Policy, 2002	Ministry of Water Resources (MoWR), Govt. of India
		Urban Water Supply Programme (AUWSP), 1994, currently merged under UIDSSMT of JNNURM	Ministry of Urban Development (MoUD), Govt. of India
		Water for Asian Cities programme, 2006 of UN-HABITAT: Water and Sanitation	Asian Development Bank (ADB)

S. No.	Projects proposed	Schemes/ Plans	Funding agency
		trust Fund	
		Small scale finance for water and sanitation (WATSEN) scheme	Department for International Development (DFID), UK
		Under District/city planning scheme, 2008	Planning Commission, Govt. of India
		Urban infrastructure PPPs under AusAID-WB partnership project scheme for South Asia	AusAID –World Bank

ANNEXURE-4
MUNICIPAL SOLID WASTE PROCESSING TECHNOLOGIES

THERMAL PROCESSING TECHNOLOGIES

Thermal processing technologies are mainly adopted to treat the hazardous waste with high calorific values. Thermal technologies are those technologies that operate at temperatures greater than 200°C and have higher reaction rates. They typically operate in a temperature range of 375°C to 5,500°C. Thermal technologies include advanced thermal recycling (a state-of-the-art form of waste to-energy facilities) and thermal conversion (a process that converts the organic carbon based portion of the MSW waste stream into a synthetic gas which is subsequently used to produce products such as electricity, chemicals, or green fuels). These technologies are briefly described below.

INCINERATION

Mass-burn systems are the predominant form of the MSW incineration. Mass-burn systems generally consist of either two or three incineration units ranging in capacity from 50 to 1,000 tons per day; thus, facility capacity ranges from about 100 to 3,000 tons per day. It involves combustion of unprocessed or minimally processed refuse. The major components of a mass burn facility include: (1) Refuse receiving, handling, and storage systems; (2) Combustion and steam generation system (a boiler); (3) Flue gas cleaning system; (4) Power generation equipment (steam turbine and generator); (5) Condenser cooling water system; and (6) Residue hauling and storage system. This technology is predominantly applicable for hazardous waste.

PYROLYSIS

In Pyrolysis, at high temperatures of 700°C to 1200 °C, thermal degradation of organic carbon-based materials is achieved through the use of an indirect, external source of heat, in the absence or almost complete absence of free oxygen. This thermally decomposes and drives off the volatile portions of the organic materials, resulting in a syngas composed primarily of hydrogen (H_2), carbon monoxide (CO), carbon dioxide (CO_2), and methane (CH_4). Some of the volatile components form tar and oil, which can be removed and reused as a fuel. Most Pyrolysis systems are closed systems and there are no waste gases or air emission sources (if the syngas is combusted to produce electricity, the power system will have air emissions through a stack and air emission control system). After cooling and cleaning in emission control systems, the syngas can be utilized in boilers, gas turbines, or internal combustion engines to generate electricity or used as raw stock in chemical industries. The balance of the organic materials that are not volatile or liquid that is left as a char material, can be further processed or used for its adsorption properties (activated carbon). Inorganic materials form a bottom ash that requires disposal, although some pyrolysis ash can be used for manufacturing brick materials. Similar to incineration, Pyrolysis is also applicable for hazardous waste treatment.

GASIFICATION

In the Gasification process, thermal conversion of organic carbon based materials is achieved in the presence of internally produced heat, typically at temperatures of 660°C to 1800°C, and in a limited supply of air/oxygen (less than stoichiometric, or less than is needed for complete combustion) to produce a syngas composed primarily of H_2 and CO. Inorganic materials are converted either to bottom ash (low-temperature gasification) or to a solid, vitreous slag (high temperature gasification that operates above the melting temperature of inorganic components). Some of the oxygen injected into the system is used in reactions that produce heat, so that Pyrolysis (endothermic) gasification reactions can initiate; after which, the exothermic reactions control and cause the gasification process to be self-sustaining. Most gasification systems, like Pyrolysis, are closed systems and do not generate waste gases or air emission sources during the gasification phase. After cooling and cleaning in emission control systems, the syngas can be utilized in boilers, gas turbines, or internal combustion engines to generate electricity, or to make chemicals.

PLASMA ARC GASIFICATION

In Plasma Arc Gasification process, alternating current (AC) and/or direct current (DC) electricity is passed through graphite or carbon electrodes, with steam and/or oxygen/air injection (less than stoichiometric), to produce an electrically conducting gas (a plasma) typically at temperatures greater than 2,200°C. This system converts organic carbon-based materials, including tar, oil, and char, to syngas composed primarily of H2 and CO and inorganic materials to solid, vitreous slag. Like Pyrolysis and conventional Gasification, Plasma Arc Gasification is a closed system; therefore there are no waste gases and no emission sources in the Plasma Arc Gasification process. After cooling and cleaning in emission control systems, the syngas produced by plasma arc gasification can be utilized in boilers, gas turbines, or internal combustion engines to generate electricity or to make chemicals. The final emission products are CO2 and water. The furans and dioxins in the emissions are extremely low and lower than the recommended USEPA or EU emission norms.

Biological Processing Technologies

Biological technologies are widely used to treat Municipal Solid Wastes (MSW) and are operated at lower temperatures with lower reaction rates. Biological processing technologies are essentially focused on the conversion of organics in the MSW consisting of dry matter and moisture. The dry matter further consists of organics (i.e., whose molecules are carbon-based), and minerals, also referred to as the ash fraction. The organics can be further subdivided into biodegradables or refractory organics, such as food waste, and non-biodegradables, such as plastic. Biological technologies can only convert biodegradables component of the MSW. Byproducts can vary, which include: electricity, compost and chemicals. Various biological processing technologies are briefly described below.

Composting

Composting is a natural micro-biological process where bacteria break down the organic fractions of the MSW stream under controlled conditions to produce a pathogen-free material called "Compost" that can be used for potting soil, soil amendments (for example, to lighten and improve the soil structure of clay soils), and mulch. The microbes, fungi, and macro-organisms that contribute to this biological decomposition are generally aerobic. A mixture of organic materials is placed into one or more piles (windrows), and the natural microbial action will cause the pile to heat up to 65-80°C, killing most pathogens and weed seeds. A properly designed compost heap will reach 70°C within 6 to10 days, and slowly cool off back to ambient temperatures as the biological decomposition is completed. Systematic turning of the material, which mixes the different components and aerates the mixture, generally accelerates the process of breaking down the organic fraction, and a proper carbon/nitrogen balance (carbon to nitrogen or C/N ratio of 20:1) in the feedstock insures complete and rapid composting. The composting process takes from 17 to 180 days. For composting process, the moisture content of the MSW should be ideally > 45%. There are two fundamental types of composting techniques: open or windrow composting, which is done out of doors with simple equipment and is a slower process, and enclosed system composting, where the composting is performed in some enclosure (e.g., a tank, a box, a container or a vessel).

Anaerobic Digestion

In anaerobic digestion (AD), biodegradable material is converted by a series of bacteria groups into methane and CO_2. A first group breaks down large organic molecules into small units like sugar. This step is referred to as hydrolysis. Another group of bacteria converts the resulting smaller molecules into volatile fatty acids, mainly acetate, but also hydrogen (H_2) and CO_2. This process is called acidification. The last group of bacteria, the methane producers or methanogens, produce biogas (methane and CO_2) from the acetate and hydrogen and CO_2. This biogas can be used to fuel boilers or reciprocating engines with minimal pretreatment. In addition to biogas, anaerobic bioconversion generates a residue consisting of inorganics, non-degradable organics, nondegraded biodegradables, and bacterial biomass. If the feedstock entering the process is sufficiently free of objectionable materials like colorful plastic, this residue can have market value as compost. AD process is also referred to as Biomethanation process.

Bioreactor Landfill

A bioreactor landfill is a wet landfill designed and operated with the objective of converting and stabilizing biodegradable organic components of the waste within a reasonable time frame by enhancing the microbiological decomposition processes. The technology significantly increases the extent of waste decomposition, conversion rates and process effectiveness over what would otherwise occur in a conventional wet landfill. Stabilization in this context means that landfill gas and leachate emissions are managed within one generation (twenty to thirty years) and that any failure of the containment system after this time would not result in environmental pollution. There is better energy recovery including increased total gas available for energy use and increased greenhouse reduction from reduced emissions and increase in fossil fuel offsets. These factors lead to increased community acceptance of this waste technology. Management of a bioreactor landfill requires a different operating protocol to conventional landfills. Liquid addition and recirculation is the single most important operational variable to enhance the microbiological decomposition processes. Other strategies can also be used to optimize the stabilization process, including waste shredding, pH adjustment, nutrient addition and temperature management.

Physical Processing Technologies

Physical technologies involve altering the physical characteristics of the MSW feedstock. The MSW is subjected to various physical processes that reduce the quantity of total feedstock, increase its heating value, and provide a feedstock. It may be densified or palletized into homogeneous fuel pellets and transported and combusted as a supplementary fuel in utility boilers. These technologies are briefly described below.

Refused Derived Fuel or RDF

The RDF process typically includes thorough pre-separation of recyclables, shredding, drying, and densification to make a product that is easily handled. Glass and plastics are removed through manual picking and by commercially available separation devices. This is followed by shredding to reduce the size of the remaining feedstock to about eight inches or less, for further processing and handling. Magnetic separators are used to remove ferrous metals. Eddy-current separators are used for aluminum and other non-ferrous metals. The resulting material contains mostly food wastes, non-separated paper, some plastics (recyclable and non-recyclable), green wastes, wood, and other materials. Drying to less than 12% moisture is typically accomplished through the use of forced-draft air. Additional sieving and classification equipment may be utilized to increase the removal of contaminants. After drying, the material often undergoes densification processing such as pelletizing to produce a pellet that can be handled with typical conveying equipment and fed through bunkers and feeders. The RDF can be immediately combusted on-site or transported to another facility for burning alone, or with other fuels. The densification is even more important when RDF is transported off-site to another facility, in order to reduce volumes being transported. RDF is often used in waste to energy plants as the primary or supplemental feedstock, or co-fired with coal or other fuels in power plants, in kilns of cement plants, and with other fuels for industrial steam production.

Mechanical Separation

Mechanical separation is utilized for removing specific materials or contaminants from the inlet MSW stream as a part of the pre-treatment process. Contaminants may include construction and demolition (C&D) debris, tires, dirt, wet paper, coarse materials, and fine materials. Generally, MSW reaching the dumping sites is unsegregated and mixed containing C&D debris and other contaminants. Therefore, it is essential to remove these contaminants from the incoming MSW by mechanical separation before processing the waste further by either biological, physical and thermal technologies (except Plasma Arc Technology).

However, in MBIR project source segregation will be adopted and the C&D debris (if generated) is expected to be reused for daily cover of the landfill. Therefore, the MSW reaching the dumping grounds may not require the elaborate mechanical separation process. This MSW has high organic content, fit to be directly used for various technologies after manual sorting only.

Size Reduction

Size reduction is often required to allow for more efficient and easier handling of materials, particularly when the feed stream is to be used in follow-on processes. Sizing processes include passive, moving, and vibrating screens and trommels. In order to reduce the size of the entire stream, or portions of it, mechanical equipment, such as shredders, is utilized. This allows for other physical processes, such as dryers, magnetic and eddy current separators, and densification equipment to work more efficiently. Magnetic and eddy current separators may be installed both up- and down-stream of shredders to increase the recovery of metals.

LANDFILLING

Landfilling means disposal of residual solid wastes on land in a facility designed with protective measures against pollution of ground water, surface water and air fugitive dust, wind-blown litter, bad odour, fire hazard, bird menace, pests or rodents, greenhouse gas emission, slope instability and erosion. Both for MSW and industrial hazardous waste landfilling is an essential component of solid waste management plan to accommodate the residue of treatment and the inert coming from the waste streams.

The technical requirement and design criteria for disposal of MSW and hazardous waste are different and is depends upon the quantity and characteristics of the waste. Therefore, in the solid waste management plan for MBIR two separate disposal strategy will be adopted for MSW and hazardous waste.

About Composting

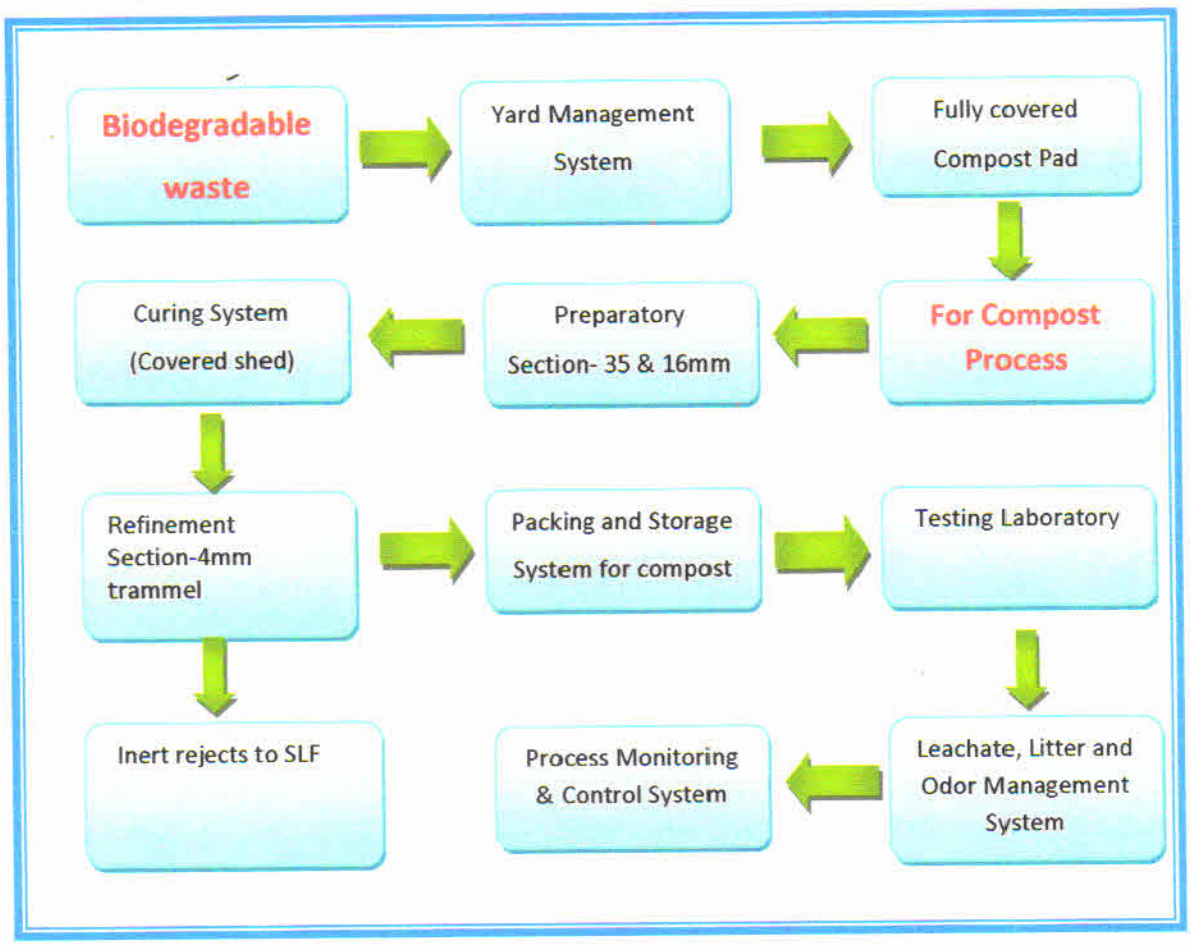
Composting is a means of processing waste, which is a legal requirement, provided under the Municipal Solid Waste Management (MSW) Rules 2000 for all municipal bodies in the country. The MSW Rules 2000 requires that "biodegradable wastes shall be processed by composting, vermi-composting, anaerobic digestion or any other appropriate biological processing for the stabilization of wastes"

Aerobic composting is the process of degradation of biodegradable waste matter into simple organic compounds by certain microorganisms in the presence of air. The process begins at ambient temperature by the activity of mesophilic bacteria, which oxidize carbon to CO_2, thus liberating large amount of heat, with the temperature reaching 50^0C within two days. At this point the process is taken over by thermophilic bacteria and the temperature continues to rise. Most of the thermophilic phase, which lasts for about two weeks, takes place in the temperature range of 55 – 65^0C. The process is dependent on the provision of adequate supplies of air and moisture for the bacteria, in addition to the nutrients provided by the wastes.

The complete composting process comprises of following activities:

- *Yard management system (windrow system)*: Fresh MSW will be stacked on the compost pad in the form of trapezoidal heaps (called windrows), inoculated and processed for correct composting & stabilised. *Due to heavy monsoons in the project location, entire compost pad would be covered.*
- *Coarse segregation system*: Automated screening system for segregation of lumpy and highly heterogeneous material.
- *Curing system*: Final curing for 15 days for further stabilisation and moisture control
- *Refinement system*: Removing of impurities such as glass, plastics, inert, etc. and maintaining the size below 4 mm as per compost quality norms.
- *Packing and storage system*: High quality compost will be stored in storage godown and packed in bags, as per the market requirements.
- *Testing laboratory*: Well-equipped laboratory will be set up to help in in-house testing of critical parameters such as temperature, moisture, C/N ratio, aerobic conditions etc.

FIGURE 1: PROCESS FLOW DIAGRAM AT COMPOST PLANT



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