



एक कदम स्वच्छता की ओर



CITY SANITATION PLAN

DRAFT REPORT OF CHANDAUSI

2017

JT Urja Pvt. Ltd.

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LIST OF ABBREVIATIONS

ADB	Asian Development Bank
AUSAID-WB	Australian Agency for International Development –World bank Group
BIA	Bureau of Indian Affairs
CSP	City Sanitation Plan
CPHEEO	Central Public Health and Environmental Engineering Organization
CT	Community Toilets
CSTF	City sanitation Task Force
DFID	Department for International Development
DMA	Directorate of Municipal Administration
DMHO	District Medical Health Officer
DPR	Detailed Project Report
FGD	Focus Group Discussions
FY	Financial Year
GoI	Government of India
GIS	Geographic Information System
GOUP	Government of Uttar Pradesh
HHs	Households
HSC	House Service Connections
HUPA	Housing and Urban Poverty Alleviation
IEC	Information Education and Communication
ILCS	Integrated Low Cost Sanitation
JnNURM	Jawaharlal Nehru National Urban Renewal Mission
MDG	Millennium Developments Goals
MSL	Mean Sea Level
MEPMA	Mission for Elimination of Poverty in Municipal Areas
M & E	Monitoring and Evaluation
MSW	Municipal Solid Waste
MOWR	Ministry of Water Resources
MOF	Ministry of Finance
MOEF	Ministry of Environment and Forests
NGO	Non-Government Organization
NPP	Nagar Palika Parishad
NRW	Non-Revenue Water
NUSP	National Urban Sanitation Policy
ODF	Open Defecation Free

O & M	Operation and Maintenance
PHED	Public Health and Engineering Department
PSP	Public Semi Public
PPP	Public Private Partnership
RVM	Rajiv Vidya Mission
SI	Sanitary Inspector
SLB	Service Level Benchmarking
SSA	Sarva Shiksha Abhiyan
SSHE	School Sanitation and Hygiene Education
STP	Sewage Treatment Plant
SWM	Solid Waste Management
TSC	Total Sanitation Campaign
UGD	Under Ground Drainage
UIDSSMT	Urban Infrastructure Development for Small and Medium Towns
ULB	Urban Local Body
UWSP	Urban Water Sanitation Programme
VAMBAY	Valmiki Ambedkar Awas Yojna
WC	Water Closet

Units of Measure

lpcd	litres per capita per day
MLD	Million Litres per Day
TPD	Tonnes Per Day
m	metre
sq.m	square metre

1 INTRODUCTION

1.1 BACKGROUND

Sanitation is defined as safe management of human excreta, including its safe confinement treatment, disposal and associated hygiene-related practices.

Inadequate sanitation is a major cause of disease world-wide. Sanitation related illnesses in both children and adults deplete productivity and resources and ultimately contributes to deprivation. The problem of sanitation is much worse in urban areas than in rural due to increase in congestion. The character of urban growth is often informal and takes place predominantly in peri-urban areas or at city fringes. These results in a high number of people exposed to severe health and environmental risks because they are unserved by the city's sanitation systems. Tangible problems connected with urban sanitation are:

- production of enormous amounts of waste and wastewater that is insufficiently collected and treated;
 - lack of on-site systems for proper fecal sludge management;
 - pollution of shallow ground water – often the source of drinking water for slum dwellers – by leaking sewers, waste, and latrine
 - e contents; and
 - Uncontrolled reuse of (untreated) sewage for irrigation in peri-urban agriculture.
- Municipalities all over the world face great difficulties in providing sustainable infrastructure to their citizens especially in developing countries since they are most affected by this rampant urbanization.

City Sanitation (Master) Plans (CSP), sometimes also referred to as Municipal Sanitation Plans or Water and Sanitation Strategy Plans, are strategic planning processes for citywide sanitation sector development. To manage water resources, water safety plans (WSP) exist.

A citywide sanitation strategy includes the vision, missions, and goals of sanitation development as well as strategies to meet these goals. Each strategy is then translated into indicative programmes (and projects).

1.2 OBJECTIVES OF CITY-WIDE SANITATION PLAN

To meet the total sanitation principles, a city needs a strategic approach. Following are some generic approaches that a city can use as the basis for developing more strategic approaches to sanitation development.

- Enhance synergy among the actors in sanitation development, including municipal government agencies, the private sector, NGOs, and others.
- Employ appropriate technologies that are suitable to user needs, while ensuring that they are relevant to the city's actual conditions, comply with technical standards, and prevent potential impacts (see also sanitation systems).
- Develop sanitation in all parts of the city (citywide), prioritising poor residential areas where the health risks are highest.
- Promote awareness of health and hygiene behavior while creating demand for better sanitation services (see also health and hygiene issues).
- Create opportunities and incentives for private sector initiatives in the development and operation of sanitation services (see also public private partnerships).
- Foster better use of existing sanitation services, which becomes the basis for developing new services.
- Encourage the development of community-based sanitation services, especially in areas where public and private services are difficult to establish.
- Engage stakeholder groups, including women groups, in sanitation planning, in line with their respective capacities (see also water sanitation and gender).
- Create enabling institutional and regulatory frameworks to accelerate sanitation services development.

- Increase funding from sources other than municipal government, such as from the national and provincial governments, donor agencies, the private sector and the public (see also financing and sources of funding).
- Adopt step-wise sanitation development as available resources allow.

1.3 CONTEXT

During the last fifty years the population of India has grown two and half times, while the urban India has grown by nearly five times. According to Census of India 2011, 31.16% of Indians, i.e. 377.1 million people live in urban areas. The Census 2011 also showed that in 4,041 statutory towns, close to eight million households do not have access to toilets and defecate in the open (7.90 million). The positive role of urbanization has often been over-shadowed by the deterioration in the physical environment and quality of life in the urban areas caused by widening gap between demand and supply of essential services and infrastructure. It is further associated

with many problems, such as high levels of poverty, environmental stress, risks to productivity, high health costs, and lack of access to basic services, such as water supply, sanitation, sewerage system, and housing. The insufficient availability of services, inadequate awareness and also poor operation and maintenance has also given rise to poor sanitation conditions.

As per the projections of Registrar General and Census Commissioner, Govt. of India (2006), 73 million urban people do not have access to latrines and practice open defecation with 5.48 million urban households use community latrines and 13.4 million households use shared latrines. More than 75% of surface water pollution is due to municipal sewage. The percentage of notified and non-notified slums without latrines is 17 percent and 51 percent respectively. In respect of septic latrines the availability is 66 percent and 35 percent. In respect of underground sewerage, the availability is 30

FACT FIGURES- INDIA

73 million urban people with no access to latrine.

Out of 423 cities, only 300 cities have 20-50% sewer networks.

85% wastewater discharged without treatment.

More than 37% of total human excreta in Urban India is unsafely disposed.

percent and 15 percent respectively. This imposes significant public health and environmental costs to urban areas that contribute more than 60% of the country's GDP.

1.4 NATIONAL URBAN SANITATION POLICY

Therefore, in 2008 Government of India (GOI) has recognized that there is an urgent need to address the issue to provide environmental sanitation, i.e. solid waste management; generation of industrial and other specialized / hazardous wastes; drainage in the cities and formulated **National Urban Sanitation Policy 2008** with the vision of to make:

“All Indian cities and towns 100% 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.”

It is understood that without proper city sanitation plan and resulting state sanitation strategy, as indicated in National Urban sanitation policy-2008 comprehensive planning cannot be achieved.

The Govt. of India had identified 100% sanitation as a goal during 11th five year plan. The Ministry of Urban Development (MoUD) officially launched a country wide NUSP on Nov. 12, 2008 with an objective to call upon individual states to draft their own strategy based on NUSP while taking into account their specific requirements.

The key issues of urban sanitation policy are to address the awareness in poor, social and occupational hazards to sanitation workers, gaps and overlaps existing in roles and responsibilities of institutions at national, state and city levels, full scale integrated safe confinement, disposal and treatment, searching for alternative cost effective and sustainable technological options, reaching to the un-served and poor (non-notified slums) population, and needs to demand responsive.

1.4.1 POLICY GOALS

The overall goal of this policy is to transform Urban India into **community-driven, totally sanitized, healthy and livable cities and towns.**

The specific goals are:

- Awareness Generation and Behavior Change
- Open Defecation Free Cities
- Integrated City-Wide Sanitation
- Sanitary and Safe Disposal
- Proper Operation & Maintenance of all Sanitary Installations



NUSP GOAL

“Urban India with community-driven, totally sanitized, healthy and livable cities and towns”

1.4.2 NUSP PLANNING INSTRUMENTS

NUSP provides states and cities with a comprehensive set of planning tools that will help in achieving the specific goals of NUSP. The two main instruments are the State Sanitation Strategies (SSS) and City Sanitation Plans (CSP), both vision documents to drive economic, social and environmental development:

State Sanitation Strategies (SSSs): Sanitation is a state subject. Hence, NUSP requires states to develop state sanitation strategies that define clear objectives and approaches to improve sanitation across the state.

City Sanitation Plans (CSPs): City Sanitation Plans are sector-planning instruments developed in synchronization with the SSS. CSPs guide Urban Local Bodies in achieving citywide sanitation through coordinated development, prioritisation and optimisation of investments in sanitation infrastructure, services and management. CSPs detail short- medium and long-term action plans for technical solution and strategies for improved governance, financial sustainability, capacity building, advanced technology and inclusiveness (CSP’s 5 strategic dimensions explained in the diagram below).

Under the policy, all states are requested to act at par with the NUSP to develop respective SSSs and prepare CSPs.

FIGURE 1: DIMENSIONS FOR SUSTAINABLE CITY WIDE SANITATION



1.4.3 RATING AND CATEGORIZATION OF CITIES BY NUSP

The rating of cities in regard to their performance in sanitation improvements will be based on set of objective indicators of outputs, processes and outcomes.

Three Categories of Indicators

The rating exercise will involve three categories of indicators:

Output Related Indicators: pertain to the city having achieved certain results or outputs in different dimensions of sanitation ranging from behavioral aspects and provision, to safe collection, treatment and disposal without harm to the city's environment. There are nine main output-indicators accounting for 50 points of the total of 100 points.

Process Related Indicators: pertain to systems and procedures that exist and are practiced by the city agencies to ensure sustained sanitation. There are seven main process-indicators accounting for 30 points of the total of 100 points.

Outcome Related Indicators: include the quality of drinking water and that of water in water-bodies of city, as also the extent of reduction in sanitation-related and water-borne diseases in the city over a time period. There are three main outcome-indicators accounting for 20 points of a total of 100 points¹.

Ideally, data for the above outputs, processes and outcomes are regularly collected by city authorities but at present, very few cities will have, at best, partial data available. This rating exercise will help in highlighting the need for regular data-collection and monitoring of indicators.

TABLE 1-1 : RATINGS OF CITIES

S. No.	Category	Points	No. of cities	Description
1	Red	≤33	204	Cities needing immediate remedial action
2	Black	34-66	228	Needing considerable improvements
3	Blue	67-90	4	Recovering but still diseased
4	Green	91-100	0	Healthy and Clean city

On the basis of the said rating scheme, cities will be placed in different categories as presented in Table 1 and the distribution of the 436 cities is also depicted. National rating survey data will utilize these categories for publication of results. On the basis of plans prepared and implemented, cities will be able to measure the results of their actions, and be able to clearly chart out their improvements over time compared to their baseline situation.

On achievement of remarkable results, i.e. coming into the Green category (Healthy and Clean City), cities will typically become eligible for the national award. Other cities showing remarkable incremental performance or selective achievements may also be given special or honorary awards. Cities in different size-classes may also be considered

for category-wise awards. Based on results of the Rating survey and selection of awardees, cities will be invited to participate in a National Urban Sanitation Award ceremony.

The survey was undertaken across 423 cities including Municipal Corporations and Class A cities across the country. As per the national ranking, Chandausi was ranked 308 at the national level with an overall aggregate mark of 28.41 on 100. Mark as a Red category.

1.5 UTTAR PRADESH URBAN SANITATION POLICY

1.5.1 VISION

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

1.5.2 GOALS

- Awareness generation and behavior change.
- Open defecation free cities.
- Integrated city- wide sanitation.
- Sanitary and Safe Disposal.

1.6 MUNICIPAL SOLID WASTE RULES, 2000

The Municipal Solid Wastes (Management and Handling) Rules, 1999 were published under the notification of the Government of India in the Ministry of Environment and Forests. In exercise of the powers conferred by section 3, 6 and 25 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government hereby made the rules to regulate the management and handling of the municipal solid wastes, 2000.

Municipal Solid Waste (Management & Handling) Rules, 2000 (MSW Rules) are applicable to every municipal authority responsible for collection, segregation, storage, transportation, processing and disposal of municipal solids. The Rules contains four Schedules namely;

TABLE 1-2: SCHEDULE DETAILS OF MSW RULES, 2000

Schedule-I	Relates to implementation Schedule
Schedule-II	Specifications relating to collection, segregation, storage, transportation, processing and disposal of municipal solid waste (MSW).
Schedule-III	Specifications for land filling indicating; site selection, facilities at the site, specifications for and filling, Pollution prevention, water quality monitoring, ambient air quality monitoring, Plantation at landfill site, closure of landfill site and post care.
Schedule-IV	Indicate waste processing options including; standards for composting, treated I lakhtates and incinerations.

The MSW Rules -2000 categorically state the roles and responsibilities of ULBs, the State Govt., the Union Territory Administrations and the Pollution Control Boards. The roles of the ULBs as stated are as follows:

- Every municipal authority shall, within the territorial area of the municipality, be responsible for the implementation of the provisions of these rules, and for any infrastructure development for collection, storage, segregation, transportation, processing and disposal of municipal solid wastes.
- The municipal authority or an operator of a facility shall make an application in Form-I, for grant of authorization for setting up waste processing and disposal facility including landfills from the State Board or the Committee in order to comply with the implementation programme laid down in Schedule I.
- The municipal authority shall comply with these rules as per the implementation schedule laid down in Schedule I.
- The municipal authority shall furnish its annual report –
 - To the Secretary-in-charge of the Department of Urban Development of the concerned State or as the case may be of the Union territory, in case of a metropolitan city; or
 - To the District Magistrate or the Deputy Commissioner concerned in case of all other towns and cities, with a copy to the State Board or the Committee on or before the 30th day of June every year.

1.7 SWACHH BHARAT MISSION (SBM)

This campaign aims to accomplish the vision of a 'Clean India' by 2nd October 2019, the 150th birthday of Mahatma Gandhi.

1.7.1 MISSION OBJECTIVES

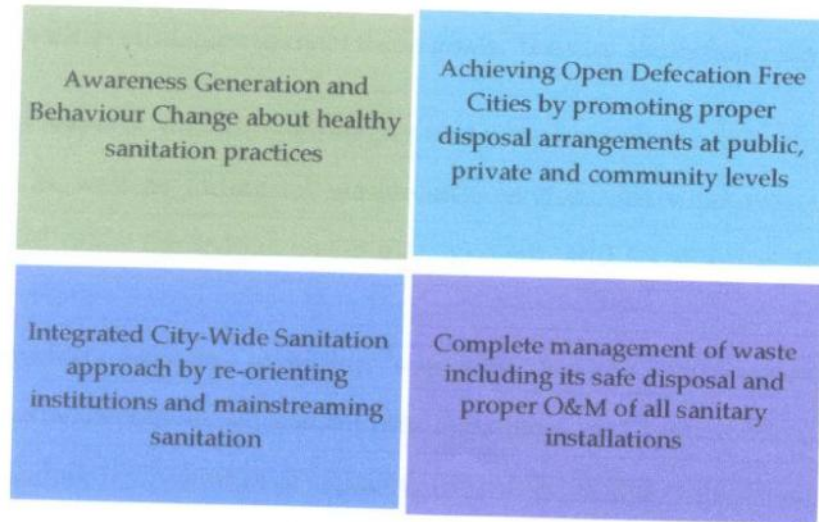
- Elimination of open defecation
- Eradication of Manual Scavenging
- Modern and Scientific Municipal Solid Waste Management
- To effect behavioral change regarding healthy sanitation practices
- Generate awareness about sanitation and its linkage with public health
- Capacity Augmentation for ULB's
- To create an enabling environment for private sector participation in Capex (capital expenditure) and Opex (operation and maintenance)

1.8 CITY SANITATION PLAN

City Sanitation (Master) Plans (CSP), are the outputs of strategic planning processes for citywide sanitation sector development. Its objective is to develop and maintain a clean, safe and pleasant physical environment to promote social, economic and physical wellbeing of all sections of the population. It encompasses plan of action for achieving 100 percent sanitation in the city through demand generation and awareness campaign, sustainable technology selection, construction and maintenance of sanitary infrastructure, provision of services, O&M issues, institutional roles and responsibilities, public education, community and individual action, regulation and legislation.

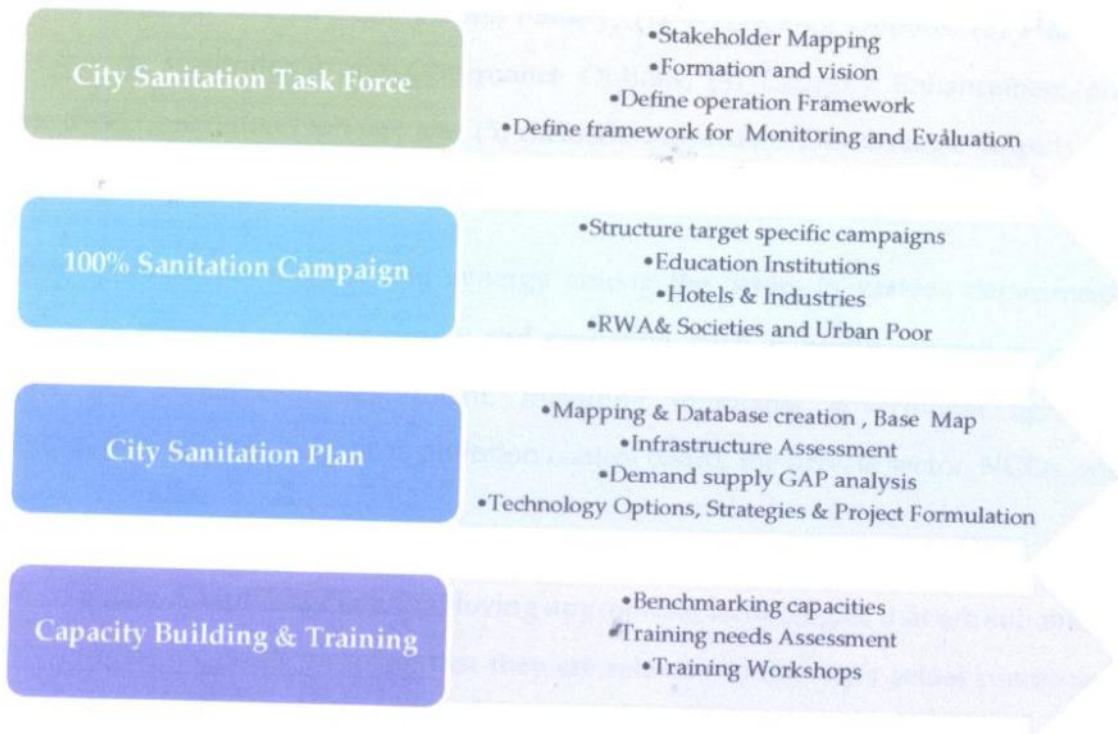
1.8.1 CSP GOALS

FIGURE 2: CSP GOALS



1.8.2 SCOPE OF CSP

FIGURE 3: SCOPE OF CSP WORK



1.8.3 COMPONENTS OF CITY SANITATION PLAN

A city sanitation plan is guided by the vision, missions, and goals of sanitation development as well as strategies to meet these goals. The city sanitation plan covers:

- **Technical Aspects**, including strategies and programs for the development of (a) domestic as well as industrial wastewater services, (b) solid waste including clinical and other hazardous waste management, and (c) storm water drainage system.
- **Non-Technical Aspects**, including strategies for the development of non-physical aspects such as (a) community awareness and participation, (b) policy and regulation, (c) institutional capacity, (d) private sector engagement, (e) NGO engagement, (f) financing and tariffs, and (g) monitoring and evaluation.

1.8.4 STRATEGY FOR CITY SANITATION PLAN

A broad city level strategy for preparation and implementation of the City Sanitation Plan is based on five strategic pillars, namely, (1) Technology Options; (2) Financial Options; (3) Institutional and Governance Options; (4) Capacity Enhancement and Awareness Generation Options; and (5) Inclusive Approach. The strategic outputs and proposals are guided by the following points:

Ensured Coordination-Enhancing synergy among the actors in various departments working in the field of water supply and sanitation, such as health, education, public health and engineering department, including municipal government agencies, industry, environment, transport, pollution control board, the private sector, NGOs, and others.

- **Locally Adaptable Plan**: Employing appropriate technologies that are suitable to user needs, while ensuring that they are relevant to the city's actual conditions, comply with technical standards, and prevent potential impacts.
- **Equitable**: Develop sanitation in all parts of the city (city-wide), prioritizing poor residential areas where the health risks are highest.

- **IEC:** Promote awareness of health and hygiene behavior while creating demand for better sanitation services.
- **Resource Generation and Mobilization:** Create opportunities and incentives for private sector initiatives in the development and operation of sanitation services. Increase funding from sources other than municipal government, such as from the national and provincial governments, donor agencies, the private sector and the public.
- **Existing Infrastructure Utilization:** Foster better use of existing sanitation services, which becomes the basis for developing new services.
- **Partnering citizens:** Encourage the development of community-based sanitation services, especially in areas where public and private services are difficult to establish. Engage stakeholder groups, including women groups, in sanitation planning, in line with their respective capacities.
- **Institutional and regulatory Frame Work:** Create enabling institutional and regulatory frameworks to accelerate sanitation services development.

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

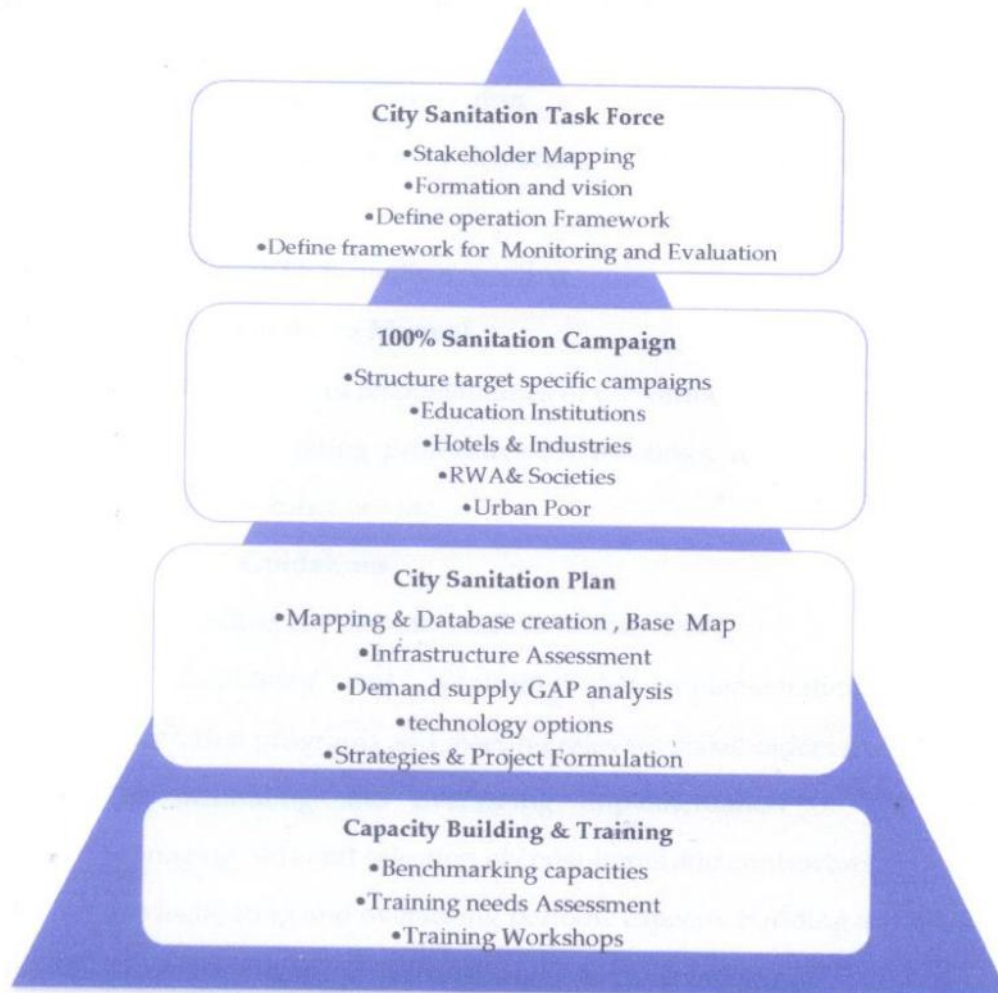
Every aspect of the process and infrastructure provision must integrate community participation and must be inclusive. In addition, water and wastewater management must be carried out in an environmentally sustainable manner, thus recycling and reusing the by-products as far as possible.

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:

FIGURE 4 BUILDING LOCAL INSTITUTIONS AND COMMUNITY PARTICIPATION



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 Chandausi 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:

- **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.
- **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.

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 Chandausi City has been prepared using satellite images and maps as provided by the Nagar Palika 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

- Administrative boundaries – Nagar Palika Parishad boundary and ward boundaries
- Transportation network – roads and railways
- Building foot print
- Water bodies and natural drainage
- Green belt – forest, cultivation, orchard

The following maps provided by the Corporation have been extensively used for preparation of the base map:

- Nagar Palika Parishad boundary and ward boundary map
- Proposed land use map (image) provided by Town Planning Department
- Survey of India topo-sheets

Based on the above information and considering the revised corporation/ward boundaries (finalized in consultation with ward councilors and city officials) the final

base map of Chandausi City was prepared. This base map has been taken as base for the preparation of CSP for Chandausi City.

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	Chandausi Municipal Boundary	Municipal boundary has been extracted from NPP Chandausi administration.	Polygon
3	Ward boundaries	Ward boundaries have been digitized according to Ward councilors and existing maps from NPP Chandausi.	Polygon
4	National and State Highways	Existing Highways have been extracted from NPP, Survey of India Map and NPP Chandausi 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 Band administration map.	Line
6	Nallah / water bodies / drains / ponds	Existing Nallah /water bodies/drains/ponds have been extracted from NPP, Jal Nigam, and Survey of India Map and identified from satellite image.	Line
7	Building Footprints	Existing building footprints have been digitized from satellite image.	Polygon
8	Landuse map	Landuse map has been extracted from prescribed govt. authority of the state of U.P.	Polygon
9	Hand pump/ Overhead tank	Existing locations and number of Handpump / Overhead tanks have been extracted from NPP / Jal Nigam of Chandausi city	Point

2.2.2 OVERLAYING SECONDARY INFORMATION ON THE BASE MAP

For the preparation of sanitation maps (including water supply, sewerage system, solid waste management and public sanitation) various primary (collected through field surveys) and secondary data has been collected and overlapped on the base map in GIS platform. The following layers of information have been added to the base map for the

purpose of preparing thematic sanitation maps and thereafter demand supply gap analysis:

- Sewerage network – existing and proposed sewer lines (diameter and length), sewerage zones, location of existing and proposed Sewage Treatment Plant (STP)
- Storm water drainage network and natural drains
- Water supply network – existing and proposed water supply network, water supply zones, rising main and feeder network, storage reservoirs
- Location of public toilets
- Location of dumper containers (for solid was collection)

2.2.3 LAND-USE AND SANITATION SURVEY

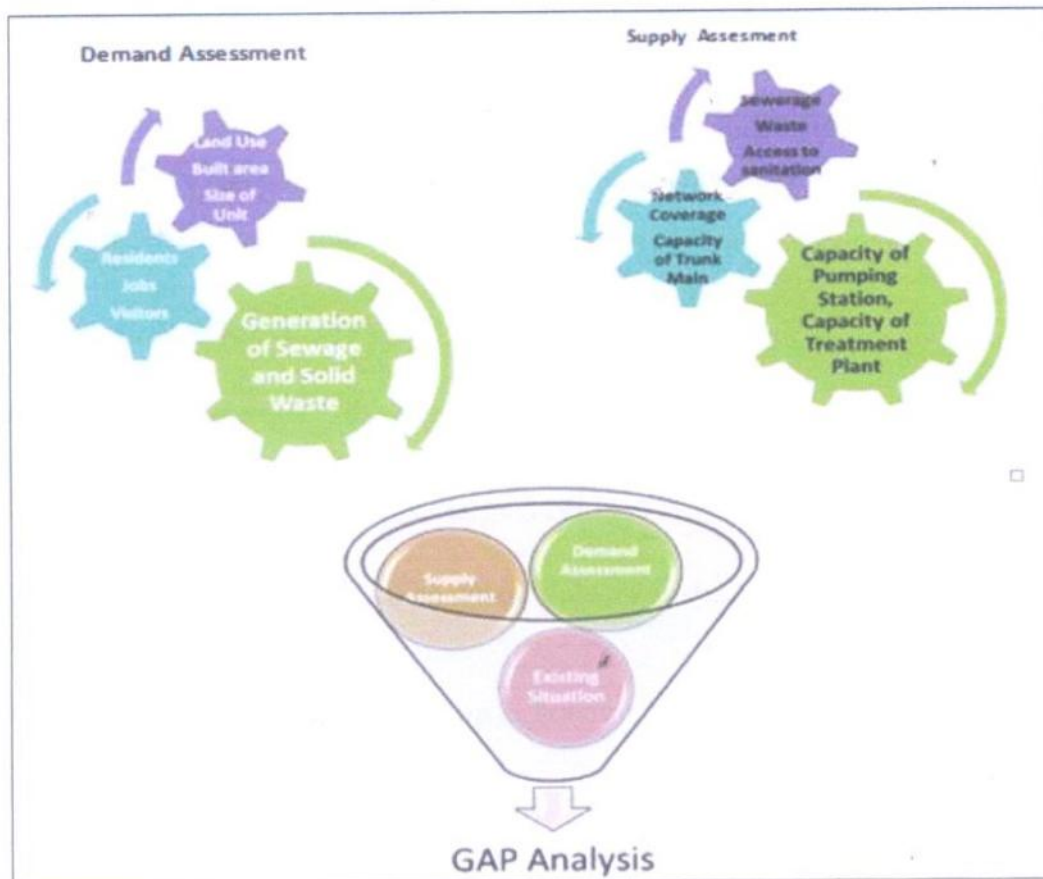
The data available from the city authorities regarding existing water supply system, sewerage system, solid waste management system and public sanitation is mostly at the ward level (aggregated data). If micro level planning has to be done at the ward level, the present level information available is 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). 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. The homogeneous land use parcels are digitised. The field data and the map are linked on the GIS platform for further analysis.

2.2.4 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.

FIGURE 5: DEMAND – SUPPLY GAP ASSESSMENT



2.2.5 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.

2.2.6 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.

2.2.7 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.

2.2.8 DRAFT CITY SANITATION PLAN

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

2.2.9 FINAL CITY SANITATION PLAN

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

2.3 CAPACITY BUILDING & TRAINING NEEDS ASSESSMENT

1. Benchmarking of capacities of the Nagar Palika Parishad
2. Training needs assessment
3. Formation of a Technical Core Group & Training Workshop Series

2.4 TIMELINE FOR TOTALLY SANITIZED CITY

The system shall be designed under the broad framework as per the guidelines for a design period of 30 years; however, the planning shall entail the implementation of the design in phases to meet the ultimate goals of the CSP. The phased approach aims to navigate through the challenges posed by the limitations in investments, institutional capacities, and community engagement in a proficient manner. The phases and the corresponding timelines are defined as stated below:

TABLE 2-2: TIMELINE FOR TOTALLY SANITIZED CITY

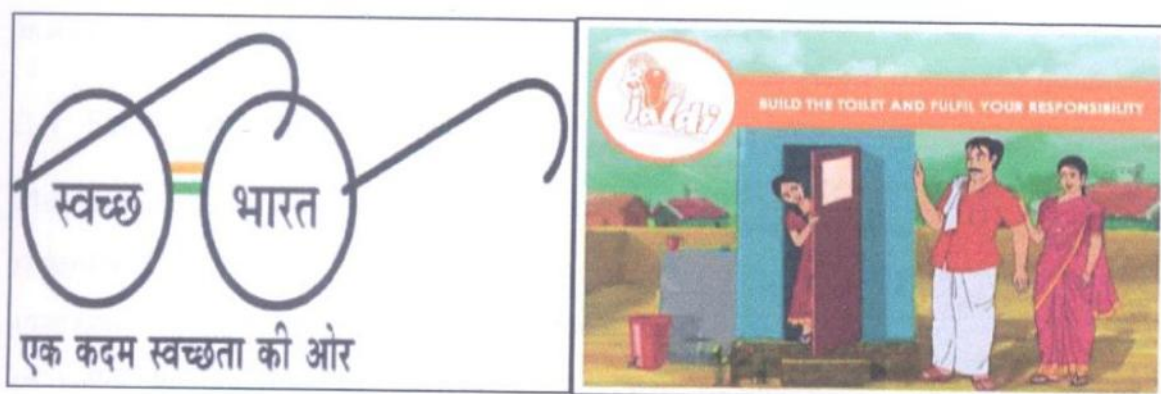
PHASE	YEAR
Immediate	2016-2018
Short-Term	2019-2024
Mid-Term	2025- 2034
Long-Term	2035 - 2046

3 AREAS COVERED UNDER CSP

As per NUSP the definition of Sanitation is defined as Safe management of human excreta, including its safe confinement treatment, disposal and associated hygiene-related practice. While this pertains to management of human excreta and associated public health and environmental impacts, it is recognized that integral solution need to take account of other elements of environmental sanitation i.e. solid waste management generation of industrial and other specialized / hazardous waste ; drainage ; as also the management of drinking water supply. Taking into consideration the definition of sanitation and vision of Municipal Corporation which is in consonance with the vision for urban sanitation in India, following components have been taken into consideration while preparing the City Sanitation Plan.

3.1 TOILET COVERAGE

Achieving open defecation free city is the objective of preparing city sanitation plan. Access to toilets is a key to improvement in Service Levels of sanitation facilities. The GoI has defined a Service Level Benchmark for toilet coverage and the benchmark value for this indicator is 100%. The citizen should have access to toilet whether individual or community in a service area. For the safe management of human excreta achieving 100% toilet coverage is must. Hence this component is included in the CSP.



GOI has launched Swachh Bharat Mission to give priority to this concept. The Goal is to achieve Open Defecation free city till 2019.

3.2 DRINKING WATER SUPPLY

Drinking water supply is also very important for upkeep of sanitation facilities and environment/health status it is necessary to have sufficient water. Poor quality of water as well as insufficient quantity of potable water can pose serious public health hazardous water borne diseases are quite common in the cities, particularly among the urban poor. MoUD, GOI has specified a performance indicator for drinking water sector. Hence drinking water supply is also taken into consideration as one of the element of CSP.



3.3 SOLID WASTE

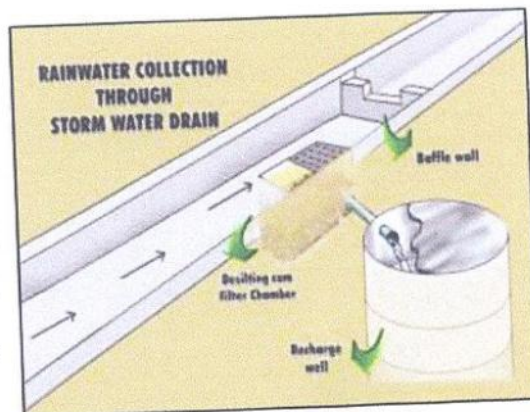
Solid waste management is also a very important element that needs to be taken care while preparing CSP. Typically the uncollected waste tends to gradually find its way into recycling in stream along the roads, clog the drains or in care of biodegradable.



The MoUD, GOI has defined eight indicators in these sectors. Environmental sustainability depends upon the effective & efficient management of Municipal Solid Waste.

3.4 STORM WATER DRAINAGE

This is also very important component to be considered in CSP. If the storm water is not managed through drainage network, the incidence of water logging/flooding will occur that will impact significantly on number of persons as well as normal life and mobilization. Because of the



water logging / flooding incidence public health in general might be at risk and there is possibility of water contamination also. Hence this component should be measured and monitored properly including in CSP.

3.5 INFORMATION, EDUCATION AND COMMUNICATION

As the overall goal of preparing City Sanitation Plan is to transform the city into community driven totally sanitized, healthy, and livable city it is necessary to include IEC/Awareness generation element in the city sanitation plan. Without IEC it is not possible to bring about sustain behavioral changes aimed at adoption of healthy sanitation practices.



4 CITY PROFILE

4.1 CHANDAUSI - CITY PROFILE

Chandausi is a city and a municipal board in Sambhal district in the state of Uttar Pradesh, India. The original name of the city was "Chaand Si", meaning "Moon Like" (in Indian poetry the moon is considered to be beautiful). It is also known as "**Mini Vrindavan**". It has an average elevation of 284 metres (603 feet). There are approximately 300 temples in Chandausi. It is only 3 hours 10 mins and 187.5 km from New Delhi. Chandausi is known for its good schools and colleges. Many people from nearby cities and villages join schools and colleges of Chandausi. The city is rich in social and cultural values, full of joys and holiness.

4.1.1 CLIMATE AND RAINFALL

The climate of the area is similar to that of the Indo-Gangatic plain, with hot dry summers and cold winters and an average of 35 inches of rainfall. Its climate is mostly pleasant.

Summer: 45.0 °C (max), 32.5 °C (min)

Winter: 28.5 °C (max), 1 °C (min)

Average rainfall: 543 mm (per year)

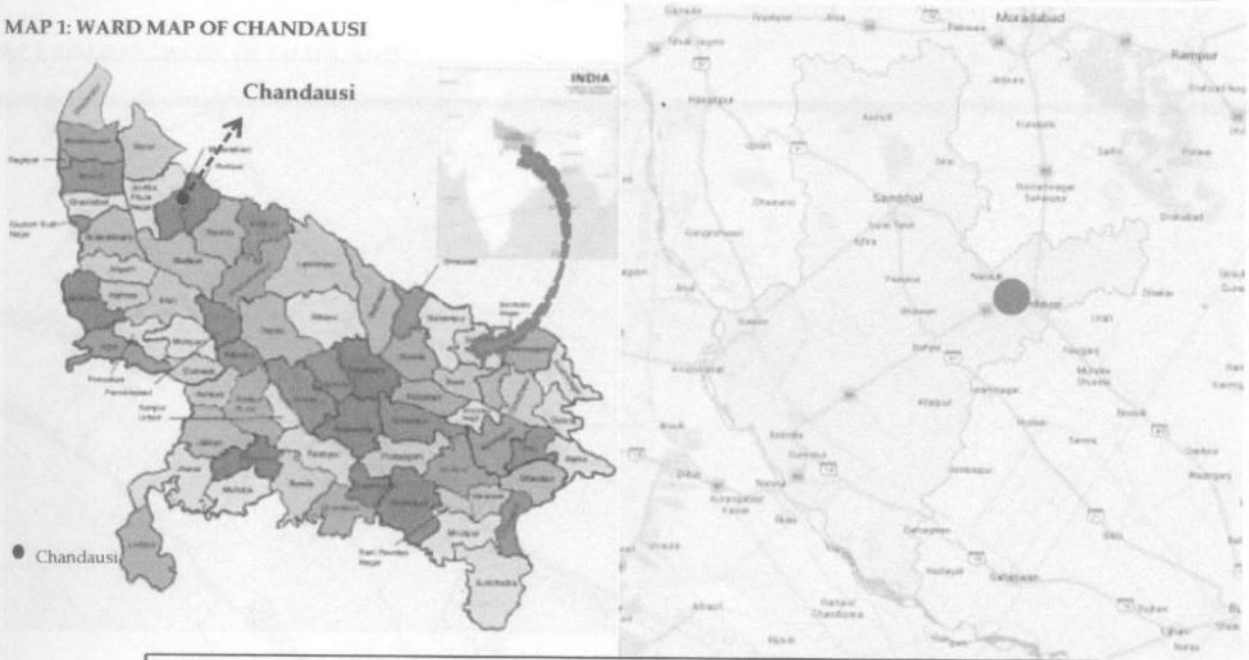
4.1.2 AREA AND LOCATION

Chandausi is a Nagar Palika Parsihad. The geographical area of the Chandausi city is 8.80 sq. kms in year 2011, the city has divided into 25 wards. City administration is headed by the Executive Officer and the Chairman.

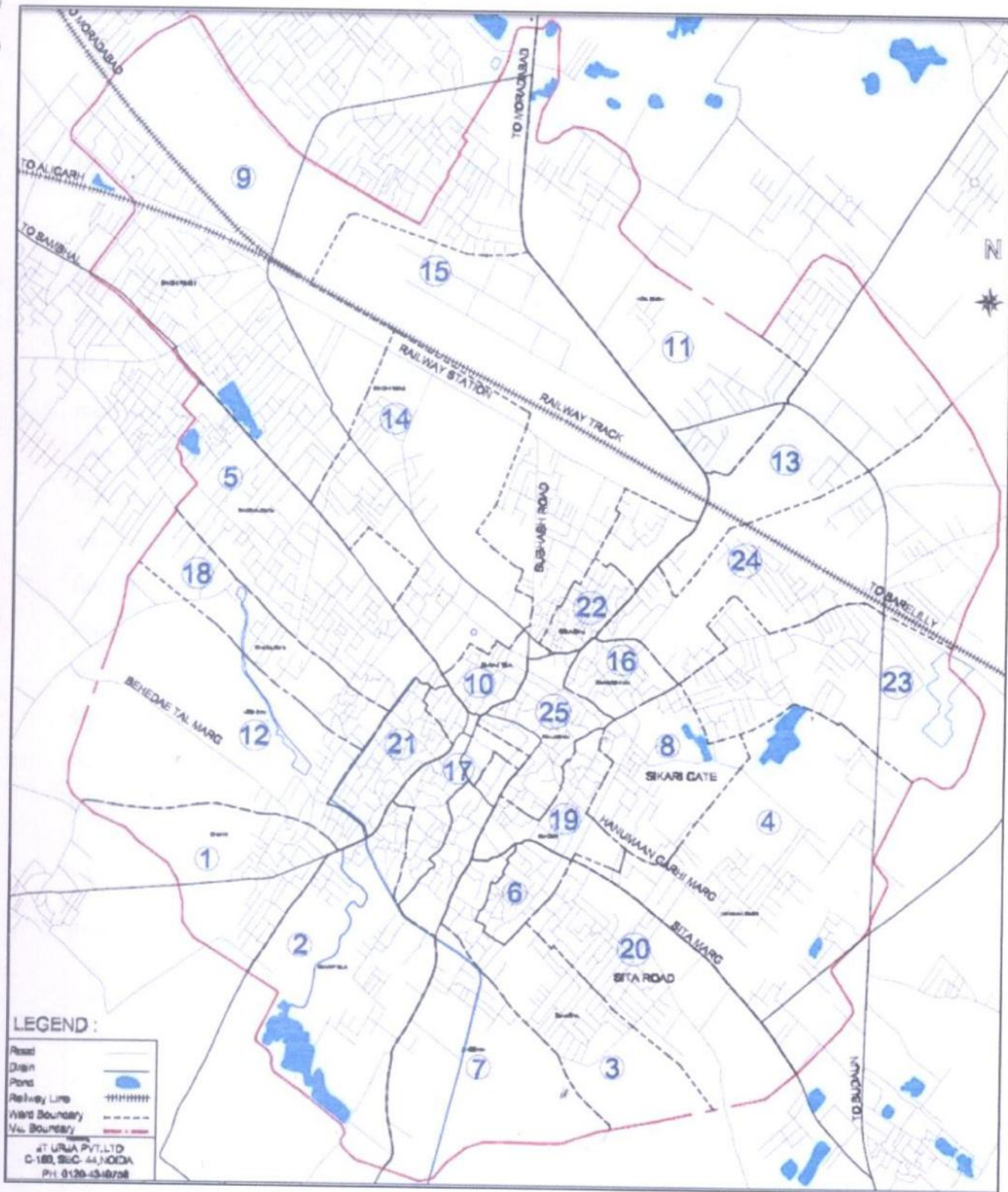
4.1.3 TRANSPORT

Chandausi railway station is on the Chandausi loop of Lucknow-Moradabad line.

MAP 1: WARD MAP OF CHANDAUSI



MAP 2: ROAD NETWORK OF CHANDAUSI



4.1.4 INDUSTRY

Chandausi is known for **mint oil**, which has become the city's main trade. The mint plant (*Mentha piperata*) is cultivated on a large scale. After extracting essential oils from the plant through distillation, the products are exported.



The city is also known for Ghee and traditional Ganesh Chaturthi Utsava. It is also known for the automatically moving statues' presentation, which is led by the representatives of Ganesha i.e. "Elephants", at the time of Ganesh Chaturthi, which is rare. A large crowd attends this festival in Chandausi. Ganesh mela is stretched in the



area of 10 acres comprising 350–400 of stalls, showrooms, halls, canopies etc. One can find the variety of shopping outlets, clothes, capital goods, eating establishments, entertainment, especially for children. Chandausi is also known for its Gajak which is generally prepared in the winter season (October – February). Gajak is prepared with sesame seeds and jaggery (or cane sugar) with a method of preparation which is time consuming. It takes about 10–15 hours to prepare 5–8 kilograms of Gajak. The dough is hammered until all the sesame seeds break down and release their oils into the dough.

4.1.5 DEMOGRAPHICS

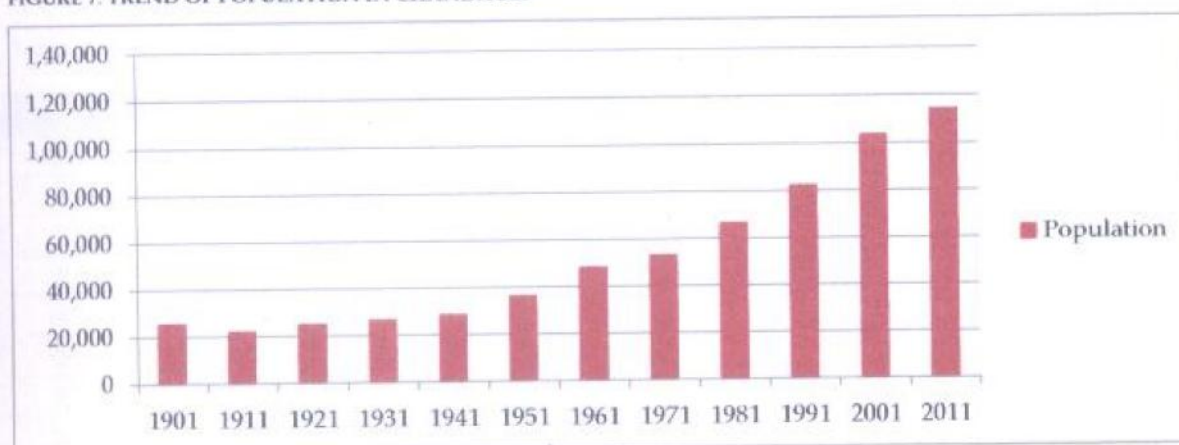
FIGURE 6: GROWTH RATE OF POPULATION



Source: Census of India

As per census 2011, the population of Chandausi NPP is 114,383 which males are 60,256 and females are 54,127. Sex Ratio in city is 898.28 as per 2011 census data. Similarly child sex ratio in Chandausi NPP was 868.52 in 2011 census. This child population figure of Chandausi NPP is 12.76 % of total population. Average literacy rate in Chandausi NPP as per census 2011 is 61.91 % of which males and females are 34.39 % and 27.52 % literates respectively.

FIGURE 7: TREND OF POPULATION IN CHANDAUSI



Source: Census of India

4.1.6 OCCUPATION STRUCTURE

Traditionally, Chandausi is known for its Mentha oil industry. It is famous for its gajak.

TABLE 4-1: WORK PARTICIPATION

	Total Workers	Main Workers	Marginal Workers
Total	32686	29265	3421
Male	29510	128290	25788
Female	3176	2375	801

SOURCE: CENSUS OF INDIA, 2011

4.1.7 URBAN GOVERNANCE

There are multiple agencies responsible for urban governance and provision and management of infrastructure and services. While, Sambhal Jal Sansthan, Sambhal Development Authority and UP Jal Nigam (UPJN) are the key urban service providers, other agencies include the Housing Board, Central and State Public

Works Departments (CPWD and PWD), Transport Department, Industries Department and the Department of Environment. There is significant overlap of roles and responsibilities and fragmentation in service provision and management of infrastructure, which makes it difficult to hold institutions accountable and to coordinate.

4.1.8 OVERALL CITY AND INFRASTRUCTURE STATUS

TABLE 4-2: CITY STATUS

S. No.	Parameters	Value and Range
1	Total Population	114383
2	No. of Households	20726
3	Average Household Size	5.5
4	Slum Population	16523
5	No. of Slums	8
6	Literacy Rate	61.90%
7	Wards	25
8	City Area	8.8 sq.km
9	No. of Public & Community Toilets	13
11	No. of Bus Station	1
12	No. of Railway Station	1
13	No. of Primary Schools	15
14	No. of Colleges	15
15	No. of Degree Colleges	3
16	Cinemas	2
17	Government Hospital	1

SOURCE: NAGAR PALIKA PARISHAD, CHANDAUSI

4.1.9 LAND USE PATTERN

Chandausi Vikas Pradhikaran is responsible for planned and sustainable development in the city. Here, most amenities are within walking distance, such as Local Markets, Banks and Vegetable Markets etc.

Chandausi City is having total 20726 numbers of household as per census 2011. Chandausi is famous for its bangle industry which is mainly done at household level.

4.2 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 Chandausi has population of 114383 persons. The population of Chandausi has increased from 103749 persons in 2001 to 114383 in 2011, recording a decadal growth rate of 10.25 percent.

There are 3 commonly used methods to assess population projection namely, Arithmetic Increase method, Geometric increase method and Incremental increase method.

4.2.1 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 as forms the basis of projections.

$PN = P \text{ (LAST YEAR KNOWN)} + N \times X$ WHERE PN, POPULATION OF THE YEAR TO BE KNOWN

N = NUMBER OF DECADES

X = AVERAGE ARITHMETIC INCREASE PER DECADE

4.2.2 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.

GEOMETRIC MEAN, $RG = 3.66$

POPULATION, $PN = P_{\text{YEAR KNOWN}} (1+RG)^N$

4.2.3 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.

$$P_n = P_1 + n \cdot x + \{n(n+1)/2\} y$$

where P_n = population of the year to be known

N = NUMBER OF DECADES

X = AVERAGE ARITHMETIC INCREASE PER DECADE

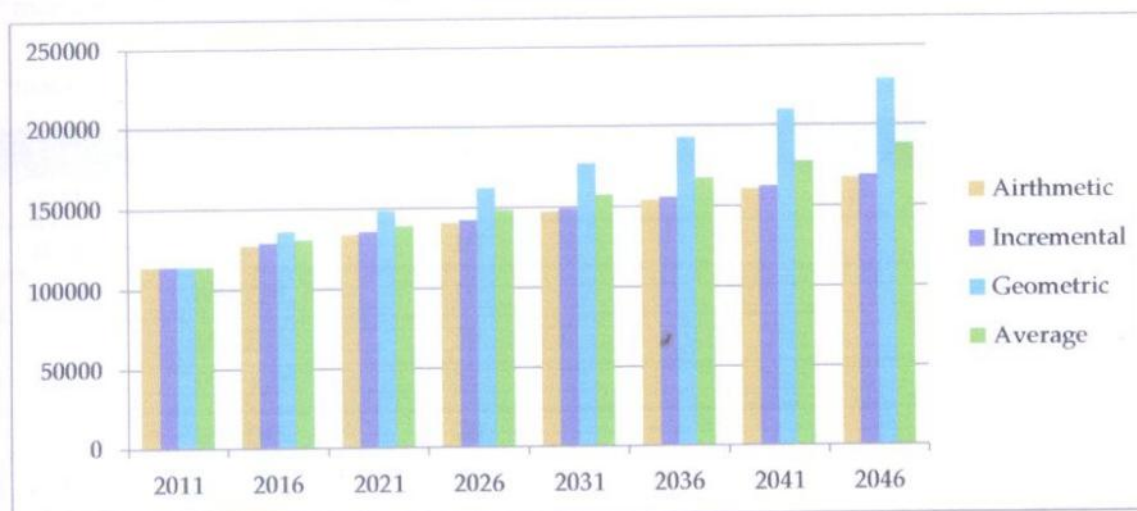
y = average incremental increase per decade

The population projection for Chandausi has been carried out for 30 years at an interval of 5 years and result are summarized in Table below –

TABLE 4-3: POPULATION PROJECTION OF CITY

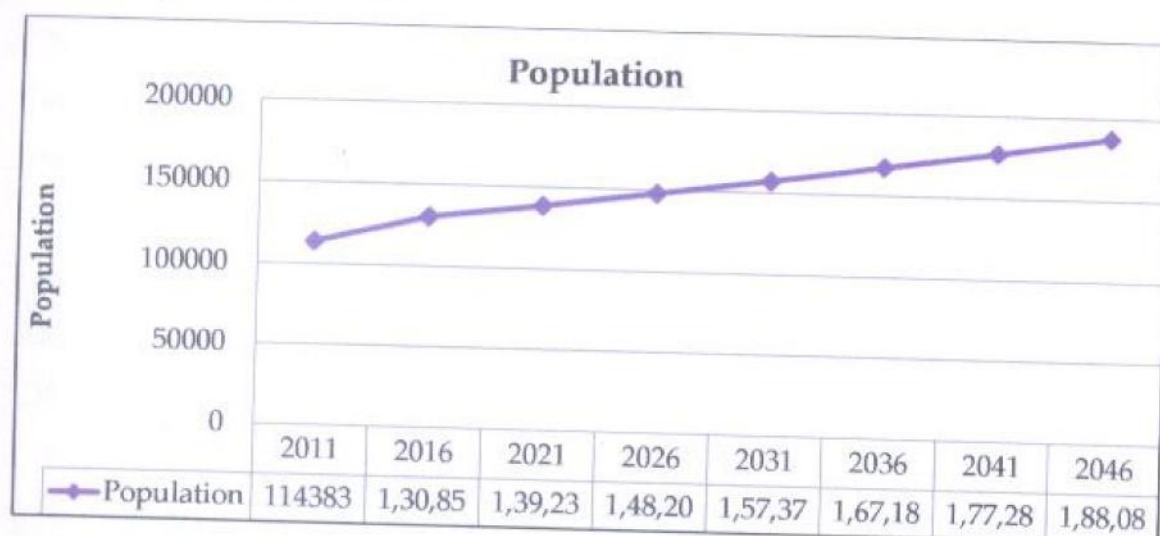
Year	Arithmetic	Incremental	Geometric	Average
2011	114383	114383	114383	114383
2016	127548	128,998	136,019	130,855
2021	133969	135,420	148,326	139,239
2026	140713	142,163	161,747	148,208
2031	147149	148,600	176,383	157,377
2036	153879	155,328	192,343	167,183
2041	160326	161,777	209,746	177,283
2046	167044	168,493	228,725	188,087

FIGURE 8: PROJECTED POPULATION BY DIFFERENT METHODS



Source: Calculated Value

FIGURE 9: POPULATION PROJECTION



Source: Calculated Value

4.3 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 Chandausi City as mentioned in Table below.

TABLE 4-4: PROJECTED INFRASTRUCTURE DEMAND OF THE CITY

Year	Population	Water (MLD)	Sewage(MLD)	Solid waste(TPD)
2011	114383	15	12	40
2016	130,855	18	14	46
2021	139,239	19	15	49
2026	148,208	20	16	52
2031	157,377	21	17	56
2036	167,183	23	19	59
2041	177,283	24	19	62
2046	188,087	26	21	66

Source: Calculated Value

FIGURE 10: PROJECTED INFRASTRUCTURE DEMAND



Source: Calculated Value

Gross Water Supply demand will be 19 MLD in 2021 and increase to 23 MLD in 2036 and 26 MLD in 2046. These translate to a waste water generation @ 80% of net water consumed.

Solid Waste generation is likely to grow at a faster pace due to a combination of population growth and increase in per capita consumption to 49 MT in 2021, 59 MTD in 2036 and 66 TPD in 2046.

The demand for Public Toilet blocks and Community toilet blocks is expected to increase with increasing public awareness.

4.3.1 WARD WISE POPULATION

The population of Chandausi city in 2011 was 114383 and Chandausi has total 25 wards. Wards 20, 9 and 23 have highest population in comparison to other wards of the city. While the wards 17, 25 and 8 are exhibiting lowest population in the city of Chandausi. The ward wise population and male female population of all the 25 wards of Nagar Palika, Chandausi is presented in Table below.

TABLE 4-5: WARD WISE POPULATION CHANDAUSI CITY

Ward No.	Households	Population	Male	Female
1	761	4801	2510	2291
2	877	4806	2560	2246
3	705	3617	1911	1706
4	666	3615	1963	1652
5	821	4633	2347	2286
6	720	3899	2053	1846
7	872	4663	2493	2170
8	540	3164	1651	1513
9	1247	6778	3553	3225
10	743	4109	2205	1904
11	718	4246	2230	2016
12	826	4584	2457	2127
13	645	3835	2065	1770
14	636	3285	1703	1582
15	955	4759	2531	2228
16	918	5880	3091	2789
17	500	2370	1252	1118
18	1010	5191	2670	2521
19	1062	5101	2681	2420
20	1404	7560	3955	3605
21	797	4174	2194	1980
22	685	3997	2097	1900
23	1069	6204	3273	2931
24	970	5986	3172	2814
25	579	3126	1639	1487

Source: Census of India, 2011

4.3.2 SLUM POPULATION

The chapter discusses about the slum population in the city with their access to basic services drawn from discussions with the slum people, discussions with the DUDA officials and the secondary data. The aim is to identify the various issues related to the status of infrastructure and suggest strategies and proposals for the improvement and efficient service delivery. It also deals with the spatial location of the slums in the city.

As per the Census 2011, the total slum population in the city is 16523. The percentage of slum population in the city is 53 per cent of the total population. As per Nagar Palika

Parishad there are 8 slum pockets. The slum population in the city has been spread over in all wards.

TABLE 4-6: NAME OF THE SLUM

S. No.	Slum Name	Population
1	Mohd. Chunni	4746
2	Semar Tola	4690
3	Dahriya	1418
4	Hanuman Gadhi	1213
5	Sikri Gate	629
6	Sambhal Gate	1044
7	Lodhiyan Anshik	2716
8	Ghatiya Gate Anshik	67
	Total	16523

Source: DUDA, Chandausi

5 WATER SUPPLY

Drinking water supply is also very important for upkeep of sanitation facilities and environment/health status it is necessary to have sufficient water. Poor quality of water as well as insufficient quantity of potable water can pose serious public health hazardous water borne diseases are quite common in the cities, particularly among the urban poor. MoUD, GoI has specified a performance indicator for drinking water sector. Hence drinking water supply is also taken into consideration as one of the element of CSP.

5.1 CITY LEVEL STATUS

In the city, total numbers of water supply connections are 15660, which is only 62.46% of total required water supply coverage. All the available connections are domestic, unmetered and serving to the households only. The total water production capacity of the city is 15.2 MLD, which is all from ground water sources (power pumps). The city does not have any surface water source and treatment facility for drinking water.

TABLE 5-1: WATER INFRASTRUCTURE

Indicator	Status
Sources of Water	Ground Water
Coverage of Water Supply	39 %
Per capita supply of Water	100 LPCD
No. of Tube Wells	15
No. of Over Head Tanks	3
No. of Hand Pumps	650
Length of Line (Total Road)	34.5 kms
Length of distribution network (NPP)	11 km
Water Connections	8083

Source: Nagar Palika Parishad Chandausi

There are total 8083 water connections in the city which includes households and commercial connections also.

TABLE 5-2: WATER CONNECTIONS OF CITY

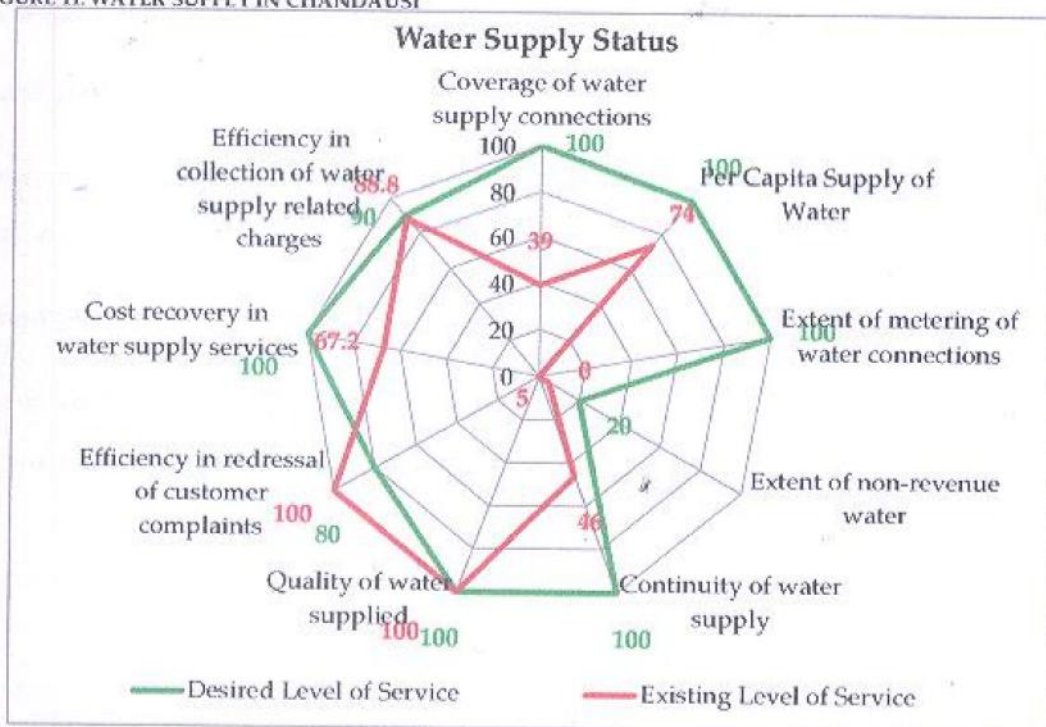
S. No.	Type of connection	Number
1	Household service connections	7563
2	Commercial Connections	520
3	Duration	11 hrs. on average

Source: Nagar Palika Chandausi

TABLE 5-3: SERVICE LEVEL BENCHMARK OF WATER SUPPLY, CHANDAUSI

Indicators	Desired Level of Service	Existing Level of Service
Coverage of water supply connections	100%	39%
Per Capita Supply of Water	135lpcd	100lpcd
Extent of metering of water connections	100%	0%
Extent of non-revenue water	20%	5%
Continuity of water supply	24hrs	11 hrs
Quality of water supplied	100%	100%
Efficiency in redressal of customer complaints	80%	100%
Cost recovery in water supply services	100%	67%
Efficiency in collection of water supply related charges	90%	89%

FIGURE 11: WATER SUPPLY IN CHANDAUSI

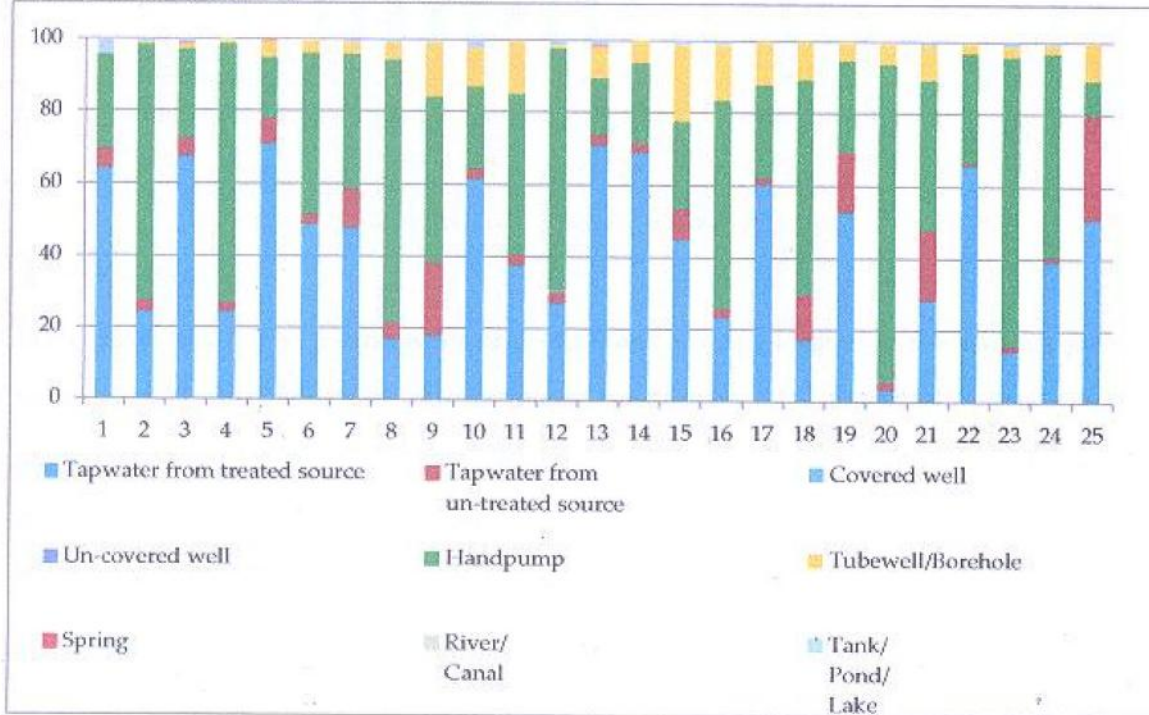


Source: SLB and NPP Chandausi

5.1.1 SOURCE OF WATER

The total water consumption of the city is 15 MLD through 8083 water supply connections. This data indicates that rest of the city is getting water from unauthorized sources.

FIGURE 12: SOURCE OF WATER (WARD WISE)



Source: Census of India, 2011

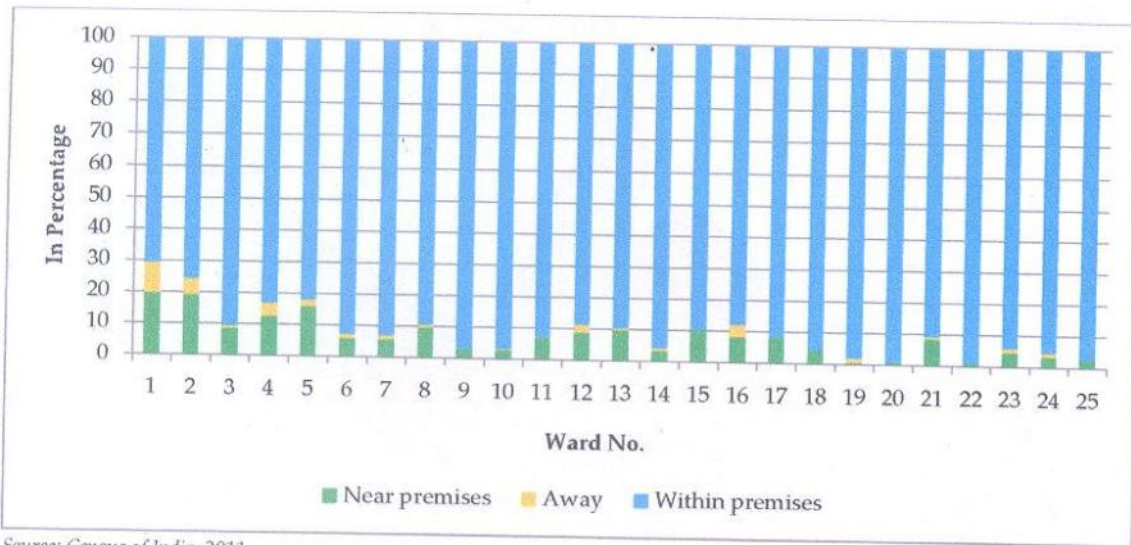
Tube wells

There are in total 15 tube wells in the city from which the water is supplied for drinking purpose.

Hand pumps

There are 402 hand pumps are working installed across the town functioning in the city in which the people are directly taking water for their domestic purpose.

FIGURE 13: LOCATION OF DRINKING WATER



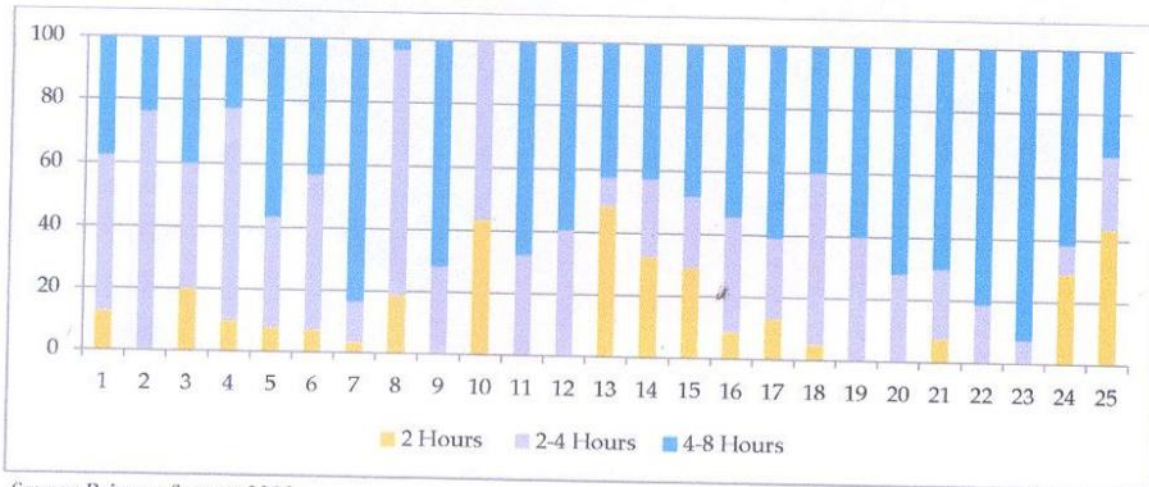
Source: Census of India, 2011

Water is drawn from 15 tube wells and 402 Hand Pumps located in the various parts of Chandausi Municipality. Out of total water production 20% is wasted in leakages, and available water to the public is hardly 11 MLD, which is supplied to household population (114383 current populations as per Census). As per the standard of 135 lpcd, the present water demand for domestic use in Chandausi Nagar Palika is 15 MLD.

5.1.2 FREQUENCY OF WATER SUPPLY

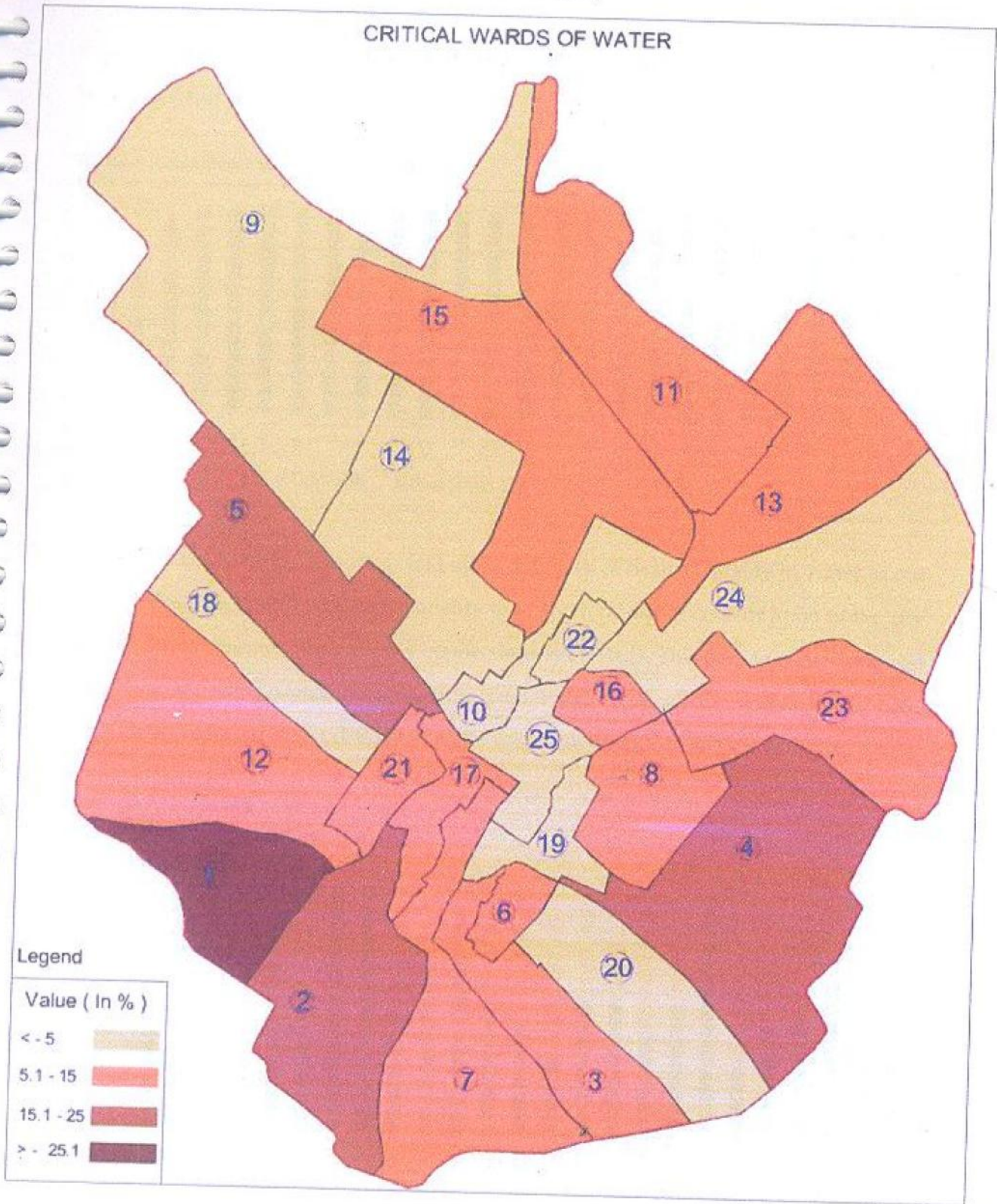
The water from Municipal comes only for 2 hours and respondent shaving bore well get 4-8 hours water supply.

FIGURE 14: FREQUENCY OF WATER SUPPLY (WARD WISE)



Source: Primary Survey, 2016

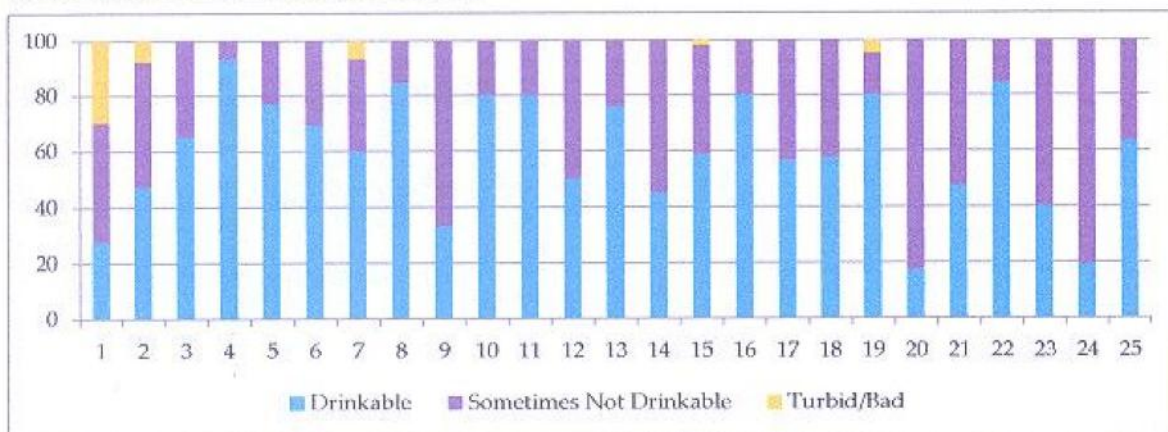
MAP 3: ACCESSIBILITY OF WATER AWAY FROM PREMISES (WARD WISE)



5.1.3 QUALITY OF WATER

In all the wards most of the respondents reported to get drinkable water and sometimes the water is not drinkable.

FIGURE 15: QUALITY OF WATER (WARD WISE)

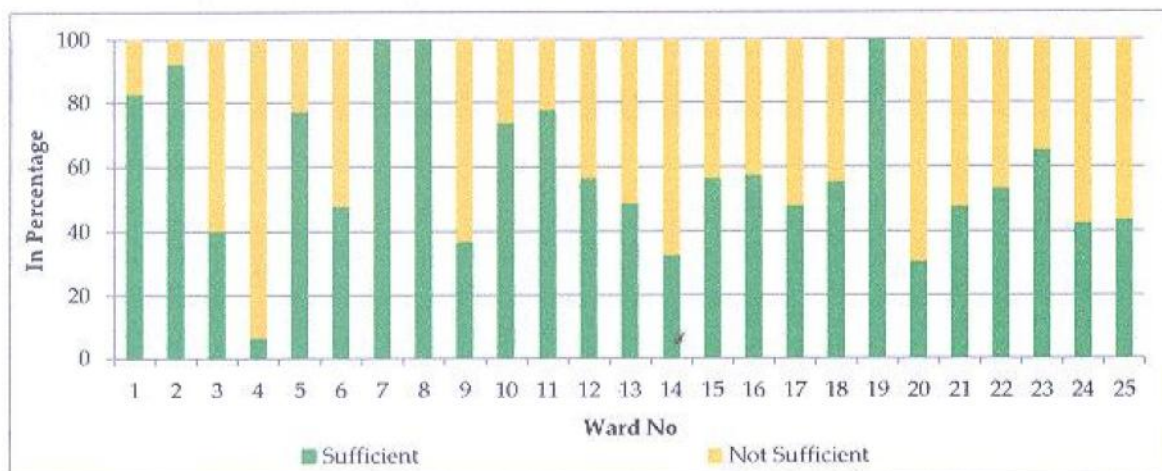


Source: Primary Survey, 2016

The quality of the water is more or less up to the mark of desired quality of water as out of 5 samples collected, 5 passed the quality test. The total water consumption of the city through 8083 domestic water supply connections is 11 MLD. This data indicates that rest of the city is getting water from unauthorized sources. In all the wards most of the respondents reported to get drinkable water and sometimes the water is not drinkable.

5.1.4 WATER SUFFICIENCY

FIGURE 16: WATER SUFFICIENCY (WARD WISE)



Source: Primary Survey, 2016

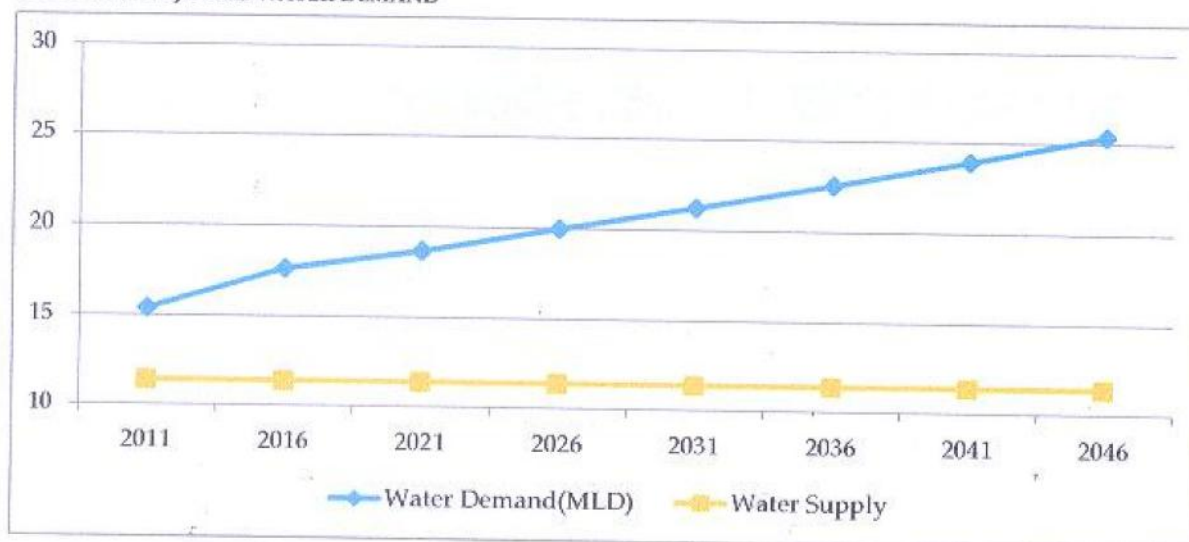
In all the wards some respondents are getting sufficient water and some of them are not getting sufficient water supply to fulfill for their needs. People are having submersible in their premises to fulfill their water needs.

5.1.5 STORAGE

Presently, clear water being collected in Overhead Tank Clear. Over all 3 Overhead Tanks has been constructed in the city.

5.2 CURRENT AND PROJECTED WATER DEMAND

FIGURE 17: PROJECTED WATER DEMAND



Source: Calculated Value

TABLE 5-4: PRESENT & PROJECTED WATER DEMAND

Year	Population	Water Demand (MLD)	Water Supplied (MLD)	Gap in Supply (MLD)
2011	114383	15.4	11.4	4
2016	1,30,855	17.66	11.4	6.26
2021	1,39,239	18.7	11.4	7.3
2026	1,48,208	20	11.4	8.6
2031	1,57,377	21.24	11.4	9.84
2036	1,67,183	22.56	11.4	11.16
2041	1,77,283	23.93	11.4	12.53
2046	1,88,087	25.39	11.4	13.99

Source: Calculated Value

The water demand has been calculated keeping in mind the decadal population projections, rate of water supply which is 135 LPCD (as per CPHEEO manual) and adding the provision of 15% for unaccounted water. For example the projected water demand for year 2011 is $114383 \times 135 \text{ KLD} = 15.4 \text{ MLD}$.

5.3 GAP ANALYSIS

Water sector is having the major problem in Chandausi city. The supply of water is only 39% in the entire city. Depletion of groundwater mainly in the center part of the city is very high.

TABLE 5-5: GAP ANALYSIS

S. No.	Indicator	Gap
1	Total Households	20726
2	Gap in Household Connection	13163 (63%)
3	Non Domestic Use	2 MLD
5	Duration of supply daily	13 hrs
6	Water Supply Gap	6 MLD
7	Length of Water Supply Network	23.5

Source: Calculated Value

- Gap in water demand is 6 MLD
- Gap in domestic connection is 13163 (63%)
- Gap in Water Supply Network 3.7%

5.4 SWOT, ISSUES AND PRIORITIES

The given table captures the SWOT analysis for Water within Nagar Palika Parishad.

TABLE 5-6: ACCESS TO TOILET SWOT

Strength	Weaknesses
<ul style="list-style-type: none"> • Connection fees and user charge framework in place. 	<ul style="list-style-type: none"> • High NRW levels; no previous audit data on loss levels. • Likely water shortage • Groundwater exploitation and pollution are key concerns • Low connections (63% of properties) and poor service levels • High O&M costs

Opportunities	Threats
<p>Potential to expand access to entire TUA by initiating a regional water master plan</p> <p>Potential to address service delivery gaps through a time-bound performance improvement program</p>	<p>Inadequate focus on O&M</p> <p>Poor cost recovery and collection efficiency</p> <p>Execution capacity and weak local financials could constrain implementation</p> <p>Ground water exploitation and pollution is a concern</p>

Key issues and priorities with respect to water supply within NPP are summarised below:

Service delivery in Water Supply within NPP falls significantly short of service level norms as it not even close to 90% coverage. There is a need to explore and implement options to bring water to NPP and other extended areas within Nagar Palika.

Information discrepancies and inadequacies constrain analysis and decision making .No information regarding presence of metered connections and need to validate higher dependency on ground water (primary source)when municipal connections are be made available.

Absence of Water Treatment plant and water quality monitoring station.

Institutional issues included inadequate capacity, multiplicity of agencies and weak monitoring

Inadequate enforcement of groundwater conservation is leading to indiscriminate extraction. Further there is need for clarity on processes for dealing with unauthorized water connections and action in case of user charge defaulters.

Since the UP Jal Nigam is responsible for planning and designing the water supply and sewerage projects of the State However Implementation, operation and Maintenance is done by the Nagar Palika and there is insufficient involvement of Nagar Palika Parishad in planning for water supply during planning and execution as a result of which ownership, capacity and accountability for O&M within is weak. Inadequate exposure to modern water management practices is also a constraint.

5.5 CONCEPTUAL BASIS AND BEST PRACTICES

Water conservation: RWH legislation and Performance Contracts for NRW reduction

LEGISLATION ON RAINWATER HARVESTING

Source: <http://www.rainwaterharvesting.org/policy/legislation.htm>

Several states and cities like Andhra Pradesh, Himachal Pradesh Ahmedabad Bangalore Chennai and Kerela have passed legislation for implementing Rainwater harvesting as a water conservation measure.

If there will be huge volumes of water being lost through leaks, which are not being invoiced it will affect the viability of water utilities through lost revenues and increased cost. All this affects capacity of water utilities fund expansion of service, especially for poor. Reducing NRW is not just a technical issue but one that goes to the heart of failings of water utilities which should be taken care of in the very beginning. This is where private sector could be of assistance.

Apart from ensuring equitable supply of water, cities should initiate measures to ensure measures to promote water conservation and protection of its water bodies. Apart from protection of water bodies against dumping of waste rainwater harvesting (RWH) and non-revenue water (NRW) reduction/prevention should two critical focus areas as the city embark on improving its water supply systems.

5.5.1 ISSUES

- Varying quantum of water availability at source, Water supply is erratic; especially during summer.
- Low coverage of network and few water connections.
- Poor metering system and low water charges collection efficiency
- Poor maintenance of water sources and infrastructure.
- Lack of proper consumer data.

5.6 VISION AND GOALS

Vision

“Achieve Water Security through provision of equitable and efficient access to continuous water supply in an environmentally sustainable manner”.

Goals

The table below translates the above vision into tangible service delivery targets

TABLE 5-7: GOALS, SML TERM TARGETS

Parameter	Unit	Norm	SLB	Short Term	Medium Term	Long Term
Coverage	%	100%	62.46%	✓		
Per Capita Supply	lpcd	135	100		✓	
Non-Revenue Water	%	20%	0%		✓	
Metered Connections	%	100%	5%		✓	
Continuity	Hours	24.00	4-8 hrs			✓
Complaints Redress	%	80%	100%	✓		
Quality Of Supply	%	100%	91%	✓		
Cost Recovery	%	100%	59%		✓	
Collection Efficiency	%	90%	11%		✓	

5.7 FINANCIAL OPTIONS (WATER SUPPLY NETWORK)

Broad cost estimates for capital expenditure are assessed for the key components of the various design sectors discussed in the preceding sections. The broad implementation strategy adopted for the Water Supply system envisages that the first two years as the major investment phase (2016-2018), whereas the subsequent years over the plan timeline until the year 2046 predominantly involve incremental procurements for augmentation of the services or replacements.

TABLE 5-8: RATE FOR PROPOSED WATER SUPPLY NETWORK

S. No	Item	Unit	Rate(Lakh)
1	Construction cost for water network	1 KM	29
2	Construction cost of WTP for	1MLD	8
3	Construction of Overhead Tank	1 MLD	56
Total Cost			
1	Construction Cost for water network	23.4Kms	678.6
2	Water Treatment Plant	15.4 MLD	123.2
3	Overhead Tank	4.4 MLD	246.4
Total Capital Investment			1048.2

Source: Calculated Value According to Delhi Schedule Rate 2014 and JNNURM

The cost of the Overhead Storage Tank is 12.5 m (40 ft) high from the ground surface.

The approximate cost for implementation of this recommendation is Rs. 10.48 Crores

5.8 TIMELINE

The system shall be designed under the broad framework as per the guidelines for a design period of 30 years; however, the planning shall entail the implementation of the design in phases to meet the ultimate goals of the CSP.

The phased approach aims to navigate through the challenges posed by the limitations in investments, institutional capacities, and community engagement in a proficient manner.

The phases and the corresponding timelines are defined as stated below –

TABLE 5-9: TIMELINE INDICATION

Phase	Year	Activity
Immediate	2016-2018	<ul style="list-style-type: none"> Water connections to every households with available resources Coverage of water supply network should be 100% Conduct awareness generation campaign on health and hygiene aspects Groundwater recharging by promoting rainwater harvesting.
Short-Term	2019 - 2024	<ul style="list-style-type: none"> Construction of new facilities in core city (balance) and peripheral areas. Formulation of policies and rules to stop groundwater depletion and contamination by industries. Water quality must be improved by constructing Water Treatment Plant. Surface water scheme should be implemented. Tariff system should be smart with advance technology
Mid-Term	2025 - 2034	<ul style="list-style-type: none"> Augment existing infrastructure as per the demand Water connections to every households with available resources 100% efficiency of revenue collection.

Long-Term	2035 - 2046	<ul style="list-style-type: none"> • Augment existing infrastructure as per the demand • Water Treatment Plant for the future population demand.
-----------	-------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------

5.9 RECOMMENDATIONS

The DPR should prepare for all the above options and proposed and implemented had carefully rezoned water supply zones to develop a comprehensive system of water supply and for distribution of water in the most equitable and efficient manner in Chandausi.

The water supply network is obsolete which needs to be changed. Along with this the given table summarizes a set of suggested actions on Water Supply

TABLE 5-10: RECOMMENDATION, WATER SUPPLY

Actions	Recommended Body
Strengthen Baseline information on water and sanitation indices	NPP
Conduct a Household Sanitation Survey to capture baseline sanitation information	
For future install Bulk Meters at Intake points, Treatment Plants, Storage and Pumping points on priority; shift to consumer level metering in medium to long term.	
Implement a water quality monitoring protocol for piped supply and ground water	
Develop and implement an Investment Program to achieve SLB norms within 5-10 years	JALKAL/NPP
Conduct a Water Loss Audit within corporation areas and implement actions to reduce losses; Follow up this initiative to prepare and implement a DPR to achieve SLB norms.	
Prepare and implement a water supply master plan	STATE GOV./NPP
Constitute a Coordination Committee among PHED and MCT to implement the investment program.	
Formulate and enforce a) Bye-laws on Ground water conservation/ Rainwater Harvesting, b) Tariff Policy, c) Connection Policy	State Gov./NPP
Constitute a Water and Sanitation Committee to implement water tariff policy which could be formed from among the CTF members.	STATE GOV./NPP
Initiate measures to increase penetration of piped connections; implement measures to improve and sustain collection efficiency.	NPP

Implement differentiated area based tariffs among residential connections; progressively shift to volumetric tariffs for all connections.

NPP

PRIORITIES:

- A) Achieve water security; improve service levels and meet SLB norms
- B) Improve information availability and reliability
- C) Improve capacity and coordination; strengthen monitoring and regulation

6 ACCESS TO TOILETS

Access to toilet is an integral part of Sanitation. Population of migration stream from rural to urban, according to 2001 census was 20 million people during last decade. 12.04 million (21.89 %) out of 55 million urban households do not have access to toilets and defecate in open. The Millennium Development Goals (MDGs) enjoin upon the signatory nations to extend access to improved sanitation to at least half the urban population by 2015, and 100% access by 2025.

6.1 CITY SANITATION RATING PROJECT

City Sanitation Rating Project was undertaken by MoUD in 2008 to rate Indian cities on various Sanitation related infrastructure, practices prevalent and information available at ULB.

Access to toilet has been covered under the outcome and process related indicators' categories. It covers access and use of toilets by urban poor, un-served households and floating population, visible open defecation, elimination of manual scavenging and M&E systems to track incidences of open defecation. Nagar Palika Chandausi has performed very poorly in this section.

6.2 PRESENT CONDITION

According to Census 2011, the total population of Chandausi is 114383 and the number of households is 20726. Among these households, only 85.8% have toilet facility within the premises and rest of the 14.2% of the population either going for open defecation or using public toilets.

Most of the slum dwellers are going for open defecation in surrounding vacant land and in agricultural lands. The slums located adjacent to railway line, uses the railway track and surrounding for their basic needs.

TABLE 6-1: GAP OF TOILET FACILITY

S. No.	Description	No.	%
1	Total number of Households	20726	100
2	Number of households having latrine facility within the premises	17783	85.8
3	Number of households not having latrine facility within the premises	2943	14.2

Source: Census of India, 2011

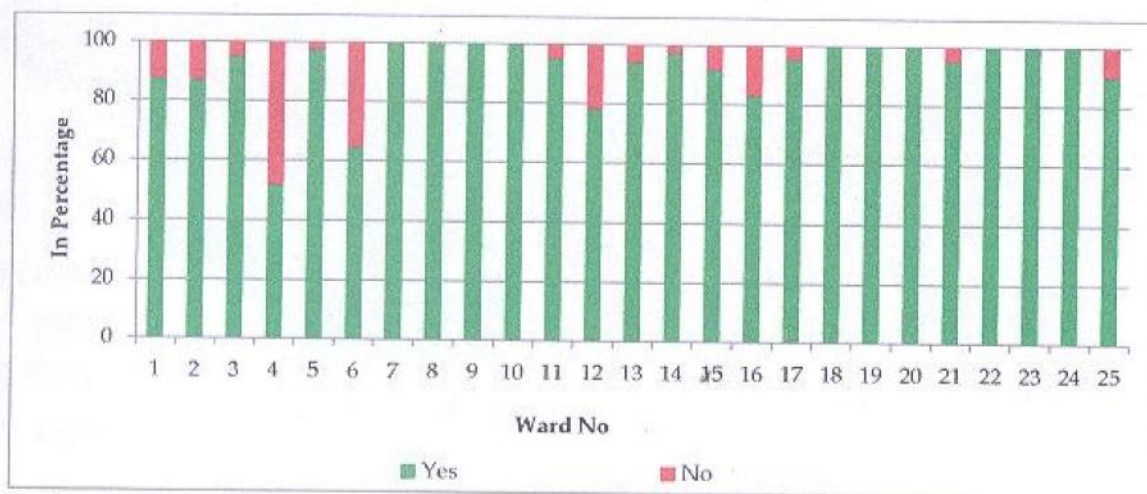
Here under Swachh Bharat Mission (SBM) Nagar Palika Parishad Chandausi is proposing individual toilets. Particularly it is proposing in the areas where people are going open defecation. The mobile toilets should be placed in the congested areas where sufficient land is not available for the construction of toilet and septic tank. All the toilets septic tanks should connected with sewer system.

6.2.1 AVAILABILITY OF TOILET FACILITY AT HOUSEHOLD LEVEL (WARD WISE)

As can be witnessed through graph below, most of the respondent reported access to individual toilets. On the other hand all these people those doesn't have Toilet facility at household level, shares neighbor's toilet or goes to outside for Open Defecation.

As the figure below depicts about the availability of toilet facility at household level, the condition is worst in the 4, 6, 12, 16 and 17 wards.

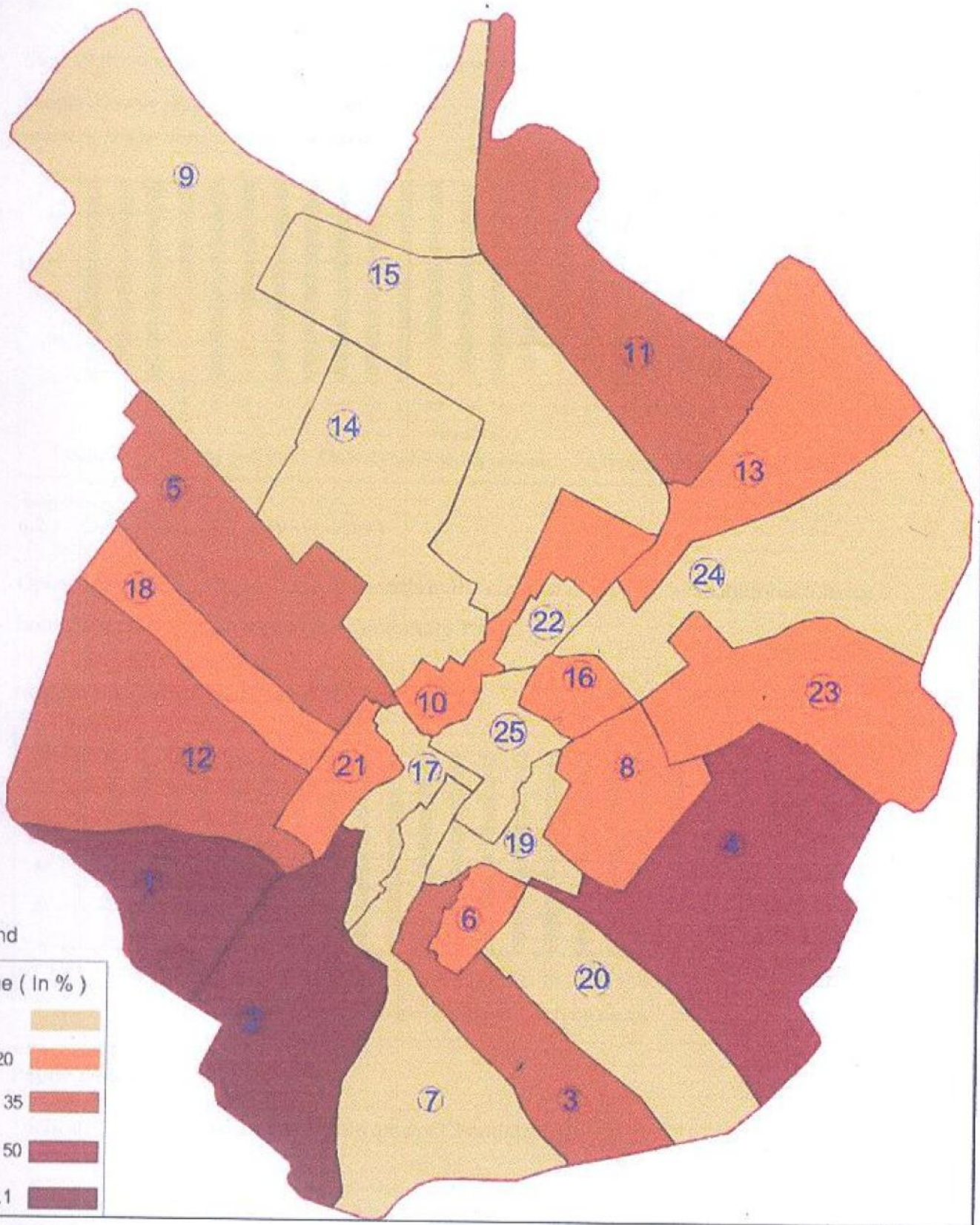
FIGURE 18: AVAILABILITY OF TOILET FACILITY AT HOUSEHOLD LEVEL (WARD WISE)



Source: Census of India, 2011

CRITICAL WARDS OF NON AVAILABILITY OF TOILET

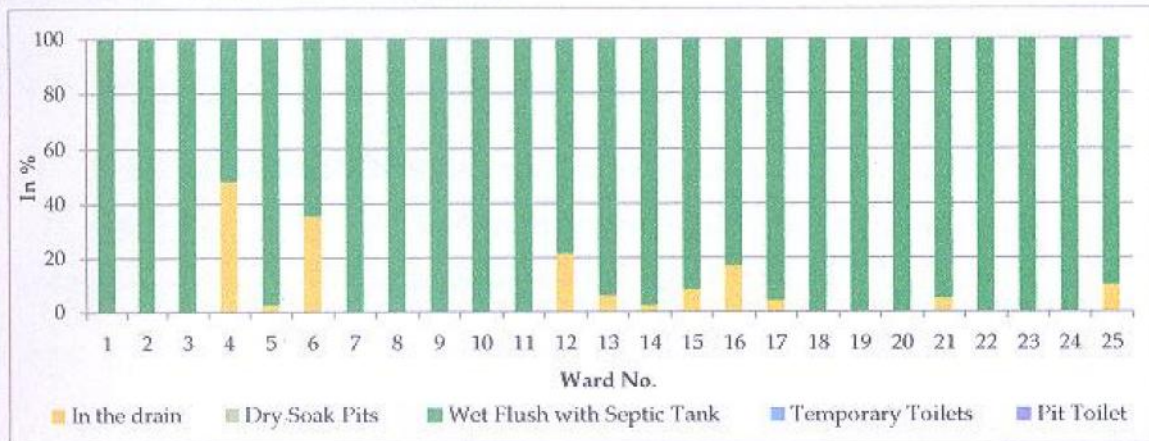
CRITICAL WARDS OF TOILET



6.2.2 TYPE OF TOILET FACILITY (WARD WISE)

Most of the respondents reported to have the wet flush toilets only in ward 4, 6, 12 and 16 people directly dispose into the drain.

FIGURE 19: TYPE OF TOILET FACILITY (WARD WISE)



Source: Primary Survey, 2016

6.2.3 OPEN DEFECTION (WARD WISE)

Open defecation is common in many wards in the city due to the non-availability of toilet at household level and absence of the community Toilet.

FIGURE 20: OPEN DEFECTION (WARD WISE)



Source: Census of India, 2011

Public Toilets

There are total 13 Public Toilets within area of Chandausi city.

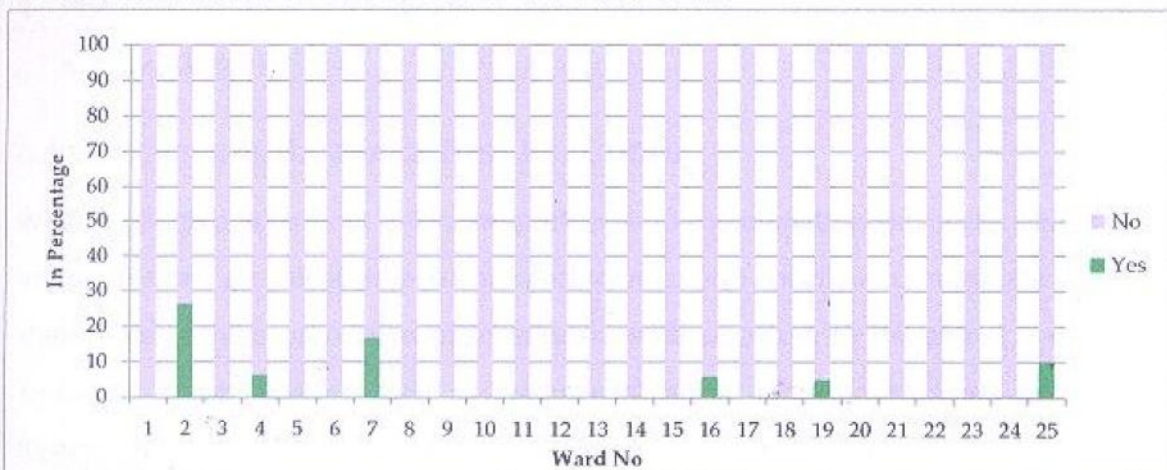
6.2.4 AVAILABILITY OF TOILET FOR PHYSICALLY HANDICAPPED (WARD WISE)

There is no toilet facility for Physical Handicapped people in the city. In India there is no tradition of having Physical Handicapped toilet. This facility should provide for physical handicapped people for the sustainable and holistic development of city.

6.2.5 WILLINGNESS TO CONTRIBUTE TO O& M FOR TOILET (WARD WISE)

In the residential areas of Chandausi city few people wants to contribute in the Operation and Maintenance of the toilet facility. In all the wards most of the respondents are not willing to contribute for the toilet facility in Chandausi.

FIGURE 21: WILLINGNESS TO CONTRIBUTE TO O& M FOR TOILET



Source: Primary Survey, 2016

6.3 SWOT, ISSUES AND PRIORITIES

The given table captures the SWOT analysis for access to toilets within NPP.

TABLE 6-2: ACCESS TO TOILET SWOT

Strength	Weaknesses
<ul style="list-style-type: none"> • Good Coverage for Toilets Access even if temporary • General awareness on sanitation hygiene is good. • People themselves want change in the city. 	<ul style="list-style-type: none"> • Open Defecation in Slums • Open Urination particularly in commercial areas • Limited availability of community toilets in slum pockets and constrained

	availability of Public Toilets.
Opportunities	Threats
<ul style="list-style-type: none"> • Open defecation is limited to selected low-income pockets • People desire individual in house toilets • Limited identifiable areas with no toilet 	<ul style="list-style-type: none"> • No willingness to pay for construction of Community Toilets and its O & M. • Poor Hygiene conditions near open defecation spots and open urination would create health hazards

Key issues with respect to Access to Toilets within Nagar Palika are summarised below-

- Open Defecation while rare is still prevalent in selected pockets of the city.
- Open Urination in public places along roadside is rampant in congested commercial areas.
- Priority should be given to the construction of Public toilets with the Nagar Palika accountable for it.

6.4 CONCEPTUAL BASIS AND BEST PRACTICES

While individual household toilets are preferable to communal/public toilets, shared toilet access solutions are still appropriate in specific situations; notably as Community Toilets in slums when a high proportion of tenants are without access to toilets and even Public Toilets in urban pockets such as commercial areas and transit points are loaded. Nonetheless, financing and sustainable management of communal/ public toilets has been challenging, and requires extensive consultation and careful analysis. Our action plans and recommendations for Shared Toilet Access in Chandausi are built on insights from recent studies and research initiatives on this subject.

Under Swachh Bharat Mission the priority has been given to the Sanitation practices in which programs to aware people about the importance of hygiene is included. Chandausi is doing a good work on awareness programs.

Where are public toilets used?

- The Sulabh organization runs Pay-per-use toilets throughout India. Reports suggest that these facilities are profitable in public locations, but tend to be loss-making in residential areas and are often inadequately maintained.

- Community toilets are seen in low-income communities of many African and Asian cities. The SPARC model, implemented in Pune and Mumbai are constructed and managed by NGOs under contract from municipality with community involvement. A moderate per-household monthly fee is collected.

KEY CONCLUSIONS

- Community or public toilets should only be introduced after exploration of the social and economic context.
- People will generally prefer communal toilets closer to home over public toilets located far-off.
- Community or public toilets are only acceptable if they provide effective service for women and children.
- Community toilets serving small groups of households and charging a monthly per household fee will be preferred by users, especially women, than pay-per-use public toilets. However, per-capita capital costs tend to be higher.

6.5 OPTIONS FOR IMPROVING SERVICE DELIVERY

Advertising rights potential does make toilet complexes profitable, so that maintenance is commercially viable. The challenge is to develop contracts so that the public service is delivered to an acceptable standard. The following could help:

- Assess Local Demand before developing New Toilet Blocks. Where demand is high, toilets can be profitable without advertising revenue. Demand is a prerequisite for contracts based on user charges.
- Revitalize Monitoring and Strengthen Accountability. Municipalities need to enforce contract compliance. Media interest, municipal accountability, consumer feedback are possible solutions. Further, service level parameters should be defined and monitored. Punitive measures should be contractually enforced to disincentives in case of poor maintenance.

- Increase the Lease Period. Longer lease periods could enable longer term cost recovery plans with proper attention to maintenance when backed by contractually enforcing penalties for poor performance.

6.6 VISION AND GOALS

Vision

Equitable and Efficient access to Public and Community toilet to “Eliminate Open Defecation” and by making all citizens sanitation-conscious through sustained awareness effort”

Goals

TO MEET SERVICE DELIVERY TARGETS TO ACHIEVE THE ABOVE VISION.

TABLE 6-3: ACCESS TO TOILET SUPPLY, SMI TERM TARGETS

Parameter	Unit	Norm	Baseline/ward number
Open Defecation			2,3,4,8 & 13
No. Of Open Urination Spots	NO.	0	
No. Of Open Defecation Spots	NO.	0	Near Slum Pockets
Toilet Coverage			
% Households With Toilet Access	%	99%	85.8%
Access To Public Toilets	Floating Population/Public	-	5%
Access To Community Toilets	Slum Dwellers/Community		0

In case like Chandausi all the above targets should be met on immediate term (3years) short term basis (5 years) as the service delivery rate must be equivalent to rate of growth of city. Medium term (10 years) and Long term (>10years) targets can be proposed in large scale projects.

6.7 GAP ANALYSIS

Since most of the wards are low-income high density Shared Toilets in Slums, Public Toilets in busy commercial wards or a combination seems to be an appropriate solution.

TABLE 6-4: GAP ANALYSIS

S. No.	Description	No.
1	Number of households not having latrine facility within the premises	2493
2	Community Toilets (1 for each Slum Pocket)	10

- At present there are 20726 households exists in which 2493 households does not have toilets in their premises.
- Firstly up gradation of existing toilets is a priority and then addition of more 13 (10 seater) for Public Toilets is must.
- Community toilets maximum 10 sulabh complex (10 seater) are required for slum population
- Schools which do not have area for the toilet facility can go for the Low Cost less space model toilets.

6.8 FINANCIAL OPTIONS

Broad cost estimates for capital expenditure are assessed for public toilet complexes and mobile toilets with appropriate wastewater treatment systems.

TABLE 6-5: UNIT COSTS FOR CONSTRUCTION OF TOILET

Component	Total units	Cost for one unit	Rate (INR in Lakh)*
Household Toilets	2493	8000	199.44
Community Toilets Complex	10 (10 seats with bathing unit)	65,000	65
Total capital investment			264.44

Source: Calculated as per S.B.M., 2014

Construction costs for public toilets and community toilets in Chandausi city vary significantly according to the public requirement. The table above presents capital expenditure currently for household, community and public toilets. This approximately translates Rs. 8000 (household) for construction of one toilet seat. The construction expenditures for one community complex translate 65,000 (per seat) and 75,000 (per seat) for public toilet complex. The costs for the rehabilitation of public toilets are approximately 60% of the capital costs for the construction of a public toilet.

It is estimated that Chandausi has to mobilise funds in the range of Rs. 2.64 Crores approximately for achieving 100% sanitation access for the communities in Chandausi City.

6.9 COST RECOVERY OPTIONS

The challenge for Chandausi is to establish a rate structure that adequately addresses the true cost of services associated with the capital investments, operations, maintenance and regulatory requirements. The recovery of costs incurred in each revenue area shall be through a tax levied upon the property owners within the jurisdiction of the catchment area in addition to the user charges and the revenue. Water Supply System should be smart with advance technology for better revenue management and operation.

6.10 TIMELINE

The system shall be designed under the broad framework as per the guidelines for a design period of 30 years; however, the planning shall entail the implementation of the design in phases to meet the ultimate goals of the CSP.

The phased approach aims to navigate through the challenges posed by the limitations in investments, institutional capacities, and community engagement in a proficient manner. The phases and the corresponding timelines are defined as stated below –

TABLE 6-6: TIMELINE INDICATION

Phase	Year	Activity
Immediate	2016-2019	<ul style="list-style-type: none"> Review condition of existing facilities against design considerations through a detailed ward level survey Rehabilitate all facilities which do not comply to the design considerations (repairs and up-gradation of public toilets) Initiate preparation of Public Sanitation DPR Identify possible construction sites for new infrastructure Construction of new facilities (toilet seats as well as urinals) mainly focussing on core city area Conduct awareness generation campaign on health and hygiene aspects of public sanitation Promotion of individual household toilets through subsidies/incentives
Short-Term	2020 - 2025	<ul style="list-style-type: none"> Construction of new facilities in core city (balance) and peripheral areas Promotion of individual household toilets through subsidies/incentives
Mid-Term	2026 - 2034	<ul style="list-style-type: none"> Augment existing infrastructure as per the demand Endure provision of 1/35 seat/user ratio for residential areas and 1/100 for tourist areas Promotion of individual household toilets through subsidies/incentives
Long-Term	2035 - 2046	<ul style="list-style-type: none"> Augment existing infrastructure as per the demand Endure provision of 1/35 seat/user ratio for residential areas.

6.11 RECOMMENDATIONS

Under the Swachh Bharat Mission scheme the toilet facility to the individuals, economically weaker section people, slum population and floating population shall be provided. We suggest PPP model for the large number of requirement. There are 2 ways in which the

bidding can take place in PPP model. Firstly all the public toilets can be bid for separately and all shared toilets in slums can be bid separately. But the slum is occupied by economically weaker section so for a successful sanitation scheme in these wards it is advisable for grouping of Toilet facility (group bidding) to a contractor with few commercially viable and few commercially unviable located toilet sites. This would be a win- win situation where profit from the viable sites can be used to run the toilets in unviable sites.

Also once the private party develops the facility on the land provided by ULB, it can avail 20% subsidy from the ULB for the O and M of the facility every month. Recommendations are summarized in detail below.

TABLE 6-7: RECOMMENDATION, ACCESS TO TOILETS

Actions	Recommended body
Prepare and Implement a city wide Public and Community Toilet Development/Rehabilitation Plan	NPP
<ul style="list-style-type: none"> • identify locations, configuration and sizing of Public and Community Toilets 	
<ul style="list-style-type: none"> • Replace dilapidated open urinals with enclosed toilets 	
<ul style="list-style-type: none"> • Provide Community Toilets, starting with identified locations with high OD prevalence 	
<ul style="list-style-type: none"> • Provide Public Toilets starting with identified areas having high floating population 	
Implement a comprehensive inspection/monitoring protocol for Toilet monitoring and upkeep	NPP/UPSIDC
<ul style="list-style-type: none"> • Render existing toilets usable through designated accountability among sanitation officials 	
<ul style="list-style-type: none"> • Engage local stakeholders in maintenance, monitoring and oversight of shared toilets 	
<ul style="list-style-type: none"> • Periodic Third Party Audit of facilities and reviews 	
Strengthen basis and capacity through formulation of bye-laws and guidelines	State Gov.
<ul style="list-style-type: none"> • Incorporate Toilet Sizing and specifications as part of Building regulations. 	

• Incorporate fines for open defecation and urination in Sanitation bye-laws	
Drive behavior change through awareness campaigns	NPP/UPSIDC
• Initiate a Slum level sanitation campaign to eliminate open defecation	
• Initiate a Trader-support campaign in commercial areas to eliminate open urination	
• Initiate a school campaign to impart positive behaviors on civic duties, sanitation and toilet	
Initiate actions to improving financial sustainability	NPP/UPSIDC
• Prepare a Toilet Budget annually	
• Explore appropriate outsourcing models for Public	

PRIORITIES:

- a) Create access to Public/Community Toilets to eliminate Open Defecation and Urination
- b) Create Awareness on Hygiene and Health Impacts and drive behavior change
- c) Fix accountability, Enforce Standards, and Strengthen Monitoring
- d) Assess financing needs and address them innovatively to ensure Sustainable operations.

7 SEWERAGE

The city does not have sewer network properly. There was lack of willingness by the people to access the facility which was reflected during the site visits. In this situation absence of required Sewage Treatment Plant and storm water drains makes it even worse. Waste water is either treated in septic tank or discharged directly in broken drain or water bodies. The city does not have sewerage treatment plant.

7.1 PRESENT CONDITION

The city does not have sewerage network. The old city is having the sewerage line which is not operational and had become obsolete. Six inch pipe is used in lying sewer line but minimum city need two ft pipe for sewer line.

7.1.1 SEWAGE GENERATION

The trend of wastewater generation and future projections is calculated based on the sewage return factor taken as 0.8 which indicates that 80% of water supplied returns as sewage. By 2011 the total estimated wastewater generated by 114383 populations is 165.4MLD in Chandausi city. As the people in Chandausi are using their own submersible for the water consumption, the waste water is more than the water supplied by municipal. The total water supplied is 11 MLD.

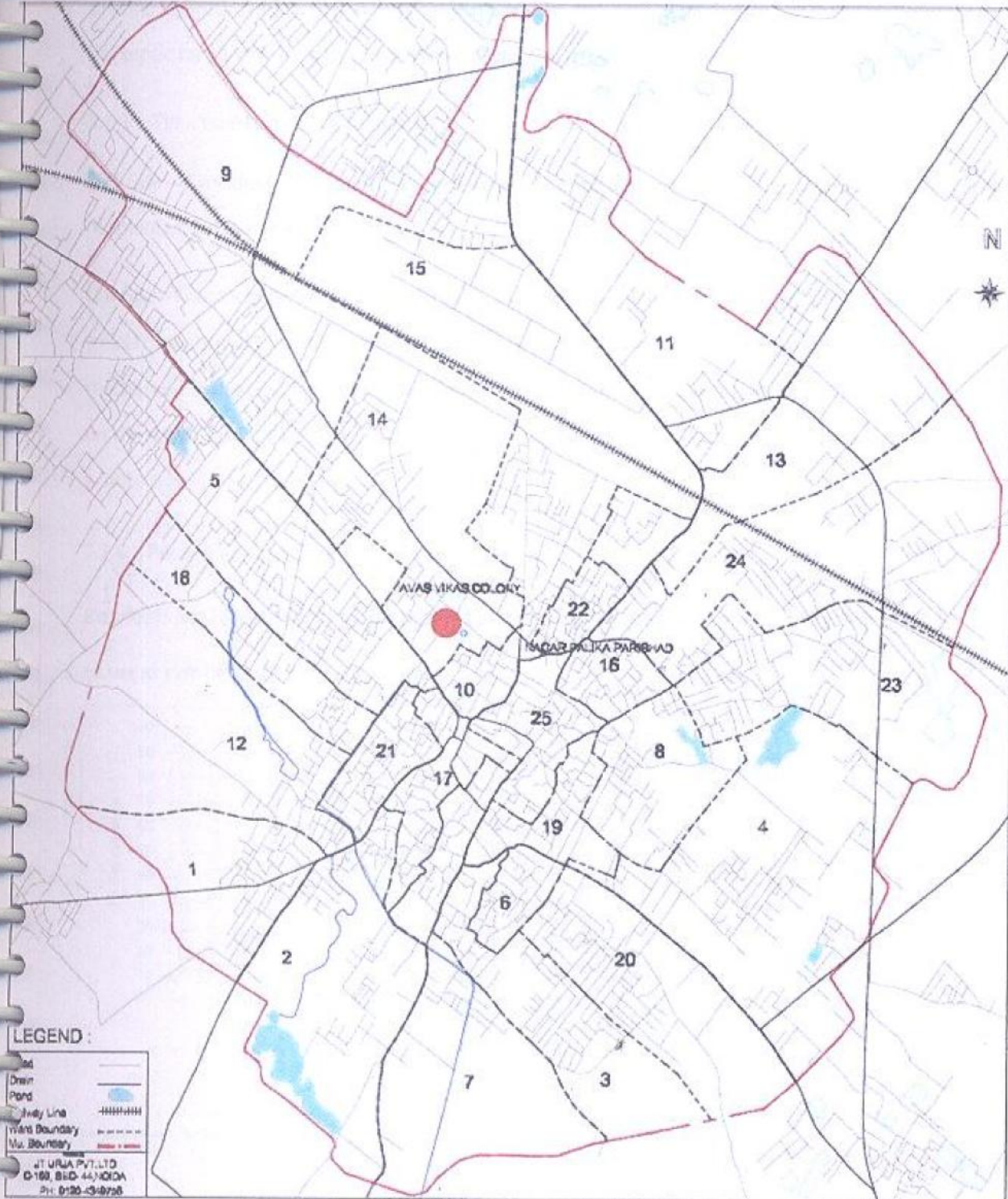
TABLE 7-1: SEWERAGE INFRASTRUCTURE WITHIN THE CITY

Indicator	Description
Population	114383
Total water Consumption	15.4 MLD
Waste Water generate	12.32 MLD
Sewerage Network	3.5 km
STP	Nil

Source: Nagar Palika Chandausi

Area covered under sewerage network is only Awas Vikas Colony the rest of the city is devoid of the sewerage network.

SEWERAGE NETWORK



7.1.2 COLLECTION

Presently, the city has the system of septic tank connections at house hold level and the sewage collection network is not operational in the city. The waste water overflows from the septic tanks mix into the drain and poses the problem of ground water contamination.

7.1.3 TREATMENT AND DISPOSAL

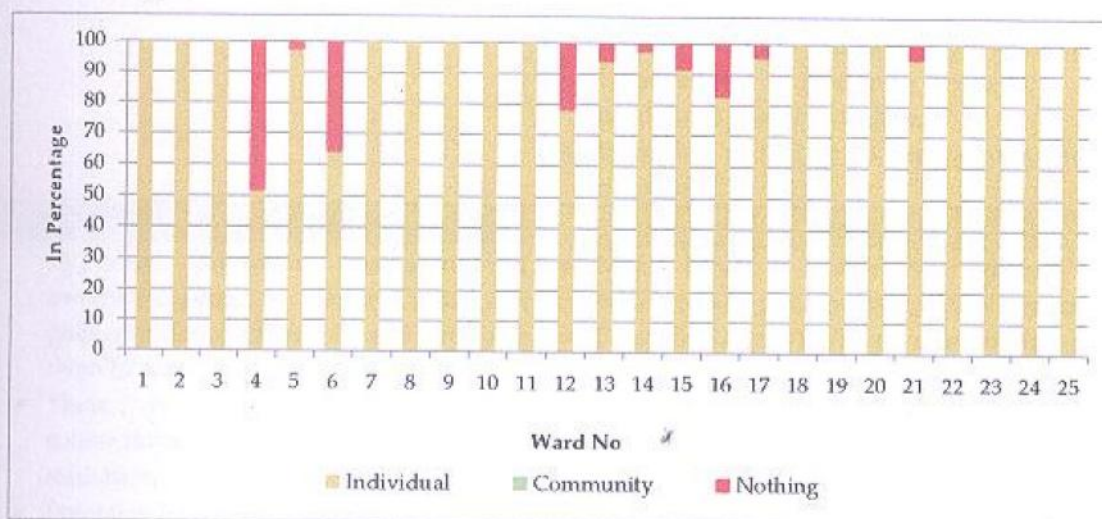
Off Site—City does not have the coverage of sewerage network. The available network is obsolete and not working.

On Site—There are many households in Chandausi 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 or coverage of septic tanks in household & slums for wastewater disposal is not know.

7.1.4 FROM PRIMARY SURVEY

Residents are having individual septic Tanks or either they do not have anything.

FIGURE 22: TYPE OF SEPTIC TANK (WARD WISE)



Source: Primary Survey, 2016

7.1.5 RESPONSIBLE FOR THE O&M OF SEPTIC TANK (WARD WISE)

In all the ward residents they are responsible for the operation and Maintenance of the Septic Tanks.

7.1.6 FREQUENCY OF SEPTIC TANK CLEANLINESS (WARD WISE)

In all the wards residents do not yet had clean their Septic Tanks.

- Management of Septic tanks: No information from respondents reported that the septic tank maintenance and cleaning in managed by individuals directly.
- Cleaning Frequency: No information from respondents about cleaning their septic tanks which seems to suggest that there could be either percolation or leakage into available drains or ground water.

7.2 SWOT ISSUES AND PRIORITIES

TABLE 7-2: WASTE WATER MANAGEMENT SWOT

Strength	Weaknesses
<ul style="list-style-type: none"> • Prevalent use of septic tanks 	<ul style="list-style-type: none"> • Absence of Sewerage Network • Absence of Sewage Treatment Plant • Mixing of storm water and sewage • No clear accountability / regulation for monitoring septic tanks (On site sanitation) • Unorganised sludge removal; Weak guidelines / safety practices • Dumping of sludge in nearby areas; no safe disposal
Opportunities	Threats
<p>By some initiatives, campaign and awareness program Nagar Palika can gain confidence of people and convince them to access laid network.</p> <ul style="list-style-type: none"> • There is potential to improve connections / cost recovery in offsite sanitation. • Potential for introducing bye-laws and regulation for onsite sanitation and 	<ul style="list-style-type: none"> • Major threat is pollution of ground water which can be a major source of water supply • Potential Ground Water contamination which is currently the most reliable source in the absence of standards and regulations • Mixing of storm water and sewage prevents from the opportunity of ground water recharge and increase in water levels of the existing water bodies.

septage management (frequency of de sludging) for onsite sanitation.

- Absence of Treatment Quality Monitoring in case of people resisting connections.

The key issues and priorities with respect to waste-water management within NPP are summarised below

- The city is devoid of sewerage network.
- Flows of grey water and in some cases black water into water bodies going unchecked.

7.3 CURRENT AND PROJECTED SEWAGE

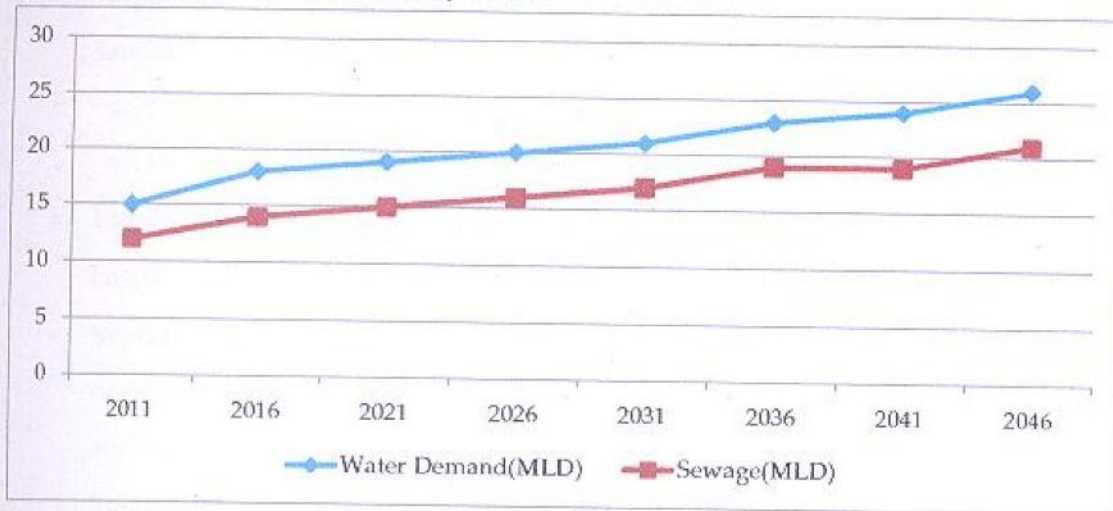
TABLE 7-3: PRESENT AND PROJECTED WATER AND WASTE WATER IN MLD

Year	Population	Water Demand (MLD)	Sewage(MLD)
2011	114383	15	12
2016	130,855	18	14
2021	139,239	19	15
2026	148,208	20	16
2031	157,377	21	17
2036	167,183	23	19
2041	177,283	24	19
2046	188,087	26	21

Source: Calculated Value

However based on the survey conducted by JT Urja, it is estimated that most of the households are using soak pits or septic tanks. 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. Surveys in the city indicate that a significant portion of sullage water find their way into drains unchecks.

FIGURE 23: WATER AND WASTE WATER PROJECTIONS



Source: Calculated Value.

7.4 GAP ANALYSIS

- The households are not having connection to the sewerage network. Only few areas are having connection to the sewerage network. Sewer connections for each household (20726) are required.
- Sewerage Treatment Plant (13 MLD) also required.

TABLE 7-4: GAP OF SEWERAGE

Indicators	Existing	Existing (in %)	Present Gap	Present Gap (in %)
Sewerage Line	3.5 km	6.10	31 km	89.85
Sewerage Connection	0	0	20726	100
STP	0	0	13 MLD	100

Source: SLB and Census of India, 2011

7.4.1 CONCEPTUAL BASIS AND BEST PRACTICES

A. Options for waste-water management

- **Fully on-site sanitation:** Fully on-site sanitation arrangements will involve on-plot treatment and disposal of all waste water and involves septic tank and soak pits - to receive and treat waste water. Septage (sludge from septic tanks) is transferred to another location for treatment. Onsite sanitation typically covers:

- **Improvements in existing household disposal facilities:** Existing household sanitation arrangements, which do not have proper disposal, can be improved by
 - Construction of soak pits for existing toilets having only septic tanks, and
 - Providing a septic tank / soak pits.
- **Public toilets:** Community/public toilets could also be provided with a septic tank based on-site system with a soak pit or soakage trenches (for effluent disposal).
- **Septage management:** An efficient septage collection system, operated by the ULB or private agencies is required along with regulation and monitoring of septic tanks and septage disposal.

Small-bore sewerage: Septic tank is connected to small-bore sewerage network: all domestic waste water is partially treated in septic tank and the effluent is disposed into small-bore sewerage network. Septage is periodically cleared.

- Twin pit latrine waste water is disposed into soak pits. Small diameter sewer pipe (< 200 mm) is laid at a flatter gradient to carry the effluent from septic tanks.

7.4.1.1 CENTRALIZED OR DECENTRALIZED SEWERAGE SYSTEM

This alternative includes the regular sewerage network to collect the waste water from the households. The network is normally laid through most of the town. A detailed topographical and land availability survey will be necessary to determine the feasibility and required number of decentralized waste water treatment plants.

7.4.1.2 COMBINED SYSTEM

Following arrangements are envisaged for household/public sanitation and waste water treatment and disposal arrangements.

- **Household Sanitation:**
 - a) Septic tank with soak pits receives the entire household waste water. Septage is periodically cleared and taken away to a common treatment facility.

b) Sewerage network receives all the household waste water and conveys it to the centralized or decentralized treatment plant(s).

- **Public Conveniences:**

Waste water discharge is disposed into the sewerage network for further treatment and final disposal, in areas where some sewer network is provided and in other areas, waste water is discharged into a septic tank with soak pits.

- **Disposal of Septage:**

For households served by on-site sanitation systems, an efficient septage collection system, operated by the ULB or private agencies is required along with regulation / monitoring of septage disposal.

- **Waste Water Conveyance and Treatment:** Domestic waste water, disposed into the sewerage network, is transported to the waste water treatment site(s) for treatment and final disposal. Treatment will meet the disposal standards

B. Challenges and Practices in Regulating onsite Sanitation

ULBs and Governments have realized the importance of onsite systems as long-term solutions to domestic wastewater treatment and disposal. The NUSP makes specific reference to on-site sanitation systems. However, institutional structure, organizational resources and personnel dedicated to the task of septage management is largely not yet in place.

Municipal laws typically contain provisions for punitive actions against properties causing nuisance, including letting out untreated human excreta into drains and open areas; but enforcement is patchy. Most references to on-site sanitation regulation exist within building regulations/building bye-laws or the development control rules (DCRs) usually developed for large cities.

Typically, the problems associated with on-site sanitation facilities can be grouped into four primary areas:

- Insufficient knowledge/capacity/awareness and public involvement
- Inappropriate system design and selection processes
- Poor O&M:
- Poor Monitoring

7.4.2 VISION AND GOAL

Vision

Collection and Treatment of all waste water to prescribed standards and incorporate recycling and re-use to conserve fresh water resources.

Goal

Table below indicates targets in short, medium and long-term.

TABLE 7-5: WASTE WATER MANAGEMENT, SML TERM TARGETS

Parameter	Unit	Norm	SLB	Short T	Medium T	Long T
% of area with sewerage network	%	100%	-	✓		
% of households with sewerage connections	%	100%	0%	✓		
WW Collection Efficiency	%	100%	-		✓	
WW Treatment Adequacy	%	100%	-		✓	
Quality of WW Treatment	%	100%	-			✓
Reuse and Recycling	%	20%	-	✓		
Cost Recovery	%	100%	-	✓		
Complaints Redress	%	80%	-		✓	
Collection Efficiency	%	100%	-		✓	

TABLE 7-6: SERVICE LEVEL BENCHMARK FOR SEWERAGE SYSTEM

Performance Indicator	Benchmarks	Status
Coverage of Sewerage Network	100%	0%
Coll. Eff. of Sewerage Network	100%	0%
Adequacy of Sewage Treatment Capacity	100%	0%
Quality of Sewage Treatment	100%	0%
Extent of Reuse and Recycling of Sewage	20%	0%
Extent of cost recovery	100%	0%
Eff. in re-dressal of customer complaints	80%	79%
Eff. In Collection of Sewage Water Charges	90%	0%

Source: Local Bodies Uttar Pradesh (Service Level Benchmark document)

7.5 FINANCIAL OPTIONS (SEWERAGE NETWORK)

Broad cost estimates for capital expenditure are assessed for the key components of the various design sectors discussed in the preceding sections. The broad implementation strategy adopted for the sewerage system envisages that the first two years as the major investment phase (2016-2018), whereas the subsequent years over the plan timeline until the year 2046 predominantly involve incremental procurements for augmentation of the services or replacements.

TABLE 7-7: RATE FOR PROPOSED SEWERAGE NETWORK

S. No	Item	Unit	Rate(Lakh)
1	Construction cost for Sewerage Network	1 KM	30
2	STP	1 MLD	108
3	De-sludging machine	1	4.5
Total Cost			
1	Length of Sewage Network NP2 R.C.C 300mm Dia. Pipe	31 kms	930
2	STP	12.32 MLD	1330.56
3	De-sludging machine	5	22.5
Total cost			2283.06

Source: Calculated Value as per D.S.R. 2014

The approximate cost for implementation of this recommendation is Rs. 22.83 Crores

7.6 COST RECOVERY OPTIONS

The challenge for Chandausi is to establish a rate structure that adequately addresses the true cost of services associated with the capital investments, operations, maintenance and regulatory requirements. The recovery of costs incurred in each revenue area shall be through a tax levied upon the property owners within the jurisdiction of the catchment area in addition to the user charges and the revenue.

7.7 IMPLEMENTATION STRATEGY

Based on the availability of manpower, machinery, requisite resources – technical and financial, the proposed interventions are prioritised over immediate phase, short-term, mid-term, and long-term.

TABLE 7-8: PHASE WISE IMPLEMENTATION PLAN

Phase	Year	Activity
Immediate	2016-2018	<p>Collection Chandausi shall conduct detailed survey in-house or through professional consultants to assess properties having sewerage connections/ septic tank & soak pit/no system at all for wastewater disposal. The survey shall also assess the feasibility of connecting each property to the sewerage system.</p> <p>Provision of household sewer connection in all wards</p> <p>Conveyance Sewerage Network must laid down under AMRUT scheme</p>
Short-Term	2019 - 2024	<p>Collection Provision of household sewer connection in un-served areas in all sewerage zones for remaining households</p> <p>Treatment Provision for STP</p> <p>O&M and M&E Establish O&M and M&E systems</p>

Mid-Term	2025 - 2034	<p>Conveyance</p> <p>Provision of sewerage network</p> <p>Extension of sewerage network</p> <p>Replacements of components</p> <p>Treatment</p> <p>Provision of new STPs for uncovered areas</p> <p>Augmentation of STP capacity</p> <p>O&M and M&E</p> <p>Regular O&M and M&E of entire sewerage system</p>
Long-Term	2035 - 2046	<p>Conveyance</p> <p>Provision of sewerage network in newly extended areas</p> <p>Treatment</p> <p>Augmentation of STP capacity</p> <p>Replacements of components</p> <p>O&M and M&E</p> <p>Regular O&M and M&E of entire sewerage system</p>

7.8 RECOMMENDATIONS

The Sewer network in the city is laid but is not operational. There is a need to generate awareness among the people regarding the importance of efficient discharge of sewage from the city.

TABLE 7-9: RECOMMENDATIONS, WASTE WATER MANAGEMENT

Actions	Recommended body
Initiate a connection drive to increase penetration of sewerage connections covering black and grey water flows;	NPP
Waste-water recycling should be priority; explore further opportunities to meet SLB norms in the medium to long term	NPP /Jal Kal

Action plan for using treated sewage for horticulture, irrigation, industrial & other non-potable use in order to conserve fresh water.	NPP / Jal Kal
Efforts to involve PPP in O & M and STP's & other components	
Formulate bye-laws / guidelines on septage management and on-site sanitation	NPP /State Gov.
Establish a waste-water quality monitoring protocol in coordination with CPCB	NPP
Regulate tariffs for desludging / cleaning	NPP

8 SOLID WASTE MANAGEMENT

Solid waste Management is an obligatory function of Chandausi Nagar Palika. However, this service is not properly performed, resulting in problems of health, sanitation and environmental degradation. The major draw backs in the management of solid waste in the city are; Lack of sanitary workers Lack of collection efficiency, improper choice of technology, Improper site of solid waste, Lack of trained manpower, Poor public participation and cooperation.

8.1 EXISTING SOLID WASTE MANAGEMENT SYSTEM

Local residents, Hotels, Restaurants, Bazaar and vegetable markets, Hospital and dispensaries are the major sources of generation of waste at city. About 44 MT of solid waste is generated every day in the city.

8.1.1 WASTE GENERATION

Solid Waste Management is a critical issue in Chandausi city due to spread of area under its jurisdiction. Based on the population of the city, it is estimated that the City generates approximately 44 MT of solid waste and waste generated per day is 350gm/capita/day. Nagar Palika is capable to clear only 80%-90% of the waste through vehicles available with Nagar Palika and staff engaged for the purpose.

8.1.2 DOMESTIC WASTE

Chandausi city is not an exception and different from other cities in terms of solid waste management. With the growth of population the problem of solid waste is increasing day by day.

Domestic waste is generated at the household level and varies from town to town and at an average, range between 200 to 500 gm. As per the standards, a town like Chandausi will generate 350 gms of solid waste per head per day. Thus this domestic sector will generate 44 Metric Tonne solid waste with the current population of 114383. It comprises of

maximum of organic material like vegetable waste, papers, cloths etc. which can be easily disposed. The household wastes include a small percentage of inorganic materials like metals and plastics.

8.1.3 COMMERCIAL WASTE

The commercial waste includes the waste from hotels and eating establishments, shops, trading units, small street traders, etc. It mainly comprises of paper, plastics and other inorganics, which are finding their way to the disposal yard along with the domestic waste.

8.1.4 HAZARDOUS WASTE

The hazardous wastes include the biomedical wastes from hospitals and clinics, nursing homes, medical research laboratories. The components of biomedical wastes are; (i) Human anatomical waste (tissues, organs, body parts etc.), (ii) Animal waste (as above, generated during research/experimentation, from veterinary hospitals etc.), (iii) Microbiology and biotechnology waste, such as, laboratory cultures, micro-organisms, human and animal cell cultures, toxins etc., (iv) Waste sharps, such as, hypodermic needles, syringes, scalpels, broken glass etc., (v) discarded medicines and cyto-toxic drugs (vi) soiled waste, such as dressing, bandages, plaster casts, material contaminated with blood etc., (vii) Solid waste (disposable items like tubes, catheters etc. excluding sharps), (viii) Liquid waste generated from any of the infected areas, (ix) Incineration ash, (x) chemical waste.

At present bio-medical waste is generated in the city. An organization M/s Synergy Waste Management (p) Ltd. and Ms. Semb Remky Pvt is responsible for collection, transportation and disposal of bio-medical waste. At present 1 Government Hospital approximately 10 Private Nursing Homes are there. The waste is segregated at source into Red (Plastics), Yellow (Cotton, Body parts, Blood), Blue (Syringe, blades, metals) and Black (General Waste) bins at the source. The hospitals are charged Rs.3.20/bed/day.

8.2 COLLECTION & TRANSPORTATION

8.2.1 PRIMARY COLLECTION SYSTEM

Door to door collection service does not exist in the whole city. Machinery and equipment available with the Nagar Palika is not capable to lift and clear total daily waste generated. The residents throw their waste outside their houses which is manually collected by wheel carts and transported to existing temporary collection centers.

Primary Storage - In Chandausi there are masonry type temporary collection centers. The wastes from these centers are transported to low-lying area for dumping without any cover and treatment. The present system is absolutely against the norms of proper Solid Waste Management system as per MSW rule 2000. The Nagar Palika does not have sufficient staff and proper infrastructure for solid waste management.

8.2.2 COLLECTION SYSTEM

The waste collection and transportation activity is executed between 10 AM and 3 PM. approximately 75 waste collection points and approximate 250 dust bin are allocated at all wards. The depot area house several categories of vehicles which are directed to the different secondary collection points for waste collection and transportation to the composting site. Present waste management services in Chandausi are provided by Chandausi Nagar Palika. Sanitary Inspector, Jamadar, Supervisor, Garage Supt. & sweepers are deployed under Executive Officer. Cleaning work of a ward is looked after by administration through staff deployed at ward level.

TABLE 8-1: WORKING STAFF FOR SOLID WASTE

S. No	Description	Nos.
1	Sanitary inspector	3
2	Total sweepers	244
3	Private contractor	117
4	Number Of Dustbin	250
5	Collection Point	75
6	Land Fill Site (existing)	Nil

Source: Nagar Palika Parishad, Chandausi

Maximum 60% of municipal solid waste is actually collected and transported. Collection and transportation is being done in open vehicle creating an ugly look and littering on travelled road.

8.2.3 DETAILS OF EQUIPMENT

The total fleet of vehicles engaged in transportation activity is 14 and each vehicle makes at least 2-3 trips to the final dumpsite. Below table illustrates the details of the fleet of vehicles.

TABLE 8-2: DETAILS OF VEHICLES

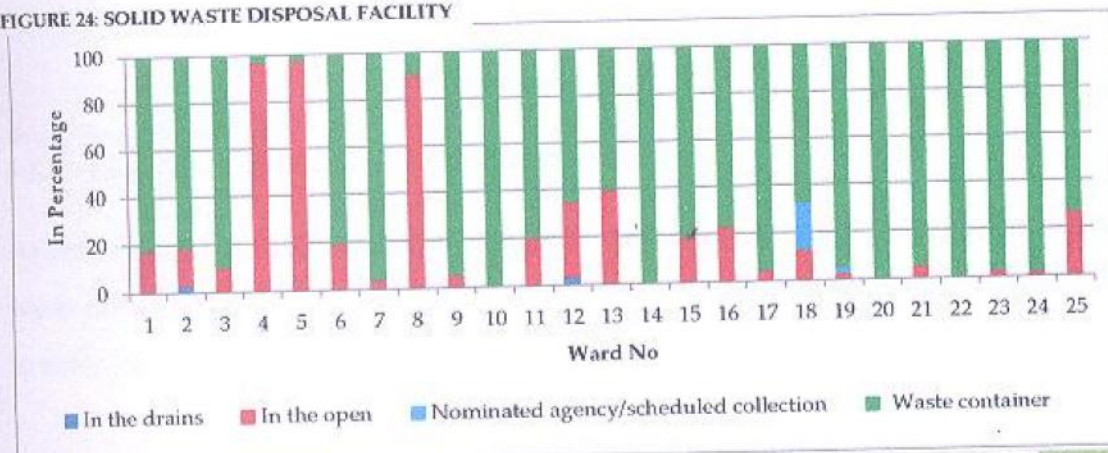
S. No	Category of vehicles	Number of vehicles	Trips
1	Tracker	6	3
2	Tracker (Small)	2	3
3	JCB (Large)	1	
4	JCB (Small)	1	
5	Magic	1	3
6	Lorries (Dumper)	1	3
7	Refuse Collector(RC)	1	12-16 box
8	RC backer attached	1	6-8 box
	Total	14	

Source: Nagar Palika Parishad, Chandausi

8.2.4 METHOD OF SOLID WASTE DISPOSAL FACILITY (WARD-WISE)

As per primary survey, in Chandausi city disposal of solid waste in the open areas is very common as it is evident from the graph below. In few wards only there are the waste containers for the solid waste disposal.

FIGURE 24: SOLID WASTE DISPOSAL FACILITY



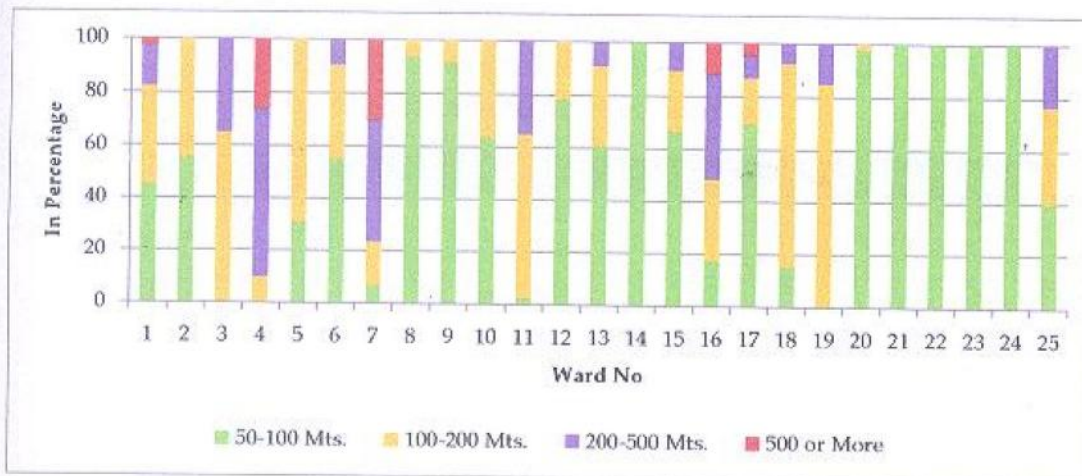
PHOTOGRAPH: WASTE IN THE OPEN AREAS, WARD - 17



8.2.5 DISTANCE OF WASTE DISPOSAL SITE (WARD WISE)

Most of the respondents reported to have the location of the waste disposal site is within the 50-100 mts of the resident area. Some of them reported to have within 200 mts of residents.

FIGURE 25: DISTANCE OF WASTE DISPOSAL SITE (WARD WISE)

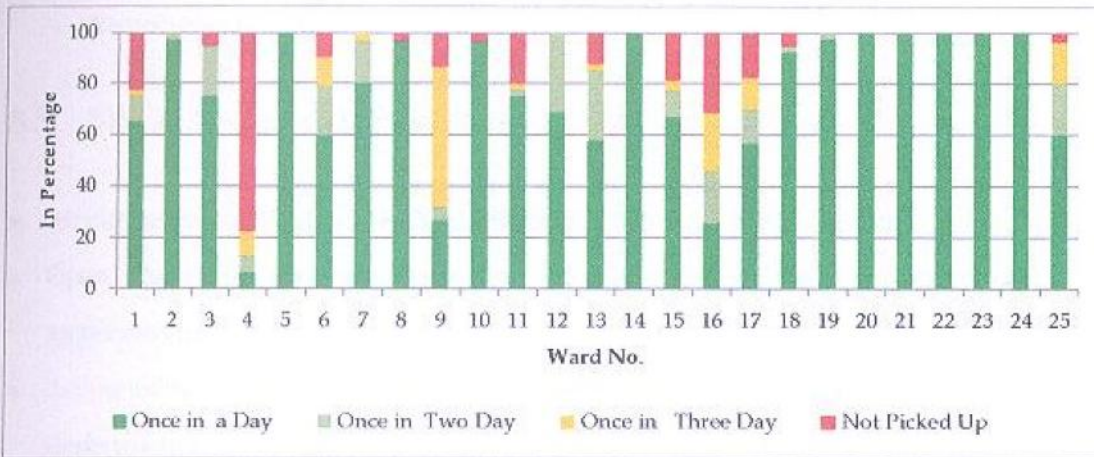


Source: Primary Source, 2016

8.2.6 FREQUENCY OF WASTE COLLECTION (WARD WISE)

As per primary survey in the residential areas most of the respondents reported that solid waste not picked up at all. Some of the respondents reported that solid waste collects once in a day, once in two days and once in three days.

FIGURE 26: FREQUENCY OF WASTE COLLECTION (WARD WISE)



Source: Primary Survey, 2016

8.2.7 TREATMENT AND DISPOSAL

Chandausi town does not have landfill site for the disposal but due to lack of proper and insufficient number of equipment and lack of solid collection system, and public awareness and the waste is disposed randomly in low lying areas or local pond areas.

8.3 CURRENT AND PROJECTED SOLID WASTE GENERATION

TABLE 8-3: PRESENT WASTE GENERATION AND PROJECTIONS (DOMESTIC)

Year	Population	Solid Waste(TPD)
2011	114383	40
2016	1,30,855	46
2021	1,39,239	49
2026	1,48,208	52
2031	1,57,377	56
2036	1,67,183	59
2041	1,77,283	62
2046	1,88,087	66

Source: Calculated Value

8.4 GAP ANALYSIS

- Requirement of Bins
- Door to Door Collection System

- Segregation of Solid waste
- Requirement of Staff

8.5 SWOT ISSUES AND PRIORITIES

- Service levels in SWM within Nagar Palika is below as per SLB norms
- Open dumping and ignorance by people reflects lack of awareness on their responsibilities towards SWM.
- Accountability for SWM is diffused which overlaps between health and engineering departments.
- Around 40-50% of the households are throwing the waste in nearby open land and on roads. Since the secondary collection is not done in regular intervals, the animals and birds are attracted by these wastes in the containers. These creatures will drag out the waste and make the surrounding ugly. In this situation also people are reluctant to approach the dustbins.

TABLE 8-4: SOLID WASTE MANAGEMENT SWOT

Strength	Weaknesses
<ul style="list-style-type: none"> • Compact city; amenable to city wide PPP initiatives 	<ul style="list-style-type: none"> • 0 % coverage ,negligible levels of door-to-door collection • Dumping of wastes in water bodies and neighbourhoods • Low frequency of collection • Inadequate machinery and staff leading to weak accountability. • No processing and landfill facilities
Opportunities	Threats
<ul style="list-style-type: none"> • Exposure to modern waste management practices. • Scope for generating revenue from processing • Scope for PPP interventions in secondary transfer and processing 	<ul style="list-style-type: none"> • Health hazards • Filling of water bodies by wastes • Mixing of solid waste with waste water leading to choking of existing line network.

8.6 CONCEPTUAL BASIS AND BEST PRACTICES

Municipal solid waste management activities are inter-related, and there are several technical options for every activity in the chain.

SEGREGATION

Source segregation is a requirement as per MSWM Rules 2000. However, when source level sorting is not developed, then sorting at the community level/ storage / processing facility may be considered till a house level sorting is established. Pre-sorting at processing facilities is desirable to ensure that output (such as compost) meets regulatory standards.

SORTING

Manual sorting comprises activities like unloading of waste collected, manually spreading the waste, handpicking visually identifiable waste for reuse, and collecting the remaining waste.

Semi-mechanized sorting comprises mechanized unloading, mechanized loading on conveyor belts, handpicking reusable waste, and mechanized collection, stocking and reloading of remaining waste; and

Fully-mechanized sorting comprises mechanized unloading, size reduction through shredders, size separation/ screening, density and magnetic separation and compaction.

STORAGE, COLLECTION AND TRANSPORTATION

Doorstep collection of waste through containerized handcarts/tricycles or motorized vehicles having non-conventional/ sounding horns deployed for doorstep waste collection with active community participation.

Bin-free collection systems are becoming popular. The commonly used waste storage include

(i) metal containers/dumpers and

(ii) plastic bins

A maximum loaded weight of around 30 kg if the collection is manual

Devices that facilitate its movement between its place in the building and the place of collection

Closable in order to avoid waste spillage or exposure

- Economical and affordable for the general public
- Not producing excessive noise while handling
- Easy to empty without leaving waste at the bottom

Transfer Stations: Transfer stations are considered when the distance between the location of large-scale collection activities and the landfill is greater than 20 km.

TREATMENT

Biological processes include; (i) aerobic stabilization and composting processes that principally generate water, carbon dioxide and heat; and (ii) anaerobic important for the production of methane. ULB should look at alternate uses for dry/non-degradable waste like RDF, utilization of inerts. Other options including thermal processes like incineration.

SANITARY LANDFILL

Sanitary landfill uses engineering principles to confine the waste to as small areas as possible, covering it daily with layers of earth and compacting to reduce its volume.

8.7 VISION AND GOALS

VISION

Litter-free through implementation of sustainable waste management practices.

GOALS

TABLE 8-5: SOLID WASTE MANAGEMENT, SML TERM TARGETS

Parameter	Unit	Norm	SLB	Short T	Medium T	Long T
Household coverage	%	100%	0%	✓		
Waste Collection Efficiency	%	100%	60%	✓		
Source Segregation	%	100%	0%	✓		

MSW recovery	%	100%	-		✓	
Scientific disposal	%	100%	-	✓		
Cost recovery	%	100%	-		✓	
Cost Collection efficiency	%	100%	-		✓	
Complaints Redress	%	80%	96%		✓	
Collection Efficiency	%	100%	-			

8.8 FUNCTIONAL ASSESSMENT

8.8.1 SWM STAFF AND QUALIFICATION

The department of solid waste management is under the administrative control of Executive Officer who is assisted by Sanitary Inspectors, Sanitary Dafedars and Safai Karamcharis.

TABLE 8-6: STAFF GAP

S. No	Indicators	Present	Required
1	Sanitary Inspector(1 per 50000 pop)	3	3
2	Sanitary Sub-inspector(1 per 25000 pop)	6	6
3	Sanitary Supervisors(1 for 12500 pop)	9	9
4	Sweepers(650to 750 RM per street)	244	330

Source: Manual Municipal Solid Waste Management (MoLID, 2000), CPHEEO

8.9 FINANCIAL OPTION

Broad cost estimates for capital expenditure are assessed for the key components of the various design sectors discussed in the preceding sections. The broad implementation strategy adopted for the solid waste management system envisages that the first six years as the major investment phase (2016-2021), whereas the subsequent years over the plan timeline until the year 2046 predominantly involve incremental procurements for augmentation of the services or replacements. The assessments are based on the costs

mentioned in the DPR for augmentation, replacement and construction of SWM infrastructure, for activities.

TABLE 8-7: SWM EQUIPMENT COST

S. No.	Activity	Particulars of item	Demand	Rate (per unit)	Amount
1	Household	Tricycle	10	7500	75000
		Hand carts with containers	150	4500	675000
		Containers for hazardous waste	5	20000	100000
2	Street sweeping	brooms	435	75	32625
		jacket, gloves	435	250	108750
		boal kit	435	50	21750
3	For Silt removal	Seamless handcraft	20	2000	40000
4	Waste storage depot	Closed trailers	40	20000	800000
5	Slum	Community bins(0.04-0.1 cum)	20	500	10000
Total Amount					1863125

Source: SWM 2000 and JNNURM Toolkit

8.10 COST RECOVERY OPTIONS

The challenge for Chandausi is to establish a rate structure that adequately addresses the true cost of services associated with the capital investments, operations, maintenance and regulatory requirements. The recovery of costs incurred in each revenue area shall be through a tax levied upon the property owners within the jurisdiction of the catchment area in addition to the user charges. The components of cost recovery could be user charges and tax component as percentage of property tax.

8.11 TIMELINE

The system shall be designed under the broad framework as per the guidelines for a design period of 30 years; however, the planning shall entail the implementation of the design in phases to meet the ultimate goals of the CSP.

The phased approach aims to navigate through the challenges posed by the limitations in investments, institutional capacities, and community engagement in a proficient manner. For the solid waste management sector, the phases and the corresponding timelines are defined as stated below –

TABLE 8-8: PHASE-WISE IMPLEMENTATION PLAN

Phase	Year	Actions
Short Term	2016-2021	<ul style="list-style-type: none"> • Initiate primary segregation , storage and door to door collection system • Procurement of gears/equipment for street sweeping, waste transportation as per the SWM Manual 2000 • Construct and operationalize the transfer station • Promote decentralised solid waste management practices • Enforcement of application of Polluter pays Principle/penalty for littering as per MSW Rules 2000 • Initiate measures to enhance the safety and dignity of sanitary workers
Mid-Term	2022-2031	<ul style="list-style-type: none"> • Augmentation of SWM system to meet the demands of growing population • Regular O&M involving in entire system of SWM • Replacements of components as per the maintenance plan • Regular M&E of entire SWM system
Long-Term	2032-2046	<ul style="list-style-type: none"> • Augmentation of SWM system to meet the demands of growing population • Regular O & M involving in entire system of SWM • Replacements of components as per the maintenance plan

8.12 RECOMMENDATIONS

Actions	Recommended body
Give priority to any Initiatives in the form of DPR's made.	NPP
Initiate actions to improve accountability, oversight and public participation.	NPP
Improve coordination among health and engineering departments and create a separate SWM department to facilitate better accountability in the medium term Engage local stakeholders in monitoring and oversight of SWM activities	
Capacity building and training of staff employed	NPP
Formulate and enforce bye-laws and guidelines to articulate citizen duties and obligations prohibit littering, ban on use of plastic below 40 microns and levy of fines for littering.	NPP
Implement user charges for SWM towards achieving O&M cost recovery in long term	NPP
Avail JNPPURM and other state level grants available to implement an integrated PPP.	NPP
Implementation of 'Door-to-door collection' through 100 percent privatization – In order to achieve the above objective, a Bin system of Solid Waste Storage 'at source' is being recommended. As per this system, each of the households shall be directed to keep separate bins/containers for biodegradable and non-biodegradable waste generated within their premises	NPP

PRIORITIES:

- A) Prepare DPR, focus on implementation and achieving SLB norms.
- B) Clarify accountability and mobilize people support.

9 DRAINAGE

Drainage system of the city is very poor water chute is not according to gradient. The city urgently needs a drainage master plan. The main problem of Drainage system is no proper city plan. Main Nala has been as choked by dumping garbage by the resident of city. The Nala is not according to gradient so it was over flow and submerges during rainy season.

9.1 PRESENT STATUS

The entire run off of the city is carried out by nallas into Sout Nadi. The drainage is open in the entire city. The drainage is open in the entire city. Some of drains/nalabs are bad in condition and these are damaged. Major problem in the city is cleaning of nalabs as 70% of nalabs are encroached upon. Residents have constructed houses/terrace on the nalabs.

9.1.1 HOUSEHOLDS CONNECTED TO DRAINAGE

The city needs urgently action to close the drainage and to provide the drainage to them. As these creates environment pollution. Bad smell from Open Drainage, Choked Drainage creates water logging, unhygienic condition for the people leads to the health problems.

In the city most of the households are connected to the open drainage which is very much harmful for the health and environment.

9.1.2 WATER LOGGING AREAS

There are some areas which partially or permanent submerge during rainy season these areas are Station Road, Sita Road, Ramswaroop Marg, Sikari Gate and Rawwara Chowk.

MAP 6: WATER LOGGED AREAS IN CHANDAUSI

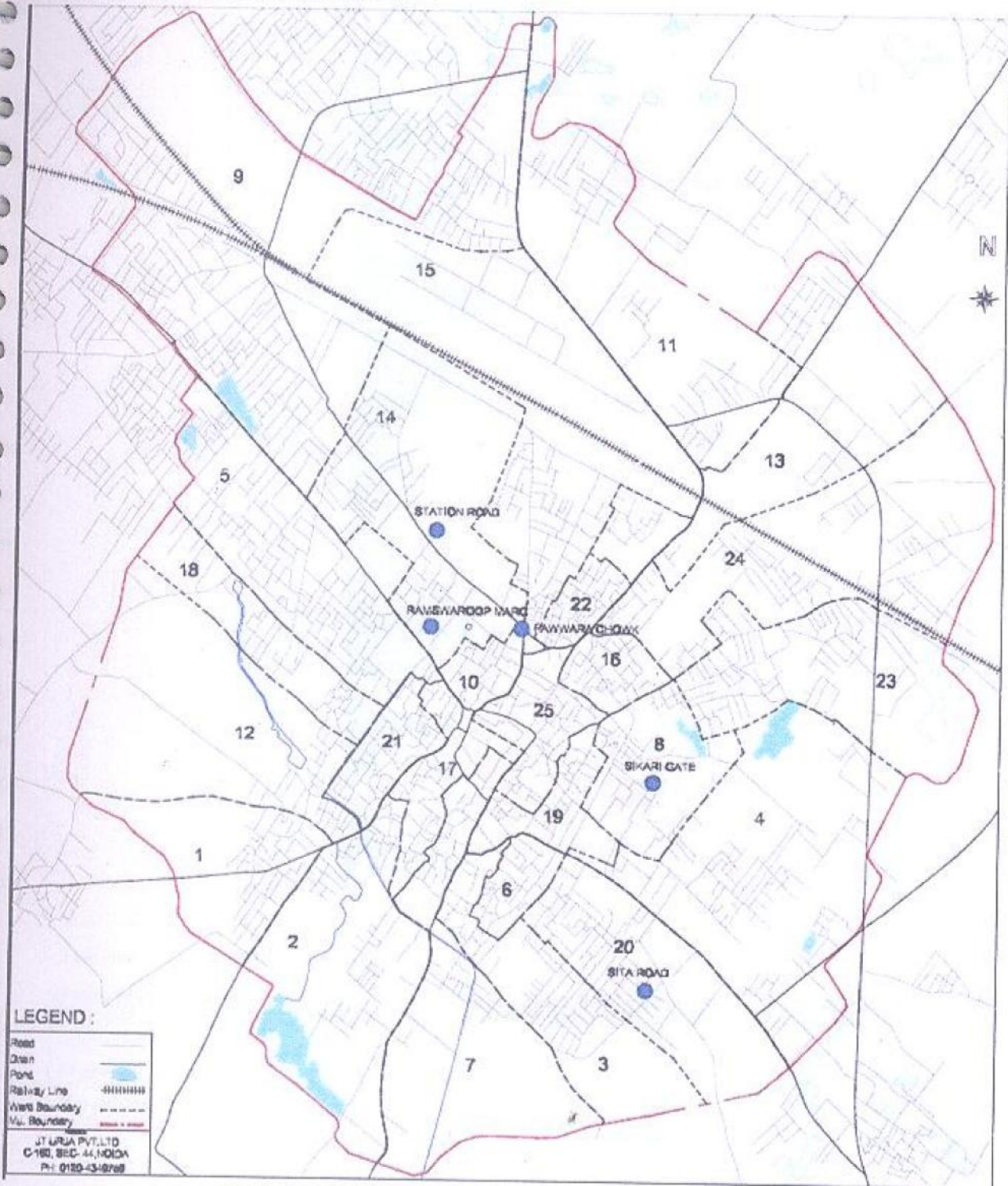


TABLE 9-1: STATUS OF DRAIN CONNECTED TO HHS

Ward No.	Closed drainage	Open drainage	No drainage
1	10.9	87.4	1.7
2	12.1	75.7	12.2
3	27.2	71.3	1.5
4	2.3	78.6	19.1
5	42.1	57.5	0.4
6	8	91.4	0.6
7	31.5	66.1	2.3
8	53.1	41.8	5.2
9	24.2	74.1	1.8
10	43.6	55.5	0.9
11	33.3	61.6	5.1
12	16.6	78.6	4.8
13	32.1	61.2	6.7
14	27.3	72.7	0
15	16.3	83.6	0.1
16	22.1	77.9	0
17	41.7	58.3	0
18	51.1	48.9	0
19	39.7	60.3	0
20	6.9	90	3
21	48.1	50.6	1.3
22	13.7	85.8	0.4
23	0.4	82.1	17.5
24	12.5	73.6	13.9
25	43.1	56.7	0.2

Source: Census of India, 2011

9.2 GAP ANALYSIS

TABLE 9-2: GAP ANALYSIS OF DRAINAGE

Type of Drainage	HHs Connection	In %	Remarks
Closed drainage	5202	25.1	
Open drainage	14695	70.9	Should Covered
No drainage	829	4.1	Gap
Total	20726	100	75%

Source: Census of India, 2011

9.3 SWOT ISSUES AND PRIORITIES

TABLE 9-3: DRAINAGE, SWOT

Strength	Weaknesses
<ul style="list-style-type: none"> ✓ Topography of old town allows several parts to be drained off, other parts, of the town have quite flat. 	<ul style="list-style-type: none"> ✓ Grey and in some cases black water let out into drains ✓ Solid Waste being dumped into drains ✓ Poorly maintained drains
Opportunities	Threats
<ul style="list-style-type: none"> • Plans under AMRUT scheme. 	<ul style="list-style-type: none"> • Health hazards due to poor maintenance and waste clogging

NPP, Chandausi does not have any centralized database or map of drainage system available. No cleaning, repair and maintenance of drains is undertaken pre-monsoon and one other time of the year.

PRIORITIES:

A) VERY LOW OR RATHER NO COVERAGE IN THE CITY.

9.4 VISION AND GOALS

9.4.1.1 VISION

100 % coverage in the city and prevention of discharge of black and grey water into storm water drains.

9.4.1.2 GOAL

TABLE 9-4: STORM WATER MANAGEMENT, SML TERM TARGETS

Norm		Incidence of water logging/flooding		Short T	Medium T	Long T
Coverage length	(Drain / Road)					
100%		0%		✓		
C	T	C	T	✓		
100	100	0	0	✓		

9.5 FINANCIAL OPTIONS

TABLE 9-5: COST ESTIMATE FOR DRAINAGE IMPROVEMENT

S. No.	Item	Km	Rate (Lakh/Km)
1	Cost of drain (250mm)	1	32.67
2	Up gradation of Kutchra drain	1	12.10
Total			
1	Cost of Upgradation of Drain	51.75	627.21
Total Cost			627.21

Source: Calculated Value as Per Delhi Schedule of Rates

Assumption drain length should cover 150 % of concrete and dammar road length and 100% of Kutchra road network. Total road length in the Chandausi city is 34.5 Km.

Hence, 51.75 km of drains are required. Thus there is a need of construction of 51.75 km of new drain and upgrading of kutchra drain.

The approximate cost for implementation of this recommendation is Rs. 6.27 Crores

9.6 TIMELINE

TABLE 9-6: PHASE WISE IMPLEMENTATION PLAN

Phase	Year	Actions
Immediate	2016-2019	<ul style="list-style-type: none"> <input type="checkbox"/> Covered Open Drainage <input type="checkbox"/> Installation of grating points for collection of solid waste entering into storm water drains <input type="checkbox"/> Conduct feasibility study for treatment measures <input type="checkbox"/> Cleaning of drainage system – removal of silt and solid waste <input type="checkbox"/> Database management – detailed mapping of natural and built storm water drains
Short-Term	2020 – 2024	<ul style="list-style-type: none"> <input type="checkbox"/> Source control strategies - Construction of rain water harvesting structures <input type="checkbox"/> Removal of unauthorised structures and encroachments on

		natural drains <input type="checkbox"/> Construction of road side drains as per the drainage designs <input type="checkbox"/> O&M and M&E systems <input type="checkbox"/> Technical and O&M Manual
Mid-Term	2025 – 2032	<input type="checkbox"/> Ensure 100% coverage by storm water drainage system <input type="checkbox"/> Augmentation of storm water drainage system
Long-Term	2033 - 2046	<input type="checkbox"/> Augmentation of storm water drainage system

9.7 RECOMMENDATIONS

- Under the AMRUT scheme storm waters should be constructed
- Strictly prevent waste dumping into natural drains followed by O&M of storm water drains along the major roads, streets and natural drains.

10 SLUM AREAS

The chapter discusses about the slum population in the city with their access to basic services drawn from discussions with the slum people, discussions with the DUDA officials and the secondary data. The aim is to identify the various issues related to the status of infrastructure and suggest strategies and proposals for the improvement and efficient service delivery. It also deals with the spatial location of the slums in the city.

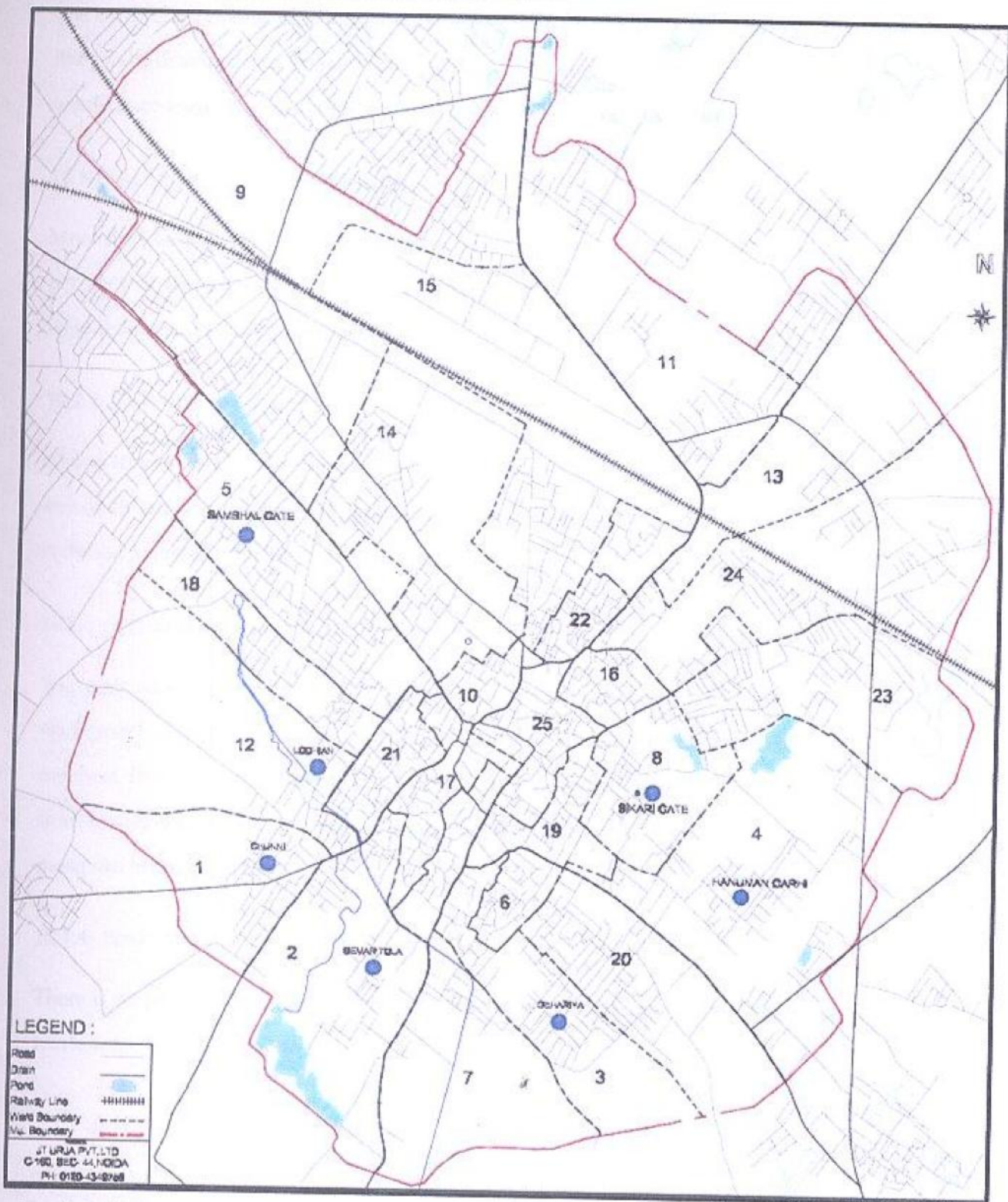
As per the NPP Chandausi, the total slum population in the city is 67941. The percentage of slum population in the city is 53 per cent of the total population. The average Household Size in Slum areas is 5.49 which are higher than the city average Household Size that is 5.25. As per NPP there are 18 slum pockets (Map). The slum population in the city has been spread over in all wards.

TABLE 10-1: SLUM PROFILE IN CHANDAUSI CITY

S. No	Description	Value
1	Total Population of city (in lakhs)	114383
2	Slum Population	16523
3	Slum Population as percentage of urban population	14.44%
4	Number of Notified Slums	0
5	Number of slums not notified	8
6	No. of Slum Household	2879
7	Number of slums where households have individual water connections*	
8	Number of slums connected to sewerage network*	
9	Sanitation Facility	
10	Solid Waste	
11	Storm Water Drainage	-

Source: Census 2011, National Urban Health Mission (Chandausi) and Nagar Palika Chandausi

MAP 7: SLUM LOCATIONS IN CHANDAUSI NAGAR PALIKA



Source: National Urban Health Mission, 2016

10.1 BASIC SERVICES

The living condition of the slum is very unhygienic due to lack of Infrastructure facilities like roads, drainage and proper water supply. Location of slum in a fast growing locality would encourage Mainstreaming the slum-dwellers into citywide network.

10.1.1 ACCESSIBILITY TO WATER SERVICES

More than 60 per cent of the population does not have any water facility. However, 20 per cent of the population has individual connections. Maximum areas the water is supplied through stand posts and piped network supplies with street taps.

10.1.2 SANITATION FACILITY

About 60 per cent of the population does not have access to sanitation facility. A very less of 15 per cent of the population is having private flush system. Open defecation is common in areas, which lack the toilet facility.

10.1.3 STORM WATER DRAINAGE

The poor sanitary conditions are prevailing due to lack of drains and collection of wastewater in pits. The clogged drains have also increased the vulnerability of the slum dwellers. Inside the settlements there are no paved drains or pathways, the wastewater from homes gets collected in open soak pits. The stagnant water in the pits results in mosquito breeding.

10.1.4 SOLID WASTE

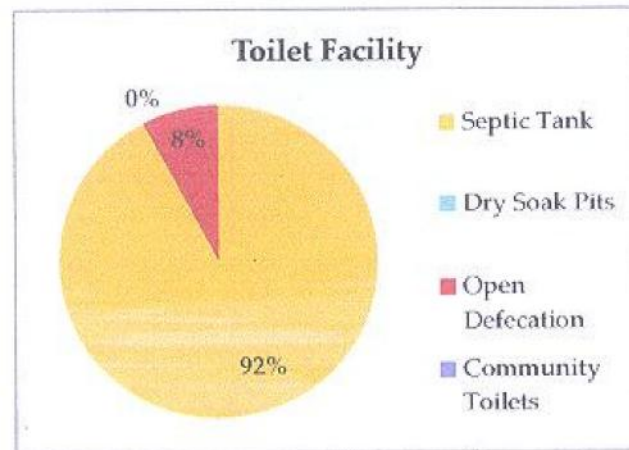
There is no provision of solid waste collection or disposal in the slum areas. The plastic waste was disposed in open spaces.

10.2 PRIMARY ANALYSIS

10.2.1 ACCESS TO TOILETS

A big share (32%) of slum population doesn't have Toilets at household level and goes for Open defecation because insufficiency of Toilet facilities exists in these areas at their houses and public Toilets are not available in these areas. The most critical slum is Bagulsher Khan and New Basti, Chota Khudaganj, Desh Nagar Ashik Bhag where most of the people do not have access to Toilets. Slum Dwellers are using Septic Tank as they do not have sewerage network facility in the city.

FIGURE 27: ACCESS TO TOILETS

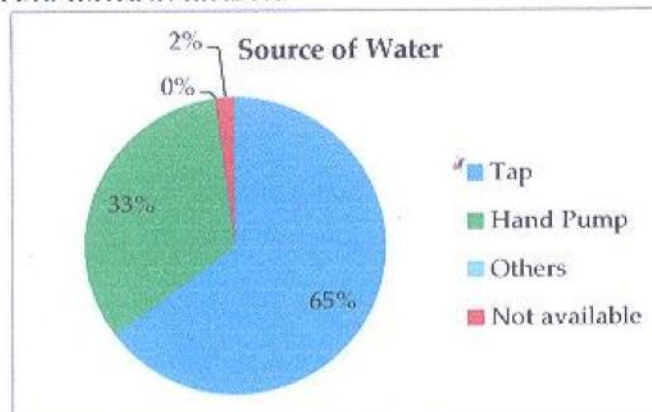


Source: Primary Survey, 2016

The slum dwellers do not have toilet facility are going for the Open Defecation as they do not have community toilet facility

10.2.2 ACCESS TO WATER AT HOUSEHOLD LEVEL

FIGURE 28: SOURCE OF WATER AT HH LEVEL

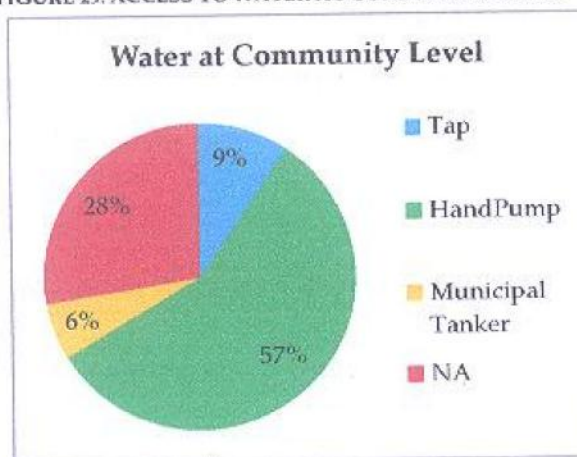


In all the wards most of the slum dwellers are having access of water through Tap Water.

10.2.3 ACCESS TO WATER AT COMMUNITY LEVEL

Around 57% respondents reported to have Hand Pump at community level. Only 9% are getting from tap, 6% are getting water from Municipal Tanker.

FIGURE 29: ACCESS TO WATER AT COMMUNITY LEVEL



Source: Primary Survey, 2016

10.2.4 WILLINGNESS TO PAY

Every respondent those living in slum area reported that they are not willing to pay for the Toilets and Sewer lines. So Nagar Palika needs to provide Public Toilet facility in slum area with the help of local or state government under suitable sanitation scheme to stop open defecation in Chandausi city.

10.3 STRATEGY FOR ADDITIONAL WORKS

Apart from waste water management and solid waste management, the city has few additional requirements to enable it to achieve 100% sanitation and healthy environment in the city that is described below:

10.3.1 DEVELOPMENT OF COMMUNITY PARK

Parks are the lungs of a city, offering green space and fresh air to people who otherwise might seldom experience anything but concrete and exhaust fumes. They can protect open land, extraordinary landscapes, and historic sites, while also functioning as open-air classrooms and laboratories for school children and others. Chandausi city needs to

develop a good community Park somewhere inside the city in order to provide a green space for their natives. The work for development of Community Park in city, Nagar Palika Parishad need to take initiative from themselves and also try to search the other way for this purpose like Integrated Housing & Slum Development Program scheme etc.

10.3.2 RIVER FRONT DEVELOPMENT

It is recommended that a project of river front development should be undertaken by NPP Chandausi with the prime objective of environmental improvement and restoring the city's relationship with the river. As a part of the project, some portion of the river edge may be reclaimed as a public asset to improve its spatial structure and habitat conditions.

Some suggested activities for river front development, are described below:

- With the development of waste water & solid waste management project (as already suggested in this chapter) the untreated sewage flow into the river and waste dumping along the river side can be prevented.
- Few public toilets are also suggested to be constructed near the river edge at suitable locations to prevent open defecation practices along the river side.
- For the beautification of the river edge, new parks and gardens can also be built on the reclaimed land.
- For better access to the riverfront and facilities built along it, few streets leading up to the river may be strengthened. Details study may be carried out by NPP Chandausi for development of area along the Sout River.
- Construction of low height weirs is recommended at 2 - 3 places in the stretch of river passing through the city, in order to increase the volume of stored water in this stretch.
- Construction of one Dhobi-ghat is also suggested.

10.4 IMPLEMENTATION STRATEGY

The river flows in the western part of the Chandausi city with the stretch of about 3 km. It is recommended that a project of river front development may be undertaken by NPP, Chandausi with the prime objective of environmental improvement and restoring the city's relationship with the river & this will enhance the overall aesthetics of the city. Therefore, it is highly recommended that the Nagar Palika Parishad hires consultants to prepare a detailed project report for develop

Development of Sout River Front. Based on the outcomes of the project report, the project implementation can be further taken up. Currently, there are various government schemes (like AMRUT) which can be availed by NPP Chandausi for execution of this project.

11 IEC AND AWARENESS GENERATION

IEC campaign and awareness programmes can influence the public behavioral change. A sustained grassroots campaign coupled with adequate mass media exposure is a mix that will deliver the required results. Community participation backed by improved civic services can help Bareilly gain open defecation free status. Neighborhood groups such as women's self- help groups (SHGs) and school children can be sensitized to the issue of open defecation. Having a community monitoring system has been found to be very effective in several cities of southern India. A community level group can be formed to dissuade open defecation. For instance, a group of school children armed with vigils can alert the community to anyone trying to defecate in open. NPP sanitary inspectors and safai karamcharies can patrol marked open defecation areas to arrest the practice. Making random visits by NPP officials to open defecation areas early in the morning can be institutionalized to arrest open defecation.

The City Sanitation Ranking methodology has given weight to reducing water-borne diseases. Reduction in water borne diseases is another key area of focus for the communication strategy. About half of those we polled said they suffered from water-borne disease in past six months. IEC can help in generating awareness required to bring down the incidence of water borne diseases. The IEC campaign can take up personal and community hygiene as key themes. These would include water-borne diseases, other communicable ailments including skin diseases to make it more comprehensive.

In addition an integrated communication campaign to promote awareness and seek participation will comprehensively tackle the issue of sanitation. This campaign will include community participation in O&M of community toilets, segregation of solid waste at source etc. NPP would be well served with a computerized public complaints resolution system. Citizens could use various means to communicate their grievances and complaints such as phone, internet etc. As of now most citizens said they complained directly through face to face interactions. Computerized complaint resolution system will keep all the records of public complaints. This can be an effective

tool for the NPP to monitor trends of complaints and find out the gaps in service delivery and weak areas. Moreover the robust grievances redressal mechanism will improve the extent of public satisfaction.

11.1 ELEMENTS OF IEC AND AWARENESS GENERATION

11.1.1 COMMUNICATION CHANNELS

The various communication channels used for the awareness campaign can be mass media, newspapers, posters, FM radio, local cable TV channels etc. This campaign should be conducted ward wise in the city under the overall coordination of NPP.

11.1.2 CAMPAIGN PARTNERS

NPP should conduct the awareness campaign in consultation and partnership with NGOs, print media like Local newspapers and other vernacular newspapers, local cable TV channels etc.

11.1.3 PUBLIC PARTICIPATION ADVISORY COMMITTEES:

These are constituted to ensure multi-stakeholder involvement in sanitation projects. Members of such bodies can include prominent personalities from academia, arts, culture, social sector, media etc. representatives of donor agencies, relevant heads of departments of NPP, and even leaders of sanitation workers union. City Sanitation Task Force (CSTF) is one such body which has been constituted as per the guidelines of NUSP at the city level. This will ensure the effective public consultations and community participation. A ward level body can be headed by Corporator and comprise of ward members, Safai karamcharies, representatives.

PUBLIC HEARINGS:

The system of public hearing is considered to be effective in monitoring the progress of projects and resolving citizen grievances. What we propose here is that public consultation is essential during designing of projects. The chances of success of a project are enhanced, as this makes sure the project is designed to benefit as many people as

possible. Seeking inputs from people will make them believe that the NPP is concerned about their sanitary problems.

NATIONAL SCHOOL SANITATION INITIATIVE

Ministry of Urban Development (MoUD), with support from Ministry of Human Resource Development (MoHRD) in collaboration with CBSE and GTZ India initiated the National Urban School Sanitation Initiative project. The countrywide programme was launched on 27 April 2011 at New Delhi. The initiative is aimed at using "Children as agents of change" philosophy and addressing the water, sanitation and hygiene issues in urban schools, who can potentially take back the lessons home and trigger a behavioral change.

11.2 ACTION PLAN

The timeframe of the recommended communication strategy is relevant for a period of two to three years from the beginning of implementation. The process can evolve with the scope to incorporate any mid-course changes and improvements, if required. Once initiated, it can take up a wide range of other issues as per the requirements of the city. There is every likelihood of such a process be institutionalized with Public Relations officer positioned at NPP. Given the growth and rapidly changing social and economic environment of the cities, it would be imperative for NPP to develop capacity to assess changes in the situation and adapt strategies accordingly. Timely implementation of the recommendations made in this document will ensure that desired results flow in a sustained manner. Keeping in view the problems faced by urban poor of the city and scope of city sanitation plan, it is opined that less emphasized area of communication holds a vast potential. There are three important components to the communication strategy:

- Inter-personal communications: Using opinion leaders
- Engaging media and NGOs as partners in promoting sanitation consciousness
- Adapting and developing multimedia IEC materials for sanitation campaigns

Interpersonal means are known to be very effective in behavior change communications. These are tedious processes to carry out but offer better returns. It is important to understand the needs of the local community and select opinion leaders who could influence the community to further sanitation consciousness. These opinion leaders could be local NGOs, corporators, school teachers or any other respected elder. A newspaper advertisement or a public service message on TV without ground level work through opinion leaders will fail to be sustainable in the long run. It is important to understand that several recommendations require institutional reforms. There are complex ways in which institutions work including overlapping responsibilities and a lack of mutual co-ordination. Success in the long run will also depend on furthering such reforms. Communications can help identify potential bottlenecks to service delivery.

TABLE 11-1: ADVOCACY ACTION PLAN

Stakeholder groups	Socio-cultural/behavioural patterns
Slum Inner City	<p>Children do not prefer to enter the community toilets; Open defecation by children in drains and open spaces is common.</p> <p>Water Scarcity and poor state of community toilets forces elders also to defecate in open but</p> <p>People are in some ways constrained in going out to defecate in the inner city areas.</p> <p>Open areas such as vacant plots have become open defecation spots.</p> <p>Most of community toilets discharge their waste into open nallahs/drains</p>
Shopkeepers	<p>city has a vibrant commercial area</p> <p>General hygiene & sanitation awareness is far below among the shopkeepers; particularly meat, milk products, vegetables/fruits or eatable shops.</p> <p>Most of the shopkeepers throw their waste on the road/street side or in nallahs.</p> <p>The nallahs get clogged and cleaned at irregular intervals by</p>

	<p>Nagar Palika.</p> <p>No provision of dustbins in the commercial areas and markets.</p> <p>Very few public toilets and urinals in the market areas</p>
Low Income Group Residents	<p>Irregular sweeping of street occasional clearing of drains.</p> <p>Irregular water supply</p> <p>Dumping of solid waste in open on roadside</p>
Municipal Officials	<p>Officials should call meetings of shopkeepers specially butchers/eatable vendors to raise their awareness about hygiene and to promote safe practices of waste disposal</p> <p>Nagar Palika officials need help to enhance their capacities for better implementation of sanitation projects</p> <p>A better co-ordination between various departments such as Jal Kal, is required</p> <p>Nagar Palika should look into operational as well as maintenance aspects of community toilets</p>

11.2.1 MESSAGES FOR STAKEHOLDERS

National Urban Sanitation Policy 2008, by the Ministry of Urban Development, Government of India has outlined constitution, roles and responsibilities of City Sanitation Task Forces envisaging multi-stakeholder involvement. Eminent persons from the city (from fields of academics, NGOs, media, art, business etc.) are included into this task force. At a more micro level, creation of Ward Sanitation Action Committee headed by Corporator of the concerned wards and comprising members from NPP, Safai Karamcharies commended.

A set of powerful mnemonics related to sanitation could be one of the ways of beginning the process of developing sanitation consciousness- say something like 'swach ghar samridh parivar'. The messages that need to be put across to the stakeholders are as follows:

TABLE 11-2: MESSAGES AND DIFFERENT CHANNELS OF COMMUNICATIONS

Target Audience	Messages/Themes	Channels of Communication
CORPORATOR, COMMISSIONER, ENGINEERS	<ul style="list-style-type: none"> • Seeking community inputs for building and repairing community and individual toilets, toilets should be designed for social acceptance. • Anti- open defecation and sanitation campaigns • How to ensure compliance from people through rewards/Punishments • Better co-ordination between various departments including Water Board for implementation of City Sanitation Plan • Safe handling of garbage by Sanitation workers • Promoting source segregation at source and dump yards 	<ul style="list-style-type: none"> • Training Programs for officials from NPP, Jal Kal • Participation in interactive programmes such as heritage walks etc. to promote city sanitation • Council meeting, CSP workshops, Newspaper advertisement calling for meeting/seeking participation in walks • Press Conference-sharing the goals and plan of action for CSP with press persons Videos on best practices and their impact
CORPORATOR, NPP OFFICE BEARERS, SLUM RESIDENTS REPRESENTING INNER CITY	<ul style="list-style-type: none"> • Consultations on preventing open defecation • Consultation seeking inputs of residents on improving community toilets and their usage • Safe disposal of Human Excreta • Contamination due to Faecal 	<p>Organize transect walk with local Corporator or officials, RWA Meeting (with the local Corporator)</p> <p>Door to door campaign</p> <p>Newspaper Advertisement calling for meeting</p> <p>Press Conference</p> <p>Short Films on best practices</p>

	<p>Matter</p> <ul style="list-style-type: none"> • Do not burn garbage • Segregation of household waste, and disposal in designated bins • Education on Health and hygiene to prevent diseases such as Diarrhoea, GE, Malaria, Scabies • Consultation on problems with current toilets, taking stock of the community toilets status • Consultation of water supply situation • Consultation on Environmental sanitation • Consultation on expectations from Municipality 	
<p>CORPORATES, NPP OFFICE BEARERS, SLUM RESIDENT REPRESENTING SLUM OF CITY OUTSKIRTS</p>	<ul style="list-style-type: none"> • Consultation on land tenure, voter ID card address related issues • Consultation on problems with community toilets, household toilets, hand washing, • Improved sanitation and hygienic practices in community toilets • Health Risks due to open defecation 	<ul style="list-style-type: none"> • Organize transect walk with local Corporator or officials • RWA Meeting with local corporators and NPP zonal officials • Door to door campaign • Newspaper Advertisements/ calling for meeting/ seeking participation in the transect

	<ul style="list-style-type: none"> • Toilet options two pit, septic tank • Safe disposal of Human Excreta • Health and hygiene, Diarrhea, GE, Malaria, Scabies • Consultation of water scarcity, water quality problems • Consultation on expectations form Municipality and how they could be met 	<ul style="list-style-type: none"> • walks • Press Conference
OFFICE BEARERS OF RESIDENTS WELFARE ASSOCIATION MIDDLECLASS LOCALITIES	<ul style="list-style-type: none"> • Consultation on problems with community toilets • Consultation on septic tank cleaning • Consultation on Environmental sanitation • Consultation of water supply situation • Consultation on expectations form Municipality 	<ul style="list-style-type: none"> • RWA Meetings with concerned officials, • Door to door campaigning • Newspaper Advertisement calling for meeting • Press Conference • Short educational videos etc.
WATER AND SANITATION OFFICIALS	<ul style="list-style-type: none"> • Display numbers of responsible officials; Sanitation Inspectors prominently in their Zones • Establish grievance redressal mechanism. • Emphasis on time bound resolution of public grievances 	<ul style="list-style-type: none"> • Printed pamphlets given with newspapers, newspaper advertisements, painting on Elevated/underground reservoirs • Print the phone numbers of responsible officials on the

		municipal garbage tractors
WATER AND SANITATION WORKERS	<ul style="list-style-type: none"> • Importance of safe handling of waste • Do not burn garbage • Do not dump Garbage on roads leading to dump yard • Educating people on waste segregation 	<ul style="list-style-type: none"> • Meetings and workshops of Municipal workers
SHOPKEEPERS, COMMERCIAL INDUSTRIAL, SLAUGHTERHOUSES	<ul style="list-style-type: none"> • Do not dump garbage in by lanes • If you need to dispose hazardous waste call the municipality and ask for a tractor. 	<ul style="list-style-type: none"> • Meeting of the local shopkeeper associations to sort out the problems among themselves, meeting with municipal officials and corporators.
CITY WIDE	<ul style="list-style-type: none"> • Keep house and neighborhood clean • Keep your community toilets clean • Boil/Filter the Water before drinking • Wash your hands before and after eating/drinking • Don't allow mosquitoes to breed in your neighborhood • Immunize children • Don't share clothes of persons infected with skin diseases 	<ul style="list-style-type: none"> • Road Side Billboards Newspaper, radio and TV Ads City Cable Press conference • Know your city and transect walks etc. Short films for screening in Theatres etc.

12 CSP SUPPORT PILLARS

12.1 CITY SANITATION TASK FORCE

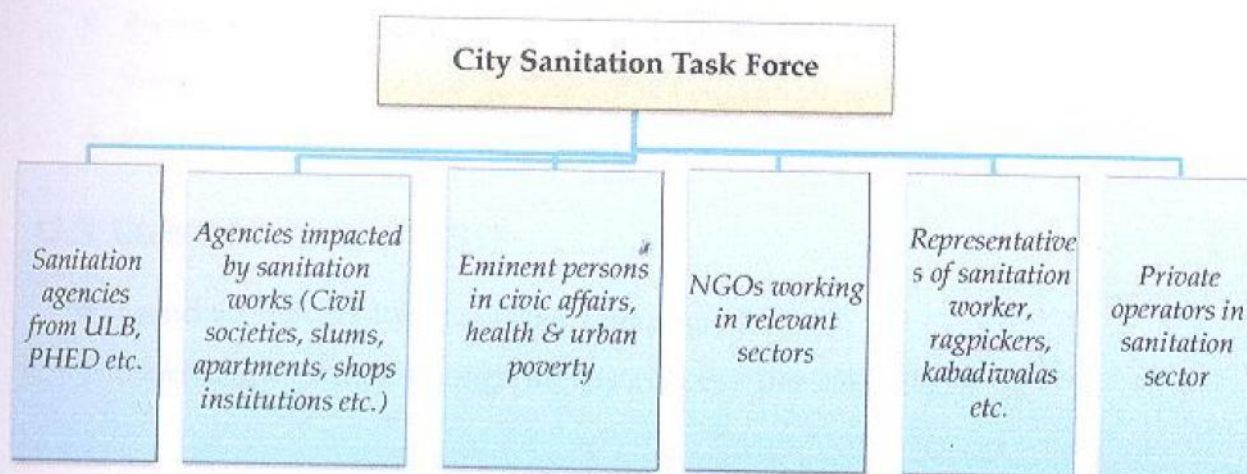
The first step in making the cities 100% sanitized is to elevate the consciousness about sanitation in the mind of municipal agencies, government agencies and most importantly, amongst the people of the city. Hence, it is one of the main recommendations and pre-requisites for the preparation of the city 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.



12.2 CITY SANITATION TASK FORCE MEMBERS

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

FIGURE 30: CSTF REPRESENTATIVES





- ❖ CSTF 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.;
- ❖ CSTF indirectly involved in or impacted by sanitation conditions including representatives from the civil society, 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 safai karamcharies, 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

12.3 RESPONSIBILITIES OF CSTF

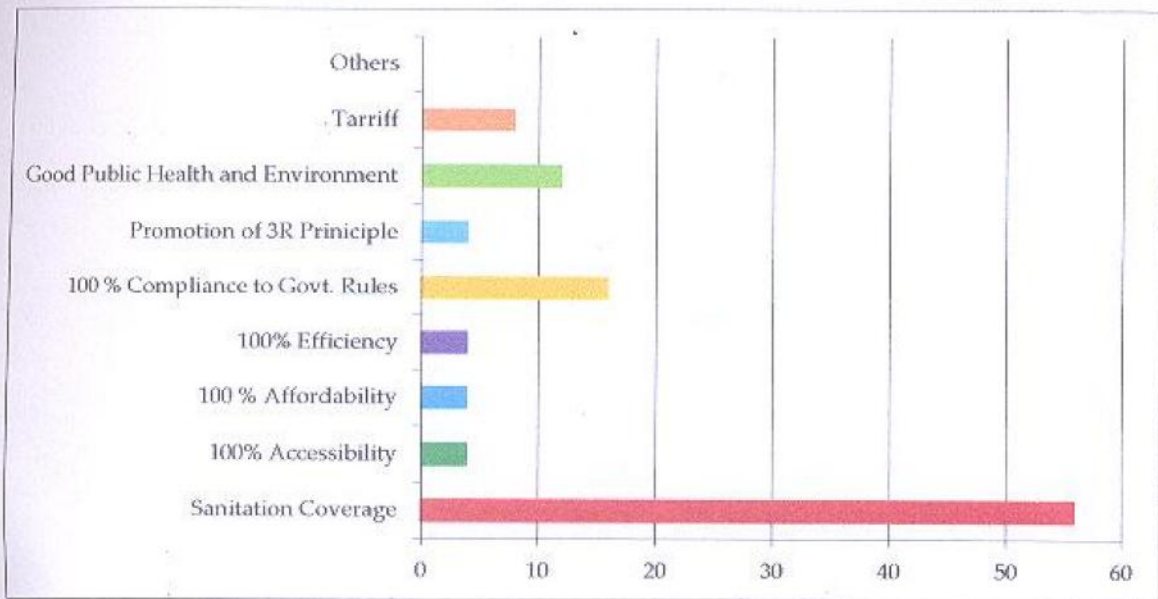
- ❖ Launching the City 100% Sanitation Campaign.
- ❖ Generating awareness amongst the city's citizens and stakeholders.

- ❖ Approving the City Sanitation Plan for the city prepared by the Sanitation Implementation. Agency after consultations with citizens.
- ❖ 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.
- ❖ 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.
- ❖ 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
 - 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 un served 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)
 - 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).

12.4 STAKEHOLDERS WORKSHOP FEEDBACK

Before finalizing the CSP of Chandausi 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:

FIGURE 31: GOALS OF CITY SANITATION

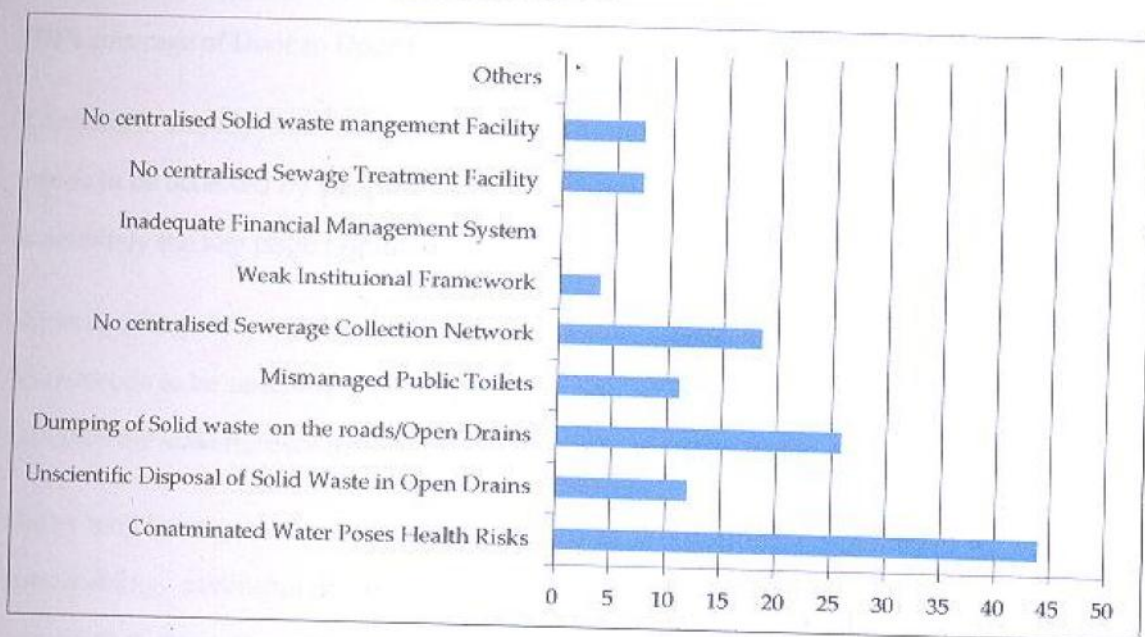


As evidenced from the figure above, 100% coverage and accessibility of sanitation services was given top most priority followed by affordability good public health and 100% efficiency.

Goals like 3R principal, Compliance with government rules were not given too much of priority. Surprisingly, awareness among people of Chandausi which is an equally important issue was not recommended by stakeholders. In light of above situation it is pertinent that immediate steps are taken to increase coverage and accessibility of sanitation facility along with quarterly campaigning to sensitize public on sanitation issues affecting their health's.

Below are the results of deliberation by CSTF and stakeholders on the key issues related to sanitation of the city. As evident from figure above absence of centralized sewage collection network and indiscriminate dumping of solid waste in drains and water body were 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.

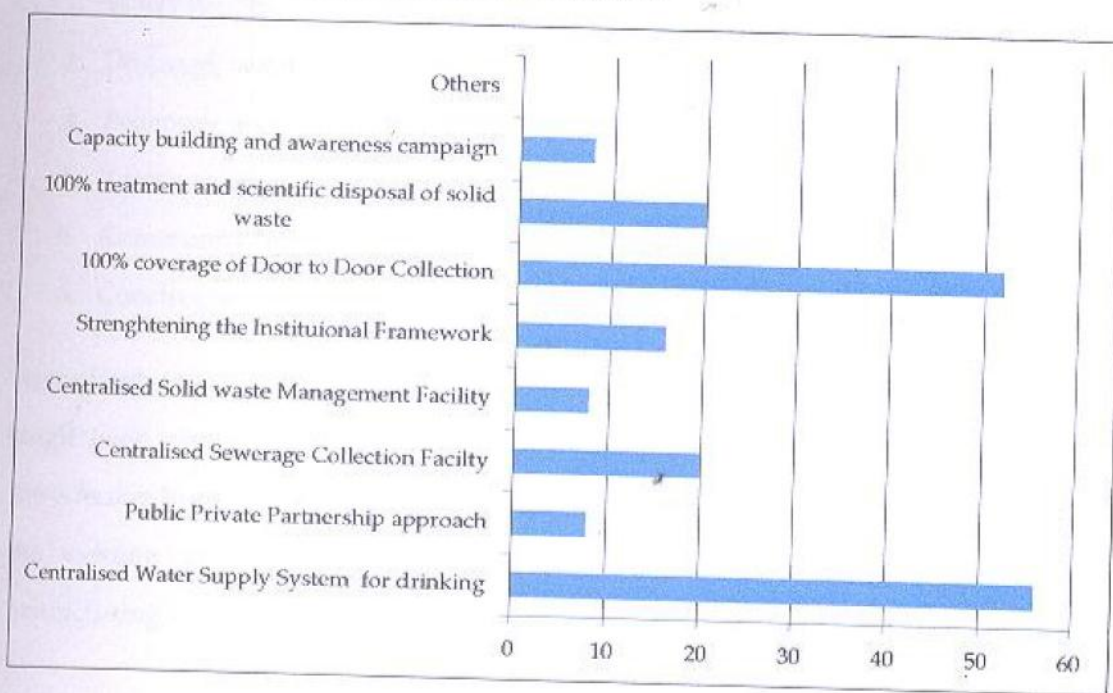
FIGURE 32: KEY PROJECTS LINKED TO SANITATION OF CITY



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:

FIGURE 33: KEY ISSUES RELATED TO SANITATION OF THE CITY



The major concern comes to be the absence of centralized water supply systems and 100% coverage of Door to Door Collection System.

Chandausi already has some infrastructure like, water supply network in the city (needs to be accessed by people). Absence of STP, Storm water drains and public toilets is definitely the key issue highlighted.

Understanding that first a detailed project report needs to be prepared and necessary funds needs to be sanctioned for implementation of this large scale Draft City Sanitation initiative the stakeholders rest of the facilities 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 lacks basic infrastructure there is no logic in conducting awareness campaigns, capacity buildings etc until the basic infrastructure is in place.

12.5 RECOMMENDED STRUCTURE

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

1. Water supply;
2. Drainage, waste management (sewerage & solid waste);
3. Economic and social development plans;
4. Transportation systems;
5. Community health and protection of environment;
6. 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 Chandausi. 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 organization. Details of the proposed administrative set up are presented below:

FIGURE 34: PROPOSED ORGANIZATION STRUCTURE

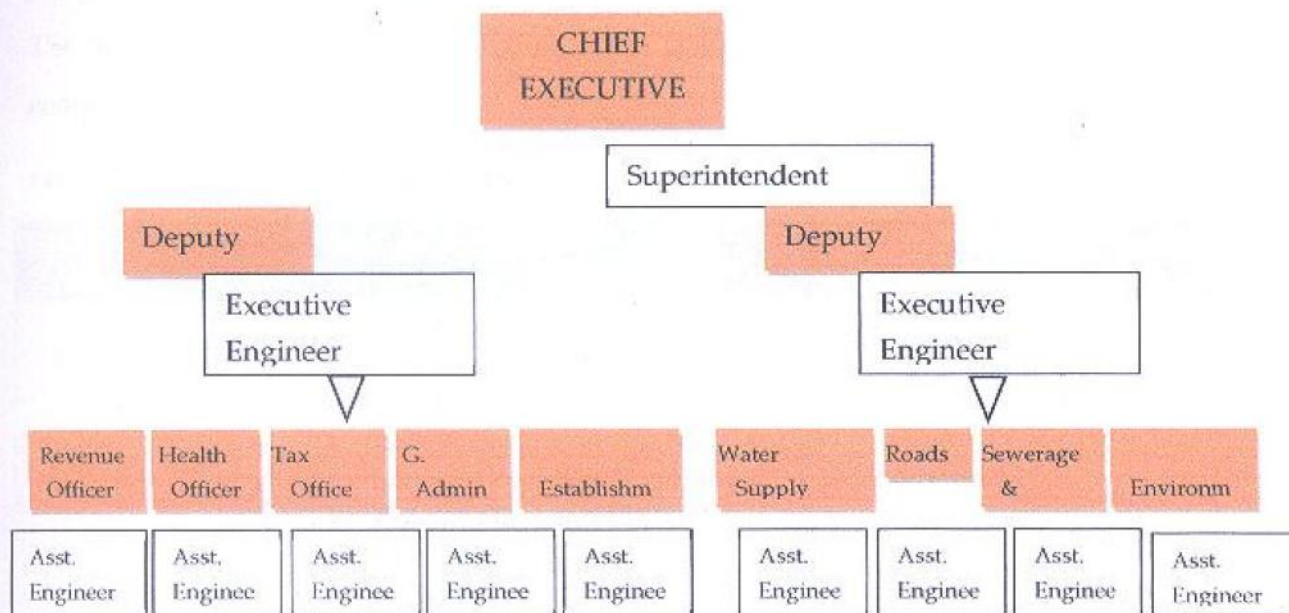


TABLE 12-1: REVISED INSTITUTIONAL RESPONSIBILITIES FOR BASIC SERVICES

S. No	Urban Services	Planning	Execution	O&M	Tariff fixing & collection
1	Water Supply	PHED	PHED	NPP	NPP
2	Sewerage	PHED	PHED	NPP	NPP
3	Public & Community Toilets	Multiple Agencies	NPP/PPP	NPP/PPP	NPP/PPP
4	SWM	NPP	NPP/PPP	NPP/PPP	-
5	Storm Water Drainage	PHED	PHED	NPP	NPP

12.6 CAPACITY BUILDING

A Detailed Training Needs Assessment is required to ascertain and validate the training requirements. NPP should set aside a Training Budget annually as part of its budgetary exercise, based on the Training Needs identified. It should implement a phased time-bound program to impart training as per the areas and level of instruction required in collaboration with GoUP.

12.6.1 TRAINING

The Training needs assessment should cover all classes of employees with the recognition that the nature and type of training requirements could be very different. The table below provides an illustrative set of training needs across select sanitation components –

TABLE 12-2: TRAINING NEEDS ACROSS SANITATION PLAN COMPONENTS

Sanitation Component	Senior Officials	Technicians / Operating Staff / Workers
ALL DEPARTMENTS	<ul style="list-style-type: none"> • Powers and Duties • Citizen Charter and commitments • Urban Reforms and JnNURM • Service Level Benchmarking • Procurement and PPPs • Use of Computers for Information system Improvement 	<ul style="list-style-type: none"> • Rights and Responsibilities • Health and Safety • Citizen Charter and commitments
WATER SUPPLY	<ul style="list-style-type: none"> • CPHEEO Manual and norms • Developing a Water Supply DPR • Conducting a Water Loss Audit • Metered Supply • SLB Reporting 	<ul style="list-style-type: none"> • Water Quality Testing methods • Installation of Meters/Reading • Repairing water leakages • Handling pipe breaks • Field Inspections and reporting • Use of equipment and safe work practices
SEWERAGE	<ul style="list-style-type: none"> • CPHEEO Manual and norms • Developing a Sewerage DPR • Treatment systems including decentralized /centralized options • Reuse of grey water after primary treatment and Methane Generation • Monitoring Onsite Sewage Treatment • SLB Reporting 	<ul style="list-style-type: none"> • Waste Water Quality Testing • Guidelines for providing connections • Repairing pipe breaks and choking • Field inspections and reporting • Use of equipment and safe work practices
SOLID WASTE MANAGEMENT	<ul style="list-style-type: none"> • Implementing Door-to-Door collection and source 	<ul style="list-style-type: none"> • Collection efficiency • Segregation techniques

	<ul style="list-style-type: none"> • segregation • Waste collection routing • Awareness generation and Community mobilization • PPPs and Contracting • Waste recovery and Landfill technologies 	<ul style="list-style-type: none"> • Complaints Redresses • Cost Recovery • Safe work practices
FINANCE AND ACCOUNTS	<ul style="list-style-type: none"> • Budget preparation and Reporting • Financial Management • MIS and Information Management • Auditing and follow up 	<ul style="list-style-type: none"> • National Municipal Accounting Manual and local accounting rules • Accrual Accounting • Accounting software

12.6.2 PERSONNEL MANAGEMENT AND OCCUPATIONAL HEALTH

Sanitation operations especially waste management essentially involve significant role of manpower especially sanitation workers and safai karamcharis 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, Chandausi allocate adequate resources to ensure appropriate interventions for management of personnel and their health and safety. These interventions will 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, Chandausi 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, Chandausi 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.

12.6.3 INFORMATION MANAGEMENT

Updation of baseline information on sanitation indicators at a household level is critical for NPP planning, analysis and decision making with respect to sanitation services. A possible periodic approach is suggested below.

- Information when compiled should be recorded in the property tax database.
- Updation through a self-declaration while residents pay their property taxes
- Ensuring Accuracy through sample Inspection of say 1-2% households and fines on false information will ensure information validity.

TABLE 12-3: LIST OF INFORMATION FROM HH SURVEY

Property Tax Identification Code	
Toilet Access	Yes/No
Type	Toilet within Property / Shared facility
No. of people using the Toilet	
Primary Water Source	
Other Water Sources	
Toilet connected to	Septic Tank/Sewer/local treatment system/open drain/others
If Septic Tank, last cleaned on	Date
If Sewered, is grey water outlets also	Yes / No
Covered under SWM Door-to-door	Yes/No
Practicing source segregation	Yes/No

Whenever there will be increase in sanitation facilities coverage NPP should install bulk meters at intake and discharge points in water supply and sewerage system.

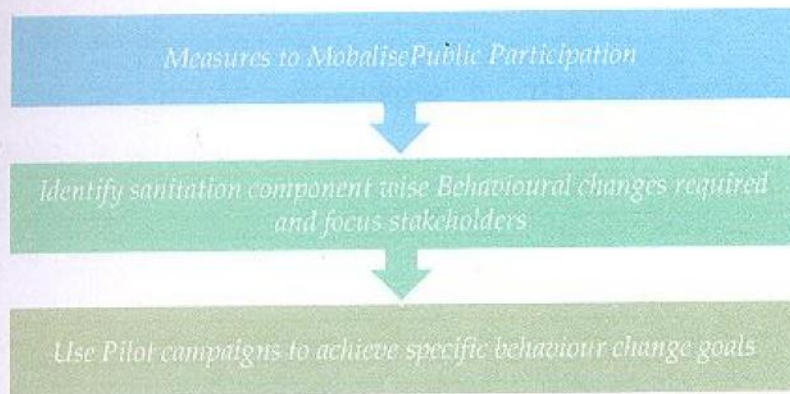
Also NPP should track and report progress with respect to cost recovery and collection efficiency targets on a quarterly basis. (Recording financial performance)

12.6.4 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, Chandausi which is competent enough to prepare a detailed IEC plan & implement it in a phased manner.
- Citizen participation and involvement is crucial to achieving service delivery goals in sanitation.

Open defecation and open urination which is rampant in parts of the city should be prohibited. Therefore at the level of an individual sanitation component, there are a number of behavioral aspects that need to be focused on through awareness generation and communication campaigns to effect positive behaviour need to achieve specific sanitation outcomes.

FIGURE 35: APPROACH TO ADDRESS AWARENESS GENERATION



12.7 RECOMMENDATIONS

TABLE 12-4: BELOW PROVIDES AN OVERALL ACCOUNTABILITY

Roles	Public/Community Toilets	SW M	On Site Sanitation	Sewerage	Water Supply
Guidance	MoUD and CPHEEO				
Planning	NPP, W & S Department			PHED + NPP & W & S	
Asset Creation/Capital Investment	NPP, W & S Department		HH	PHED + NPP & W & S Dept.	
O and M	NPP, W & S Department		HH	NPP, W & S	
Monitoring	NPP, Ward Committees(if exists),Independent (third party)				
Regulation & Tariff Setting	Elected Body				
Clarity on Land Titles	NPP and Revenue Department, GOAP				

The above framework attempts to fix accountability for various components of Sanitation with respect to various roles namely, Guidance, Planning, Asset creation, O&M, Monitoring and Regulation/Tariff Setting. The framework recognizes that:

- NPP clearly has single point accountability for Shared Toilet Access, Solid Waste Management and planning and monitoring of On-site sanitation

- A three tier monitoring approach is recommended for oversight of delivery of water and sanitation services.
- There will continue to be overlaps between PHED in sewerage and water supply, particularly in planning and asset creation, with O&M being the responsibility of NPP.

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- Delhi Schedule of Rates, 2014
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- UDPFI Guidelines
- Manual of Solid Waste Management 2000

ANNEXURE

CSTF MEMBERS

Nagar Palika Parishad Chandausi
City Sanitation Workshop Dated : 24-12-2016

S.No	Name	Designation	Phone no	Signature
1	श्री. प्रमोद चौधरी	अध्यापक, नगर पालिका चण्डाूसी	8534932727	[Signature]
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3	विजय सिंह	आवारा/सी.डी.ओ. चण्डाूसी	9417118071	[Signature]
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13	श्री. अ. अ. अ. अ. अ.	अध्यक्ष, नगर पालिका चण्डाूसी	9758686684	[Signature]
14	श्री. अ. अ. अ. अ. अ.	अध्यक्ष, नगर पालिका चण्डाूसी	8548140048	[Signature]
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16	श्री. अ. अ. अ. अ. अ.	अध्यक्ष, नगर पालिका चण्डाूसी	9027787623	[Signature]
17	श्री. अ. अ. अ. अ. अ.	अध्यक्ष, नगर पालिका चण्डाूसी	9411672759	[Signature]
18	श्री. अ. अ. अ. अ. अ.	अध्यक्ष, नगर पालिका चण्डाूसी	893675586	[Signature]
19	श्री. अ. अ. अ. अ. अ.	अध्यक्ष, नगर पालिका चण्डाूसी	215723155	[Signature]
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21	श्री. अ. अ. अ. अ. अ.	अध्यक्ष, नगर पालिका चण्डाूसी	9991711342	[Signature]
22	श्री. अ. अ. अ. अ. अ.	अध्यक्ष, नगर पालिका चण्डाूसी	9012129666	[Signature]
23	श्री. अ. अ. अ. अ. अ.	अध्यक्ष, नगर पालिका चण्डाूसी	9358925659	[Signature]
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25	श्री. अ. अ. अ. अ. अ.	अध्यक्ष, नगर पालिका चण्डाूसी	9659198290	[Signature]
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12.8 MINUTES OF MEETING OF STAKEHOLDERS CONSULTATION

Date : 24 December, 2016

Time : 2:30 p.m. – 4:30 p.m.

Venue: Nagar Palika Marriage hall

Guests: Chairman (Neelam) Executive Officer (Vikas Saini) and other CSTF Members.

Miss. Madiha Khan (one of the JT Urja Representative) welcomes all the Guest and CSTF member and introduced the consultants and briefly explained the process of City Sanitation Plan and she delivered the presentation on situation analysis based on the survey results and analysis conducted by the survey team and explained the prioritization setting exercise as proposed to be carried out at the conclusion of the meeting. After the presentation the points discussed are as follows:

- 1) CSTF member's sanitary inspectors highlighted the issue related to industrial and medical solid waste generation and segregation and also they suggest need proper landfill site for the future and present gap.
- 2) One of the member (Rajeev Varshniya) from Traders union highlighted the space problem for toilets in the commercial areas.
- 3) One of the CSTF member Suman from Swachh Karya Vimukti Nigrani Samiti highlighted the problem of drainage in Chandausi near Inter College, which lacks the solid waste management properly.
- 4) One of the member Drigpal Singh (Principal) from Nanakchand School highlighted the unsystematic disposal of solid waste and the same should be checked immediately.
- 5) At the end Executive Officer of Chandausi assured that the problems of city will be resolved specially sanitation, solid waste and water supply systems to be improved and he emphasized the need public cooperation to increase the awareness in the public regarding sanitation.

12.9 COVERAGE OF CSTF WORKSHOP BY PRINT MEDIA (30.12.2015)

DATE: 25 DECEMBER, 2016



12.10 EXECUTIVE SUMMARY ON CHANDAUSI VISIT

Visit date: 12 January, 2016

Site name: Chandausi

Visit purpose: Data Collection and meeting with Executive Officer in Chandausi

Visitor: Madiha Khan (Urban Planner), Fareed

Travel Time: 8:15 a.m, **Reached:** 12:45 (Chandausi)

Meeting with Executive Officer in Chandausi regarding data collection and CSTF for City Sanitation Plan. Slum List was collected. The meeting was with Jyoti Ji who has to collect all the data to whom we give data requirement list.

Thanks and Best Regards

Madiha Khan

Visit date: 17 February, 2016

Site name: Chandausi

Visit purpose: Data Collection and meeting with Executive Officer in Chandausi

Visitor: Madiha Khan (Urban Planner), Fareed

Travel Time: 8:15 a.m, **Reached:** 12:45 (Chandausi)

The meeting was with Executive Officer in Chandausi regarding data collection and CSTF for City Sanitation Plan and about the pending bill. Then we meet Chairman and discuss about Situation Analysis Report. The meeting was with Jyoti Ji who has to collect all the data to whom we give data requirement list.

Thanks and Best Regards

Madiha Khan

12.11 VISIT REPORT OF CHANDAUSI

Visit date: 29 November, 2016

Site name: Chandausi

Visit purpose: Data Collection and meeting with Executive Officer in Chandausi

Visitor: Madiha Khan (Urban Planner), Fareed

Travel Time: 7:00 a.m, **Reached:** 11:30 (Chandausi)

The meeting was with Executive Officer in Chandausi regarding data collection and CSTF for City Sanitation Plan and about the pending bill. Then we meet Chairman and discuss about Situation Analysis Report. The meeting was with Jyoti Ji, SI about the city requirement and data.

Thanks and Best Regards

Madiha Khan

ANNEXURE-2: SURVEY QUESTIONNAIRE

Personal information

Name: _____ H. No.: _____ No. of members in the household: _____ Ward No.: _____

Employment Type: _____ Zone: _____ Income Category: _____

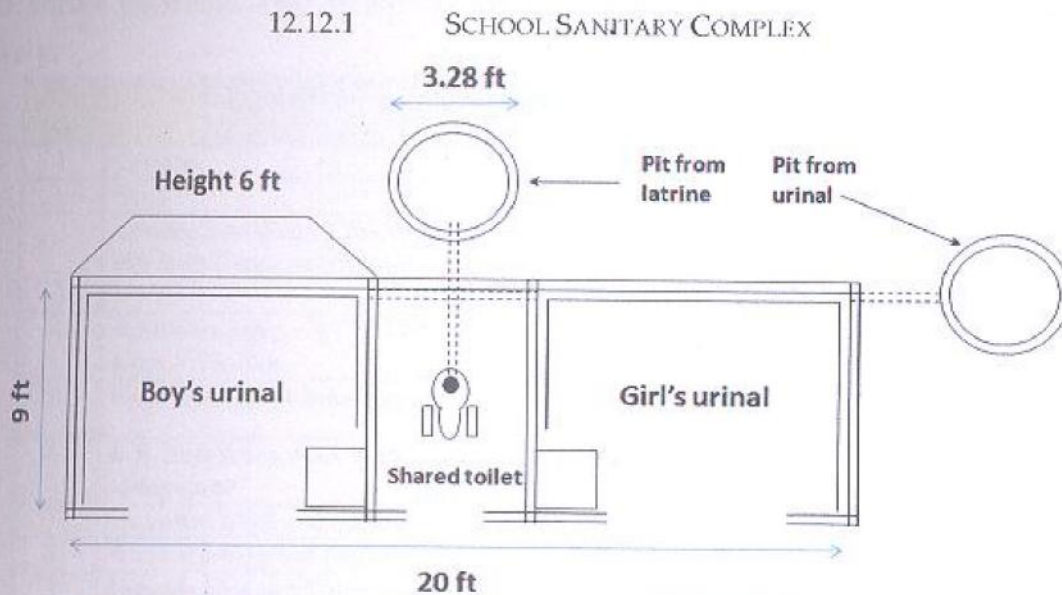
Q.	Questions	Responses	Count
I. Sanitation System			
1.	Is there toilet facility available in house?	Yes	
		No	
		Total	
	Type of Toilet (Wet-Flush/dry- soak pit)		
2.	If yes.		
3.	If No, do you use a public/community toilet OR		
4.	Are there community toilets/ Urinals in your locality?	Yes	
		No	
		Total	
4a.	If Yes:		
	What is the condition of the public toilet?		
	Who is responsible for maintenance of the public		
	Are there any user fee/charges for the usage of		
	If yes, what are the charges?		
	How many people use the public toilet (average		
	Any toilet for physically disabled persons in		
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	
		Connected to	
II. Sewerage System			
1.	Do you have sewer connection?	Yes	
		No	
2.	If yes, what is the cost of the connection you		
	Any monthly fee?		
3.	If no, are you willing to pay for sewerage	Yes	

	connection and how much?	No	
4.	Do you face any problem with your sewer connection?	Chocking	
		Frequent	
		Foul smell	
		Overflowing in rainy	
5.	Who is responsible for cleaning the sewerage	Pvt./ Municipality/any	
6.	How often the corporation people visit you for health/sewerage purpose	Quarterly	
		Half yearly	
		Annually	
		Need base	
		When complaint is	
	Where does the sewage go from your place	STP/open	
III. Septic Tanks			
1.	Are you connected to individual septic tank or		
2.	Who manages the septic tanks?	Municipal	
		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		
5.	Where is septic tank waste disposed of?	STP	
		Open drain/ open	
		Don't know	
IV. Water Supply			
1	What is the source of water supply?	Nagar Palika Parishad	
		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/	
		Waste containers/	
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	
		Outside the city	

Similar questionnaires were prepared for conducting surveys in commercial, industrial, Institutional areas and public places to process baseline information and critically analyze the existing situation from public point of view.

12.12 ANNEXURE- 3: Toilets Model



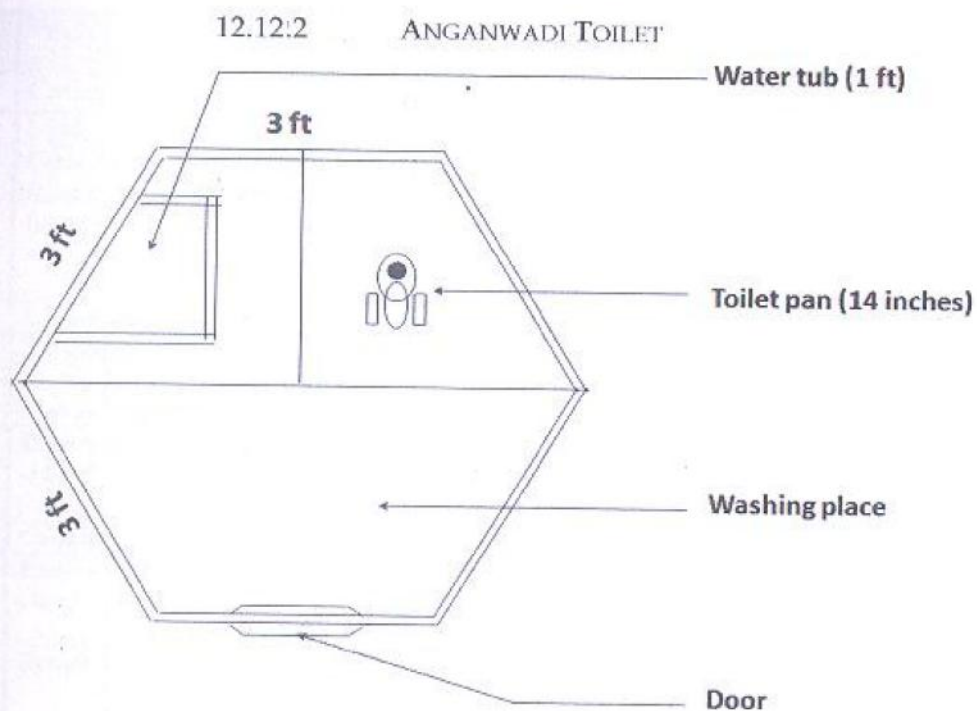
Salient features

1. School Sanitation is a tool for promoting better sanitation and water management for children
2. Improves the school environment
3. Privacy for school children
4. Promoting proper hygiene behaviours from childhood
5. Operation and maintenance by school children
6. Separate facilities for children for urination and defecation
7. School toilets should be constructed within the school campus
8. Incinerator should be installed in girls toilet for menstrual hygiene management

9. One toilet is enough for primary school children

10. WATER FACILITIES AND HAND WASHING FACILITIES SHOULD BE INSIDE OF THE TOILET

Sl. No.	Particulars	Quantity/Nos.	Unit cost	Amount Rs.Ps.
1	Cement	25 bag	280.00	7000.00
2	Sand	2 Unit	2400.00	4800.00
3	Ceramic pan Water Closet 18" size with P trap and footrest	1 No.	270.00	270.00
4	Stoneware pipes – 4" or PVC pipes – 4 inches	6 Nos.	60.00	360.00
5	Earth work excavation charges	L.S.	.....	2000.00
6	R.R. foundation work with soling stone	1 Cart load	750.00	750.00
7	Basement work with R.R.	L.S.	....	1500.00
8	White washing and painting	L.S.	....	3000.00
9	Ceramic tiles and fitting charges	Tiles 8" x 8" size – 8 boxes	500.00	4000.00
10	Water Tap connection to toilets and urinals	L.S.	.....	1500.00
11	Pre-cast cement slab – 4' x 2' size, 2" thickness – reinforced slab for toilet roof	4 No.	300.00	1200.00
12	Door with iron frame and tin sheet 5' x 2' size	3 No.	1000.00	3000.00
13	Country Bricks – 9" size	3000 Nos.	4.00	12000.00
14	Masonry charges	10 Days	400.00	4000.00
15	Unskilled labour charges	20 days	Rs.150.00	3000.00
16	Transport charges			1500.00
	Total Cost			49880.00



Salient features

1. It is a platform for behavior change for the children
2. Promoting hygiene behaviors from childhood
3. Child friendly door with a provision for opening from inside and outside of the toilet
4. Displays pet animal pictures inside the wall, providing a friendly environment
5. Smallest toilet pan with 14 inches should be used
6. To maintain one foot height of water storing tub. Water tub should be easy to access for children for cleaning and washing.

Sl. No.	Particulars	Quantity/Nos.	Unit cost	Total Rs. Ps
1	Cement	4 bag	280.00	1120.00
2	Sand	½ unit	1200.00	1200.00
3	Ceramic pan Water Closet baby friendly size with P trap and footrest	1 No.	270.00	270.00
4.	Stoneware pipes – 4 "	2 Nos.	60.00	120.00
5.	Pre-cast cement slab for roof – 6' dia, 2" thickness – reinforced slab in 2 pieces for roofing	2 No.	350.00	700.00
6.	Door with iron frame and tin sheet 5' x 2' size	1 No.	750.00	750.00
7.	Country Bricks	700 Nos.	4.00	2800.00
8.	Earth work including pitting charges			500.00
9.	Rough stone or soling stone			350.00
10.	Cover slab for leach pit	1 no.	300.00	300.00
8.	Masonry charges	6 Days	400.00	2400.00
9.	Unskilled labour charges	6 days	Rs.150.00	900.00
10.	White washing and painting charges			750.00
				500.00
10.	Transport charges	.....	.....
	Total Cost			12660.00

Note: The cost of construction materials and labour involved are subject to change according to the local conditions and price escalation.

Technical drawings designed by: Mr. Luke Whaley, Water and Sanitation practitioner, London, UK

12.13 ANNEXURE- 4: Waste Water Management Systems

A typical wastewater management system comprises of three main components:

(i) **Wastewater collection system**, which could be based on any of the following systems:

- Micro scale conventional centralized system,
- settled sewage system,
- Small bore sewer system,
- Shallow sewer system,
- Twin drain system and
- Incremental sewerage system

(ii) **Treatment System Having Following Components:**

a. **Primary treatment system consists of screens, grit chambers and primary sedimentation tank;**

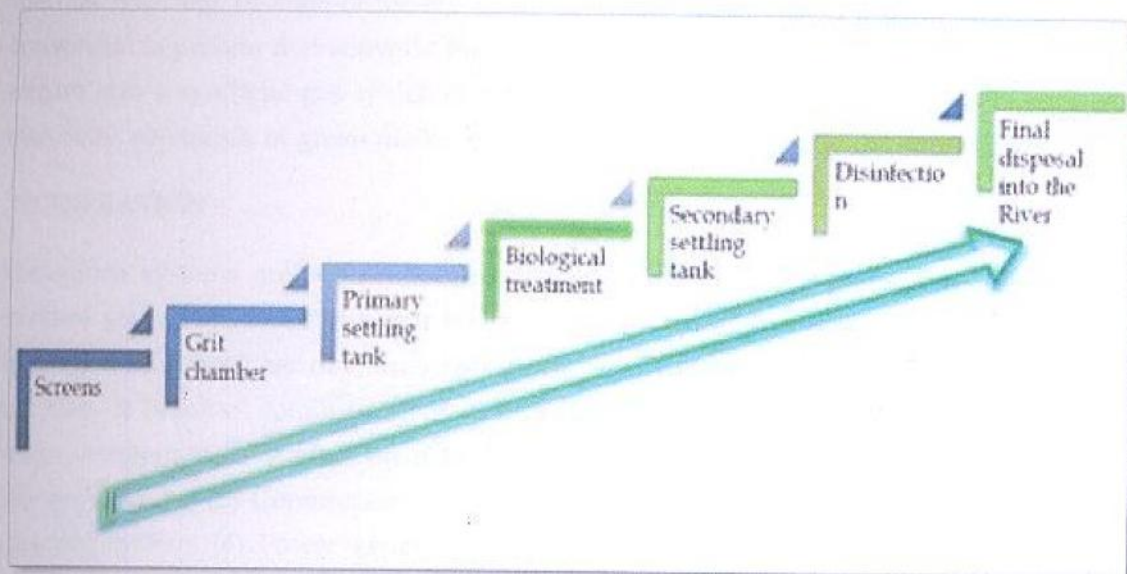
b. **Secondary treatment system mainly consists of biological treatment systems.**

c. **Tertiary treatment** is given to polish the treated wastewater coming out of secondary treatment unit to meet the reuse / recycle requirement. A tertiary treatment process normally consists of coagulation, solid/liquid separation and disinfection units for the removal of residual suspended solids (SS), colour, organic matter, offensive odour and microorganisms. Solid/liquid separation is normally achieved by filtration, floatation and adsorption. Disinfection of the pathogenic organisms is achieved by chlorination or Ozonation or UV disinfection or combination thereof.

(iii) **Reuse / disposal systems could be**

SEPTIC TANK: A septic tank is a wet technology. It is a watertight tank that collects wastewater from household utilities via a pipe. The wastewater flows through the tank and the solids will settle to the bottom of the tank. It functions as a storage tank for settled solids and floating materials with storage time of usually 2 to 4 days. About 50% removal of bod and suspended solids is usually achieved in a properly operated septic tank. The clarified effluent flows out of the tank into a drainage field or a drainage system. The solids that accumulate must be removed periodically, as in the case of pit latrine (UNEP/GPA, 2000; UNEP, undated).

- These are relatively low-tech, low-cost technologies which allow construction and operation by the local community, and they can reduce public health problems related to wastewater (UNEP/GPA, 2000). However, they provide only partial treatment and do not meet strict environmental standards, and very often are associated with environmental pollution (Wilderer and Schreff, 2000; Bakir, 2001).



Nevertheless, recently, improved technologies are being developed to provide better solutions for decentralized treatment. Combining septic tanks with sand filters can upgrade septic tank's effluent to advanced secondary and even tertiary levels (Verhuizen, 1997) and various processes for on-site aerobic treatment systems have been developed and are available commercially (Bakir, 2001.) Further developments include combination of hi-tech components such Membrane Bioreactor (MBR) with the aerobic systems. The advanced aerobic systems, however, require power for aeration and possibly pumping. These improved technologies can meet high environmental standards and can indeed be considered as viable alternatives for wastewater treatment. In this case smaller flows of wastewater will be collected and treated in several small treatment facilities in the community (Bakir, 2001).

- Constructed wetland,
- Anaerobic baffled reactor,
- Green toilets with separation of urine and faeces.

ANNEXURE-5: 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 (H₂), carbon monoxide (CO), carbon dioxide (CO₂), and methane (CH₄). 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 H₂ 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. By products 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 to 10 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 CO₂. 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 (H₂) and CO₂. This process is called acidification. The last group of bacteria, the methane producers or methanogens, produce biogas (methane and CO₂) from the acetate and hydrogen and CO₂. This biogas can be used to fuel boilers or reciprocating engines with minimal pre-treatment. In addition to biogas, anaerobic bioconversion generates a residue consisting of inorganics, non-degradable organics, non-degraded biodegradables, and bacterial biomass. If the feedstock entering the process is

sufficiently free of objectionable materials like colourful plastic, this residue can have market value as compost. AD process is also referred to as Bio methanation 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 aluminium 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 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

Land filling 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 land filling 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.