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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
CTF	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
NN	Nagar Nigam
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

Executive Summary

This document presents City Sanitation Plan (CSP) of Firozabad City Municipal Corporation.

The CSP process in Firozabad city endeavors to identify the various areas that are affected by various issues with different sectors of sanitation, (viz. sewerage, solid waste management, storm water drainage and water supply) and also to provide guidance towards the solutions of the identified issues.

This has been made possible through an extensive participatory approach including field visits, repeated discussions with various stakeholders, sample surveys, etc. Acquiring and assimilation of varied secondary information also formed an important part of the process.

The plan preparation process was carried out using methodology requiring wide range of data in various areas and population groups, to develop robust analysis and produce outputs. The data collection included both primary and secondary sources and detail analysis of them.

The analysis in turn has paved the way for the preparation of the proposal for various strategies to alleviate the sanitary conditions of the place, so that Firozabad city may well overcome the various plaguing issues and thereby a healthy sanitized environment prevails for the citizens.

Introduction

The sanitation situation in India depicts a very grim picture as Census of India 2011 results have indicated that nearly 17 million urban households (more than 20 percent of the total 79 million urban households) suffer from inadequate sanitation. About 11.88 million households are not connected to any kind of drainage network, 23.28 million households are connected to open drains (*ref: various publications of MoUD, Govt. of India*). This situation has resulted into significant public health issues and very high environmental cost for urban area affecting the country‟s GDP. The problem is further compounded by the fact that as high as 69% of the waste water generated in urban areas is not treated & is disposed into the water bodies without any treatment due to which three fourths of surface water resources are polluted (*ref: Central Pollution Control Board, 2009*).

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

Objectives of the City Sanitation Plan in Firozabad City

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

To adopt locally suitable methods, technology and materials, and provide necessary facilitation support to Firozabad Nagar Nigam.

To encourage community and private participation and define their role in creation and maintenance of sanitation infrastructure, thereby ensuring a sense of ownership.

To ensure coordination between various departments working in the field of water supply and sanitation, such as departments of health, education, public health and engineering, industry, environment, transport, pollution control board, etc.

To ensure an optimum use of funds allocated by 13th Finance Commissions for solid waste management and other sanitation related projects. To coordinate various externally aided projects for their optimum results.

To promote the novel ideas in mobilization of funds, including reforms in tax regime, public private partnerships, exploring the private market, user charges, beneficiary contribution etc.

Approach and methodology

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

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

Step 2 - Conduct 1st Consultation

Step 3 - Reconnaissance Survey

Step 4 - Preparation of Situation Analysis

Step 5 - Conduct 2nd Consultation

Step 6 - Preparation of Draft City Sanitation Plan

Step 7 - Preparation of Implementation Plan

Step 8 - Conduct 3rd Consultation

Step 9 - Final City Sanitation Plan

About Firozabad

Firozabad is a city situated in Firozabad district in Uttar Pradesh. It is known as the "Bangle city". The geographical area of the Firozabad city is 34.90 Km2 as per census of 2011. It may be noticed that size of the city has increased more than five times during last ten years. The city has 42 wards in the year 2011. City administration is headed by the Commissioner.

Population projection

The population is one of the major factors in dete rmining future patterns of progress and development of the city. As per Census 2011 Firozabad has population of 177,658 persons. There are 3 commonly used methods to assess population projection namely, Arithmetic Increase method, Geometric increase method and Incremental increase method.

Year	Arithmetic	Incremental	Geometric	Average
2011	604214	604214	604214	604214
2016	**721802**	**756093**	**882826**	**786907**
2021	778378	812763	1067129	886090
2026	839390	873681	1289909	1000993
2031	896257	930619	1559198	1128691
2036	956977	991268	1884704	1277650
2041	1014068	1048415	2278166	1446883
2046	1074565	1108856	2753768	**1645730**

Projections of Water Demand, Sewage & Solid Waste Generation

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

Year	Population	Water (MLD)	Sewage(MLD)	Solid Waste(TPD)
2011	604214	82	65	211
2016	**786907**	**106**	**84**	**275**
2021	886090	119	95	310
2026	1000993	135	108	350
2031	1128691	152	122	395
2036	1277650	172	137	447
2041	1446883	195	156	507
2046	**1645730**	**221**	**177**	**576**

Situation Analysis

Situation will be analyzed by taking into consideration the ground realities, local conditions, and assessment of the present sanitation situation The Situational Analysis will address all issues like: coverage of sewer network and zone wise STP capacity utilization, status of public toilets, disposal of night soil where sewer connection does not exist, disposal of domestic wastewater/ storm water/ solid waste disposal of wastes of special category.

Water Supply System

In the city, total numbers of water supply connections are 40741, which is only 39% 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 57.44 MLD, which is all from ground water sources (power pumps) 125 tube wells are located in the various parts of city. People are directly drawn water from 1110 hand pumps. Out of total water production 20% is wasted in leakages and available water to the public is hardly 57.4 MLD, which is supplied to 38252 household. The city does not have any surface water source and treatment facility for drinking water.

Gap Analysis

- Gap in water supply is 49 MLD
- Gap in domestic connection is 61581 (61%)
- Water supply network is 54 kms (7.60%) Required
- Water treatment plant is required.
- Quality of water is poor.
- Ground water depletion in the center part of the city.

Access to Toilet

Firozabad is having 84858 flush toilets and 5 community toilets, 16 Public Toilets and 2 Mobile Toilets.

There are 15 and 5 Proposed Community Toilets of 10 seats by Development Authority and Nagar Nigam respectively in different parts of the city.

Gap Analysis

- At present there are 99833 households are exists in which14975 households does not have toilets in their premises.

- Firstly up gradation of existing toilets is a priority and then addition of more 27, 10 Seater for Public Toilets is must.
- Community toilets maximum 100 sulabh complex (10seater) are required for slum population

Sewerage System

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 604214 populations is 45.92 MLD in Firozabad city. The total water supplied is 57.4 MLD. At presents only 20% (147 kms) area covered by the sewer network. As of now there is no waste water treatment facility.

Gap Analysis

- At presents only 21% (147 kms) area covered by the sewer network remaining 563 kms (79%) required.
- The sewage collection system is not laid to cover all areas of the city. In fact it does not fully cover even the areas for which branch and main sewers have been laid. Sewer connections for each household are required.
- Sewerage Treatment Plant also required.

Drainage and Storm Water System

There is no provision for storm water drainage system in the city. Storm water drains are severely abused with grey water flows and solid waste dumping. The problem of water logging during monsoon period is common in different parts of the city.

Solid Waste Management

Local residents, Hotels, Restaurants, Bazaar and vegetable markets, Hospital and dispensaries are the major sources of generation of waste at city. About 65.4 MT of solid waste is generated every day in the city.

Solid Waste Management is a critical issue in Firozabad city due to spread of area under its jurisdiction. Based on the population of the city, it is estimated that the City generates approximately 158 MT of solid waste per day and waste generated per day is 250gm/capita/day. Nagar Nigam is capable to clears only 40-50% of the waste through vehicles available with Nagar Nigam and staff engaged for the purpose.

Gap Analysis

- 50-60% municipal solid waste not collected.
- Door to door to door collection is missing.
- As per the standard 2493 bins are required all over the city.
- Proper landfill site are required.
- So most of the people are putting waste in the nearby dustbins.
- Machinery and equipment available with the Nagar Nigam are not capable to lift and clear total daily waste generated.

Findings from Primary Survey & Prioritization Workshop

More than 2000 primary survey was carried out across all the wards of Firozabad. The survey predominantly concentrated on availability of water and sanitation facility in the city like toilet facility, MSW facility, water source and quality etc. A willingness to pay survey was also carried out as a part of primary survey.

Most of the respondents reported presence of toilet facility at household level. Most of the respondent reported access to individual toilets. However, visual inspection during survey revealed a much higher fraction of disposal of night soil directly in drains. Since most of the respondents surveyed have reported access to individual toilet, a majority of them do not desire any toilet facility. Most of the respondents reported absence of community toilet facility. Community toilets are critical for reaching the goal of open defecation free city.

Disposal of Municipal Solid waste in Open is common in city. A number of respondent reported waste disposal site to be less than 100 meters. Though these are open dumping sites not covered under municipal waste collection system, in absence of a designated waste disposal area it is common for citizen to dispose waste in nearby areas. Most of the respondents reported absence of designated area of garbage disposal resulting in open dumping being common in the city.

Even Municipal supply of water is extracted from ground water. The current sanitation and waste management practices in Firozabad as witnessed earlier are highly detrimental to ground water quality and there is immediate threat of contamination of ground water if preventive measures are not taken. Most of the respondents reported acceptable quality of water. However if the current malpractice with regards to sanitation situation continue, the quality of water is expected to be severely affected in Firozabad.

Firozabad does not have a centralized sewage system and septic tank is the only source of treatment. The construction of the septic tanks is often faulty leading to contamination of ground water. Most of the respondents were not willing to pay for installation of a sewerage system of the city thus ruling out a PPP approach.

Results of prioritization workshop

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

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

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

Firozabad lacks basic sanitation facility like a sewerage system. The city has no sewer line or treatment facility resulting disposal of waste water in river through storm water drain.

Key issues related to Sanitation of the city

Members of city sanitation task force and stakeholders were requested to deliberate the key issues related to sanitation of the city. The result of their deliberation is presented. As evident from the graph, 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.

Since the basic sanitation services like a sewage network and waste treatment facility is missing in the city higher level requirement like a robust institutional framework, financial management system and sustainability of sanitation facilities were not considered to be important by the stakeholders at this level**.**

Key Projects Linked to Sanitation of the City

At the conclusion, the stakeholders deliberated on the key projects that should be implemented in the city. Understanding that limited funds may be available for implementation of sanitation projects this exercise aimed at deciding on short term, medium term and long term projects.

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

Firozabad already has some infrastructure with related to drinking water supply and DPR for improvement of quality of drinking water has already been prepared. Since the project has received government sanction and necessary funds are available for the implementation of

project activity, the stakeholders felt that necessary action should be taken for fast track implementation of the project activity.

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

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

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

Information, Education and Communication (IEC) and Capacity Building

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

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

Communication needs assessment identified three stages for implementation of Information, Education and Communication strategy for improvement in water and sanitation services. These are 1) Awareness, 2) Process and 3) Compliance. While it is generally understood that these stages would lead to better citizen participation in the schemes, it is in fact imperative for all stakeholders to be appraised from their own specific stand points. Awareness includes an

understanding of health and hygiene related education specifically directed towards slums. Equally important is an awareness of municipal officials about the problems face by all the city residents including slum & middle class households and sanitation workers. This awareness is generally taken for granted. Here, we propose that open and specific appraisals be carried out without assuming too much of prior knowledge regarding sanitation issues. Next is to create processes which are essential to maintain improved services. These could include citizen participation in community toilet maintenance etc.

Implementation Strategy

Implementation strategy has been divided in 4 phases starting from immediate to Long term (till 2046). Different actions and resultant awareness generation is detailed below:

Phase I immediate

Action at NN level

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

- Sanitation Awareness Workshop for the ULB staff and elected representatives resulting in identification and prioritization of all sanitation aspects;
- Prepare a City level CSP

Awareness Generation at City Level

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

Phase II Short Term (2017- 2019)

Action at NN level

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

Awareness Generation at City Level

- Involve media in demonstrating healthy sanitation practices

- Finalize school sanitation program – train school children and make them aware of the sanitation situation and need for healthy sanitation practices.
- Create community groups specifically targeting their sanitation needs
- Address the tenure security issues of urban poor which in turn help them build basic services of permanent nature
- Develop Information Management System

Phase III Medium Term (2021- 2030)

Action at NN level

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

Awareness Generation at City Level

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

Phase IV Long-term (2031 – 2046)

Action at NN level

- Update and upgrade Training Calendar and Training Programs.
- Update the HR Policies and incentive programs.

- Conduct Sanitation Workshops.
- Update the CSP.
- Update and upgrade Monitoring & Evaluation Systems.

Awareness Generation at City Level

- A long term and permanent effect on awareness can be made by sustained effort from the NN Firozabad and community.
- The CSTF is recognized as a body holding the sanitation campaign for Firozabad. The CSTF will also ensure long term influence in the sanitation scenario of Firozabad city.
- NN Firozabad and the CSTF have to periodically take feedback from the community groups and provide necessary support.

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.

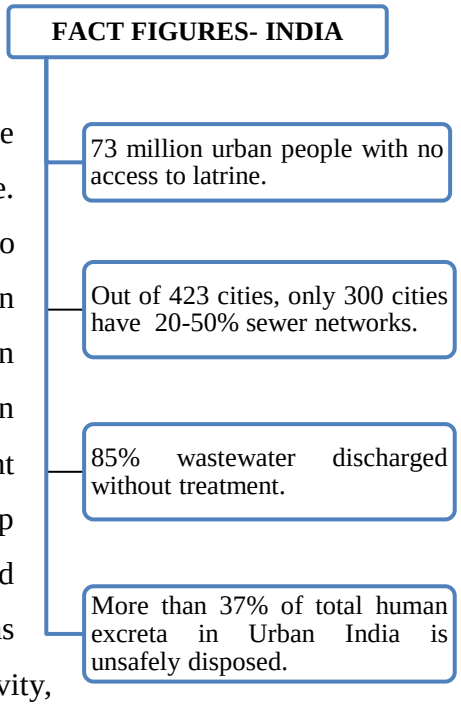
A citywide sanitation strategy includes the vision, missions, and goals of sanitation development as well as strategies to meet these goals. Each strategy is then translated into indicative programmes (and projects).

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 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.**

NUSP GOAL

“Urban India with 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

1.4.2 NUSP Planning Instruments

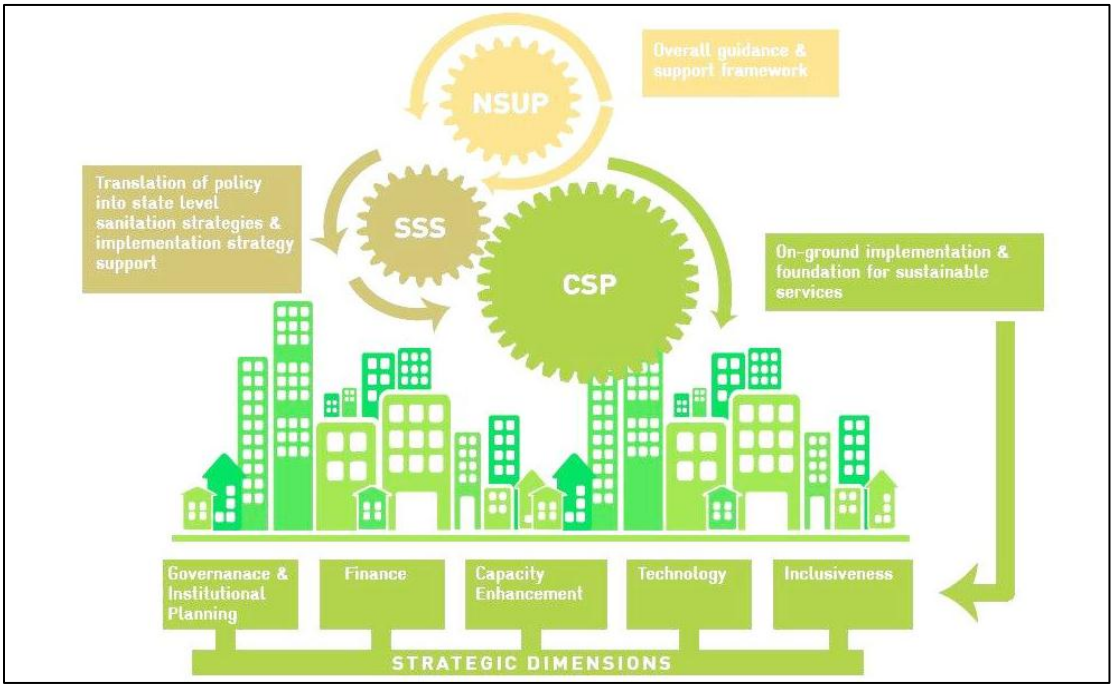
NUSP provides states and cities with a comprehensive set of planning tools that will help in achieving the specific goals of NUSP. The two main instruments are the State Sanitation Strategies (SSS) and City Sanitation Plans (CSP), both vision documents to drive economic, social and environmental development:

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.

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.

Table 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 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, Firozabad was ranked 386 at the national level with an overall aggregate mark of 22.660 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 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 l 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 2 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 Jawaharlal Nehru National Urban Renewal Mission (JNNURM)

The aim of JNNURM is to encourage reforms and fast track planned development of identified cities. The prime focus of JNNURM is stimulating efficiency in urban infrastructure and service delivery mechanisms, community participation, and accountability of ULBs/ parastatal agencies towards citizens.

1.8.1 Objectives of JNNURM:

- Focused attention to integrated development of infrastructure services in cities covered under the Mission;

- Establishment of linkages between asset-creation and asset-management through a slew of reforms for long-term project sustainability;
- Ensuring adequate funds to meet the deficiencies in urban infrastructural services;
- Planned development of identified cities including peri-urban areas, outgrowths and urban corridors leading to dispersed urbanization;
- Scale-up delivery of civic amenities and provision of utilities with emphasis on universal access to the urban poor;
- Special focus on urban renewal programme for the old city areas to reduce congestion; and
- Provision of basic services to the urban poor including security of tenure at affordable prices, improved housing, water supply and sanitation, and ensuring delivery of other existing universal services of the government for education, health and social security.

1.9 UIDSSMT Scheme

Urban Infrastructure Development Scheme aims at improvement in urban infrastructure in towns and cities in a planned manner. The scheme seeks to enhance public and private investments in infrastructural development of urban areas.

1.9.1 Objectives

The objectives of the scheme are to:

a) Improve infrastructural facilities and help create durable public assets and quality-oriented services in cities & towns.
b) Enhance public-private partnership in infrastructural development.
c) Decentralize urbanization and promote planned development of towns, cities and metros.

1.9.2 Duration of the Scheme

The duration of the Scheme will be for five years beginning from 2005-06. An evaluation of the outcomes of the Scheme will be undertaken before the commencement of the 11th Five Year P\an and, if necessary, the scheme would be suitably calibrated.

1.9.3 Coverage

The scheme will apply to all cities/towns as per 2001 census, excepting cities/towns covered under JNNURM. Allocation of funds among states will be on the basis of the state's urban population to total urban population in the country. States may allocate funds to towns/cities based on similar formula. However, funds would be provided to only those towns and cities where elections to local bodies have been held and elected bodies are in position. The State Governments may prioritize towns and cities on the basis of their felt-need.

1.9.4 Components

The components for assistance under the scheme will include all urban infrastructure development projects including water supply and sewerage. Cost of land for such infrastructure projects will not be provided under the programme. Admissible Components

i. Urban Renewal i.e. redevelopment of inner (old) city areas (this would include items like widening of narrow streets, shifting of industrial/commercial establishments from non-conforming (inner-city) areas to 'conforming' (outer-city) areas to reduce congestion, replacement of old and worn-out water pipes by new/higher capacity ones, renewal of sewerage/drainage/solid waste disposal systems, etc), land acquisition cost will not be financed under this component of the program me.
ii. Water Supply and sanitation, including setting up de-salination plants, where necessary;
iii. Sewerage and Solid Waste Management
iv. Construction and improvement of drains/storm water drains
v. Laying/improvement /widening of arterial/sub-arterial roads and bridges to remove transport bottlenecks,
vi Construction and development of bus and truck terminals
vi. Environmental improvement and city beautification schemes,
vii. Construction of working women hostels, marriage halls, old age and
viii. Destitute Children's homes, night shelters with community toilets, street lighting and Slaughter house
xi. Civic amenities like playgrounds/stadia, community halls,
xii. Hospital Waste Management

1.9.5 Funding Pattern of the Scheme

The sharing of funds would be in the ratio of 80: 20 between Central Government & State Government. Out of 20% of state share 10% will be borne by the ULB which could be raised by the nodal/implementing agencies from the financial institutions or internal resources for funds.
The National Urban Sanitation Policy (NUSP) seeks to address the gap in sanitation infrastructure and move Indian cities towards "total sanitation" through a "systems" driven approach. NUSP tries to create a more coordinated institutional roles and responsibilities to reach the poor and the un-served. Under the NUSP, Firozabad Nagar Nigam has to prepare City Sanitation Plan (CSP), with the active participation of the city level stakeholders.

1.10 Rajiv Awas Yojana

Rajiv Awas Yojana (RAY) is a scheme announced by the President in 2009, focuses on slum dwellers and the urban poor. This scheme aims at promoting:

- slum-free India in five years and would focus on according property rights to slum dwellers. The scheme will focus on according property rights to slum dwellers and the urban poor by the states and union territories.
- It would provide basic amenities such as water supply, sewerage, drainage, internal and approach roads, street lighting and social infrastructure facilities in slums and low income settlements adopting a 'whole city' approach. It would also provide subsidized credit.

1.11 City Sanitation Plan

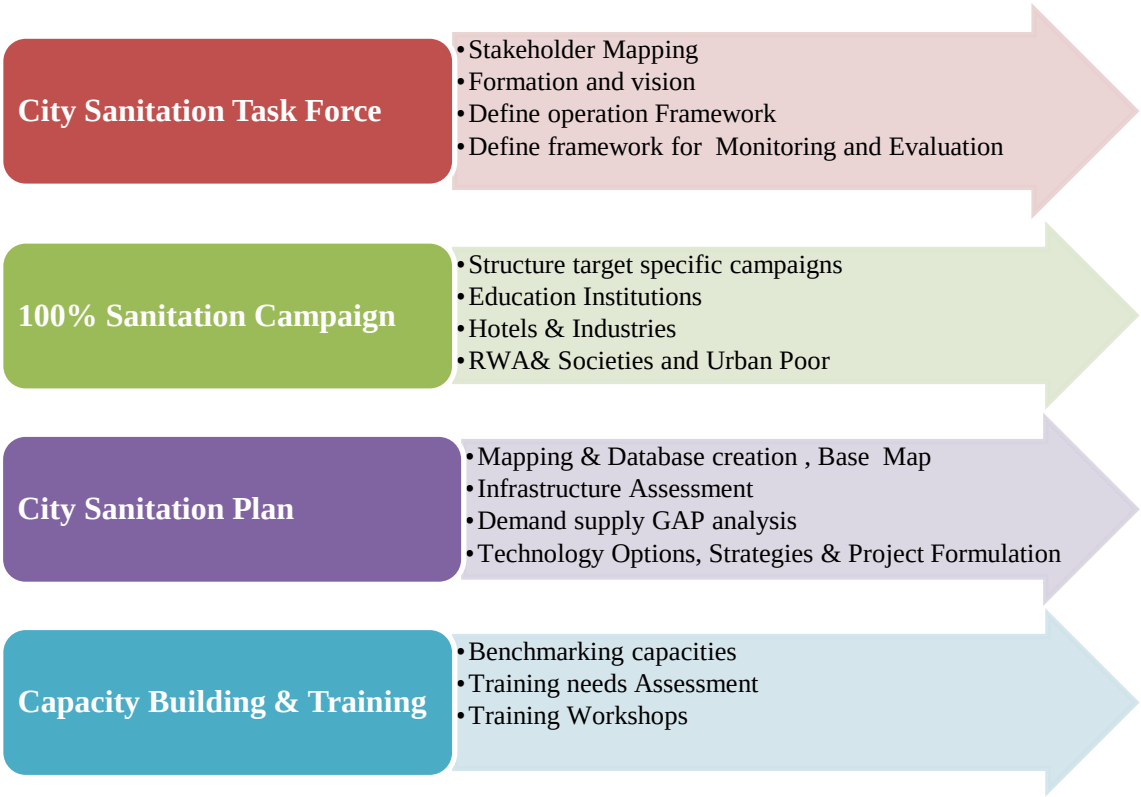
City Sanitation (Master) Plans (CSP), are the outputs of strategic planning processes for citywide sanitation sector development. Its objective is to develop and maintain a clean, safe and pleasant physical environment to promote social, economic and physical wellbeing of all sections of the population. 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

1.11.1 CSP Goals

Figure 2: CSP Goals

1.11.2 Scope of CSP

Figure 3: Scope of CSP Work



1.11.3 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.

1.11.4 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.

1.12 CSP Approach and Methodology

1.12.1 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

- Every citizen has access to a toilet & the city is "Open Defecation Free (ODF)"
- All the sewage generated is collected, treated, and disposed of 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 will advocate for the inclusion of these indicators into the city sanitation planning

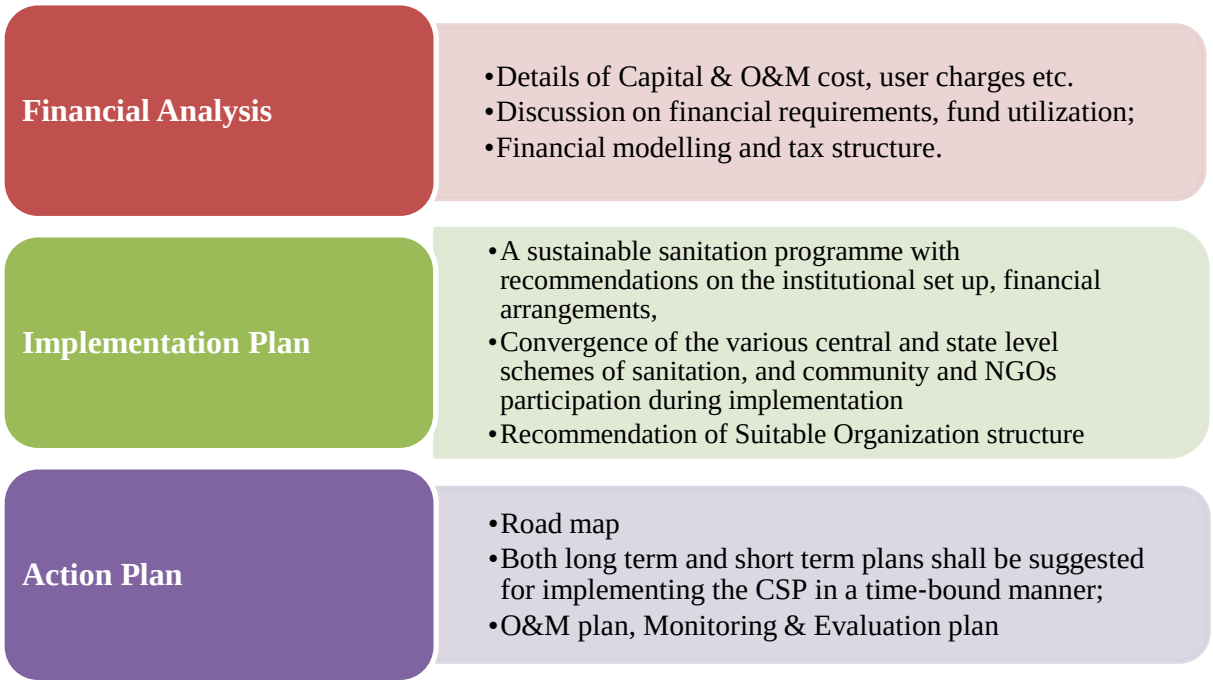
- All the solid waste generated is collected, treated, and disposed of safely
- All water bodies and drainages are preserved and kept clean
- All the storm water drains are kept clean

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.

Implementation Strategy

There should be complete financial analysis of all sectors like water, access to toilet, sewerage network, solid waste management etc which will also include details of operation and maintenance charges, funds required and sources of fund. Then for implementation of plan recommendations on its institutional framework is necessary to analysis additional fund arrangement. This would include Convergence of the various central and state level schemes of sanitation, and community and NGOs participation during implementation. This would lead to action plan.

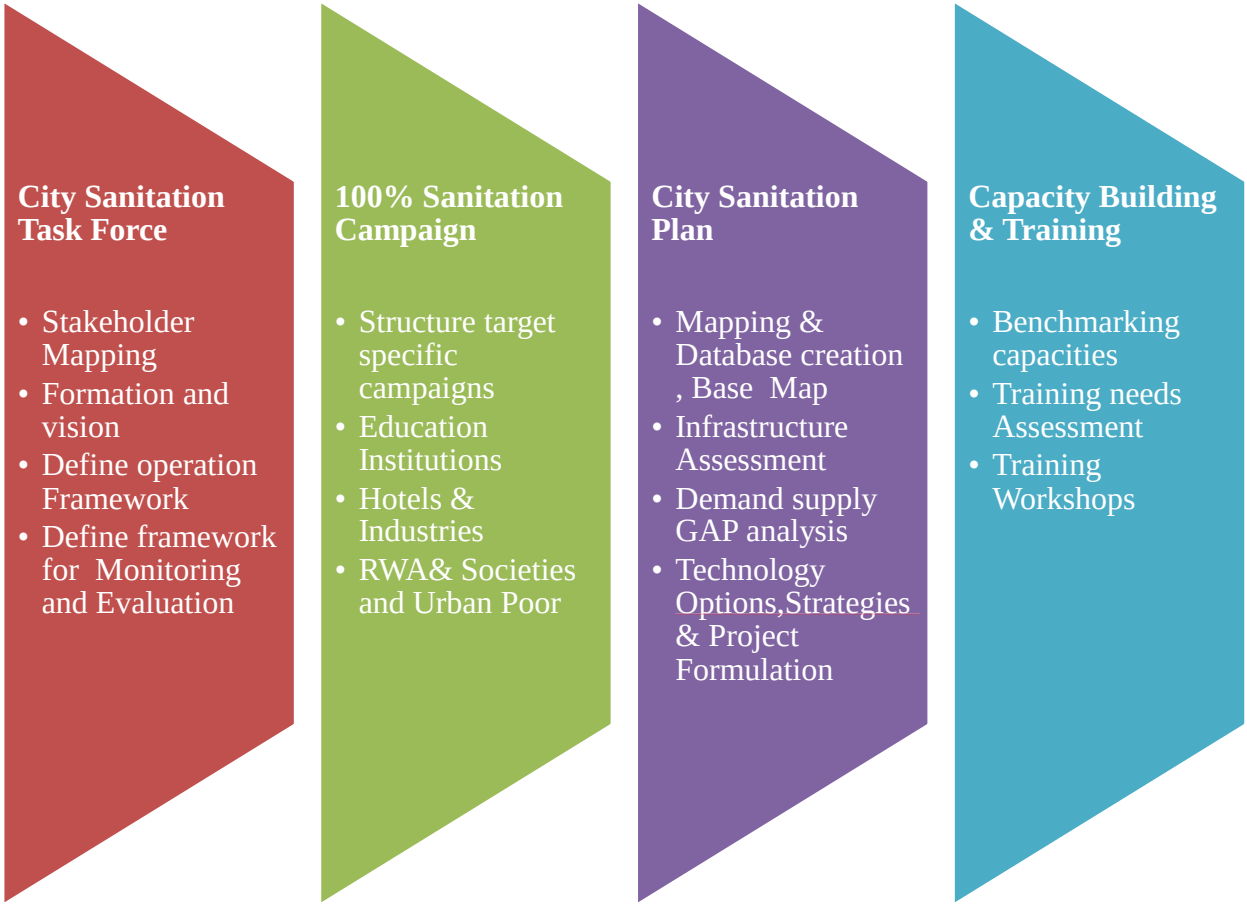
Figure 4: Implementing Strategies



1.12.2 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 consortium. The city sanitation task force is the institutional structure that will hold 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 5 : Pillars Supporting Inclusive Sanitation



1.12.3 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. The entire CSP formulation exercise is an effort to generate much-needed momentum, both within government and civil society, in a segment of urban infrastructure that requires demand-led planning and renewed attention. To this end, a structured, participatory and multi-stakeholder engaging consultative process was adopted to create a City Task Force (CTF) and engage different stakeholders including staff of the NN departments, para statal agencies and other state and local institutions, policy makers and citizens.

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 Firozabad City has been prepared using satellite images and maps as provided by the Nagar Nigam. 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 Nigam boundary and ward boundaries
- Transportation network – roads and railways
- Building foot print
- Water bodies and natural drainage
- Contours
- Green belt – forest, cultivation, orchard

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

- Nagar Nigam boundary and ward boundary map
- Proposed land use map (image) provided by Town Planning Department

Based on the above information and considering the revised corporation/ward boundaries (finalised in consultation with ward councillors and city officials) the final base map of Firozabad City map was prepared. This base map has been taken as base for the preparation of CSP for Firozabad City.

Table 3: Layers Used In Map Preparation

S. No.	Layers	Source	Data Type
1	Locations	Landmarks have been extracted from NN, satellite data, Survey of India Map and identified locations during survey.	Point
2	Firozabad Municipal Boundary	Municipal boundary has been extracted from NN Firozabad administration.	Polygon
3	Ward boundaries	Ward boundaries have been digitized according to Ward councillors and existing maps from NN Firozabad.	Polygon
4	National and State Highways	Existing Highways have been extracted from NN, Survey of India Map and NN Firozabad administration map	Line
5	Major District Road, City Main Road and Streets, Rail road	Existing District roads have been extracted from NN, satellite data, Survey of India Map and NN Firozabad administration map.	Line
6	Nallah / water bodies / drains / ponds	Existing Nallah/water bodies/drains/ponds have been extracted from NN, jal nigam, 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	Handpump/ Overhead tank	Existing locations and number of Handpump / Overhead tanks have been extracted from NN / jalnigam of Firozabad city	Point

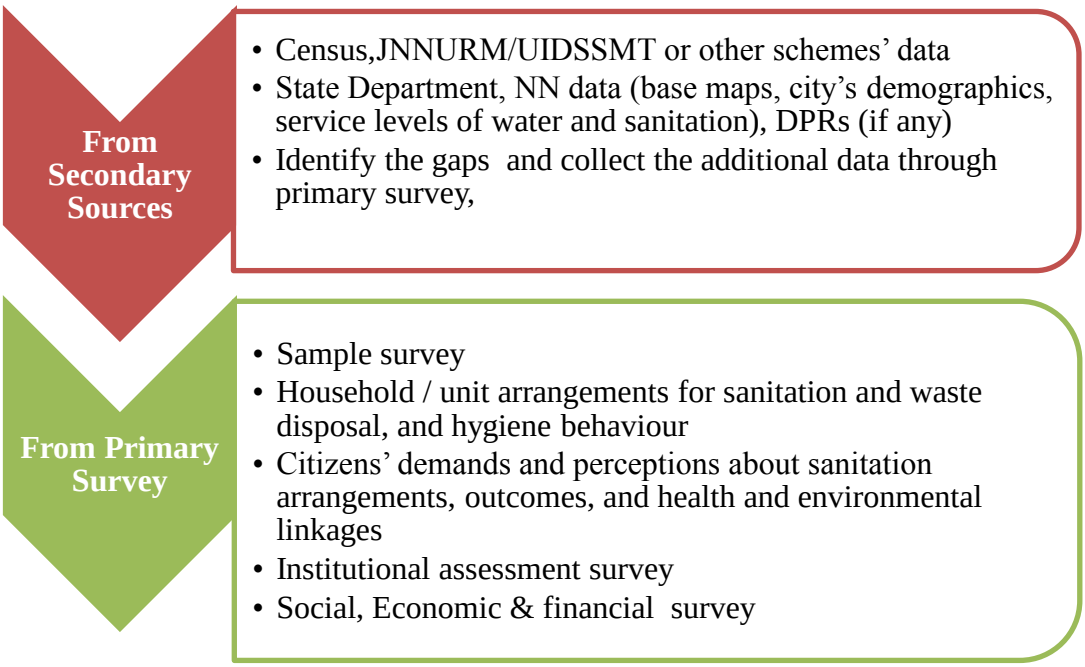
1.12.4 Overlaying Secondary Information on the Base Map

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)

Figure 6: Situation Analysis from Primary & Secondary Data



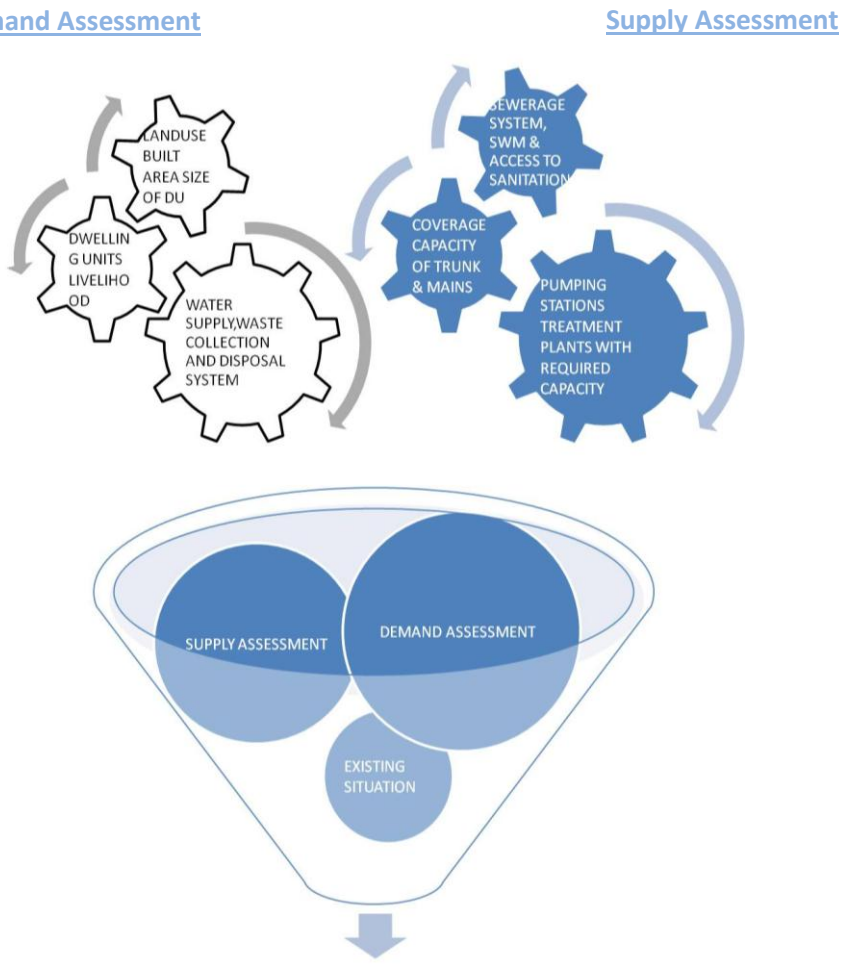
1.12.5 Land-Use and Sanitation Survey

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. For more accurate assessment of the ground situation and effective planning thereafter, it is necessary to have data at sub ward level .To this determining the existing sanitation condition at disaggregate level 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 (See Annexure) was designed to capture information on access to water supply, access to sewerage system, solid waste management, access to public sanitation, willingness to pay for the basic services etc. The surveyors were oriented on the need and purpose of the survey and the methodology of conducting the same.

Maps and the questionnaires were used to conduct the survey. The city was divided into several survey blocks based on the road and ward boundaries. The surveyors went through the area to understand the various land uses. Each survey block is further divided into building blocks demonstrating homogeneous land use and built typology. The survey was conducted in each building block capturing the land use and sanitation information. The homogeneous land uses were identified based on use (e.g. residential, commercial etc.), built characteristics (e.g. number of floors, type of construction), and socio-economic characteristics (e.g. Middle Income Group (MIG) residential apartments, residential villas, slums etc.).Open land parcels and water bodies are also marked on the map and information was entered in the questionnaire. The information collected from the survey is entered in a structured format. The homogeneous land use parcels are digitised. The field data and the map are linked on the GIS platform for further analysis.

1.12.6 Demand – Supply Gap Assessment

Figure 7 : Gap Analysis



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.

1.12.7 Consultation with the CSTF

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

1.12.8 Assessing Technology Options

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

1.12.9 Strategies and Project Formulation

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

1.12.10 Draft City Sanitation Plan

Based on the situation analysis, strategy formulation and technology selection, a draft city sanitation plan shall be prepared for Firozabad. This shall include schematic designs, broad cost estimates and an implementation strategy.

1.12.11 Final City Sanitation Plan

In consultation with the CSTF, the city sanitation plan will be finalized.

1.13 Capacity Building & Training Needs Assessment

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

1.14 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 4 Timeline for Totally Sanitized City

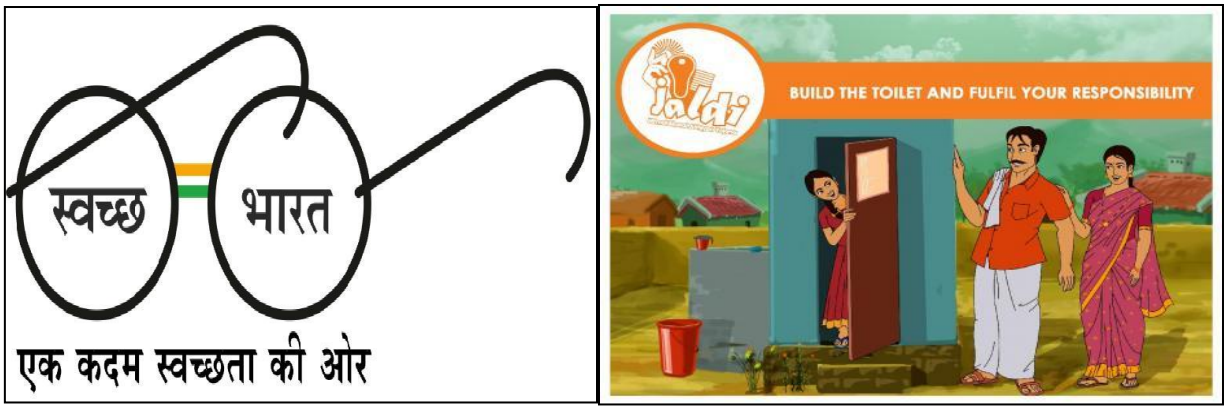
Phase	Year
Immediate	2016-2018
Short-Term	2019-2024
Mid-Term	2025- 2034
Long-Term	2035 - 2046

2 CITY SANITATION PLAN COMPONENTS

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.

2.1 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.

2.2 Drinking Water Supply

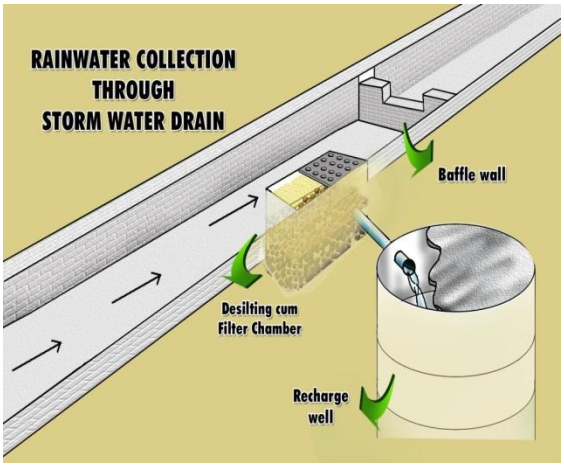
Drinking water supply is also very important for upkeep of sanitation facilities and environment/health status it is necessary to have sufficient water. Poor quality of water as well as insufficient quantity of potable water can pose serious public health hazardous water borne diseases are quite common 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.

2.3 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.

2.4 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.

2.5 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.

3 CITY PROFILE

3.1 Firozabad - City Profile

Firozabad is a city situated in Firozabad district in Uttar Pradesh, India Firozabad is located at 27.15°N 78.42°E. It has an average elevation of 164 meters (538 ft.). Firozabad district forms one of the western districts of the Indian state of Uttar Pradesh, which has Firozabad Town as its district headquarters. The district is a part of the Agra division. The ancient name of this town was Chandwar Nagar. It is said that during the reign of Akbar the great revenue was brought through the city, which was looted by the people who lived there. Akbar sent his army lead by a man named "Firoz" to make the city a cantonment to improve thieves who lived here. The tomb of Firoz is still present today. From early times, it was famous for glass and bangle works, and its related small scale industry is famous throughout the world.

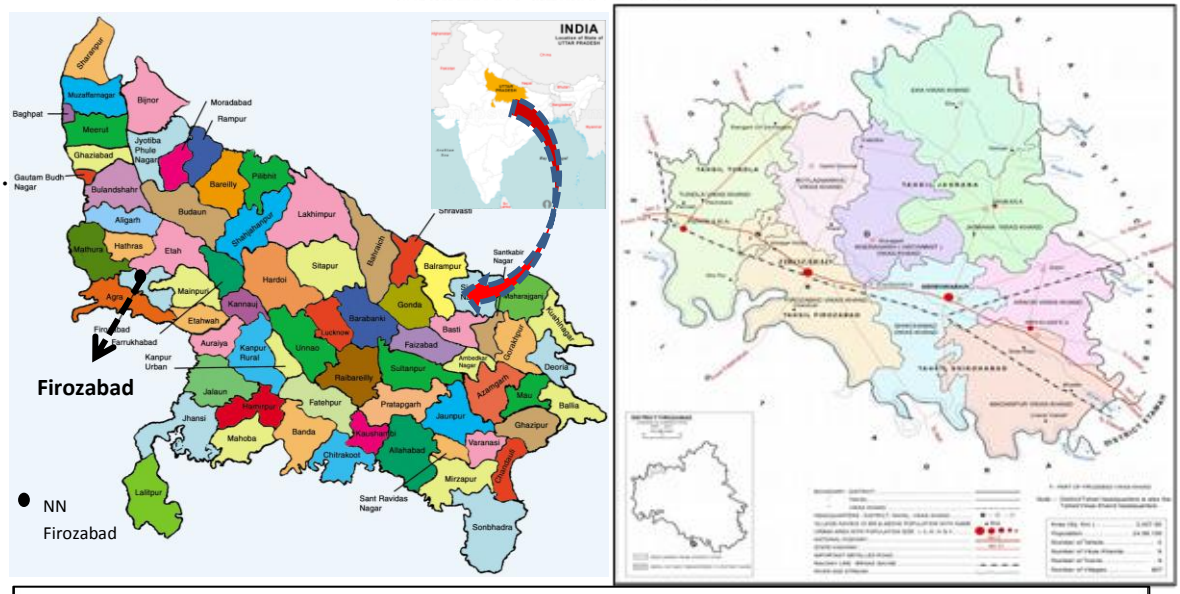
Firozabad is located in **Taj Trapezium Zone (TTZ),** which is a defined area of 10,400 sq km around the Taj Mahal to protect the monument from pollution. The use of coal/ coke in industries located in the TTZ is banned by a ruling of Supreme Court in December, 1996 and the Mission Management Board of Taj protection programme keep an eye on environmental parameters of the concern area.

3.1.1 Climate and Rainfall

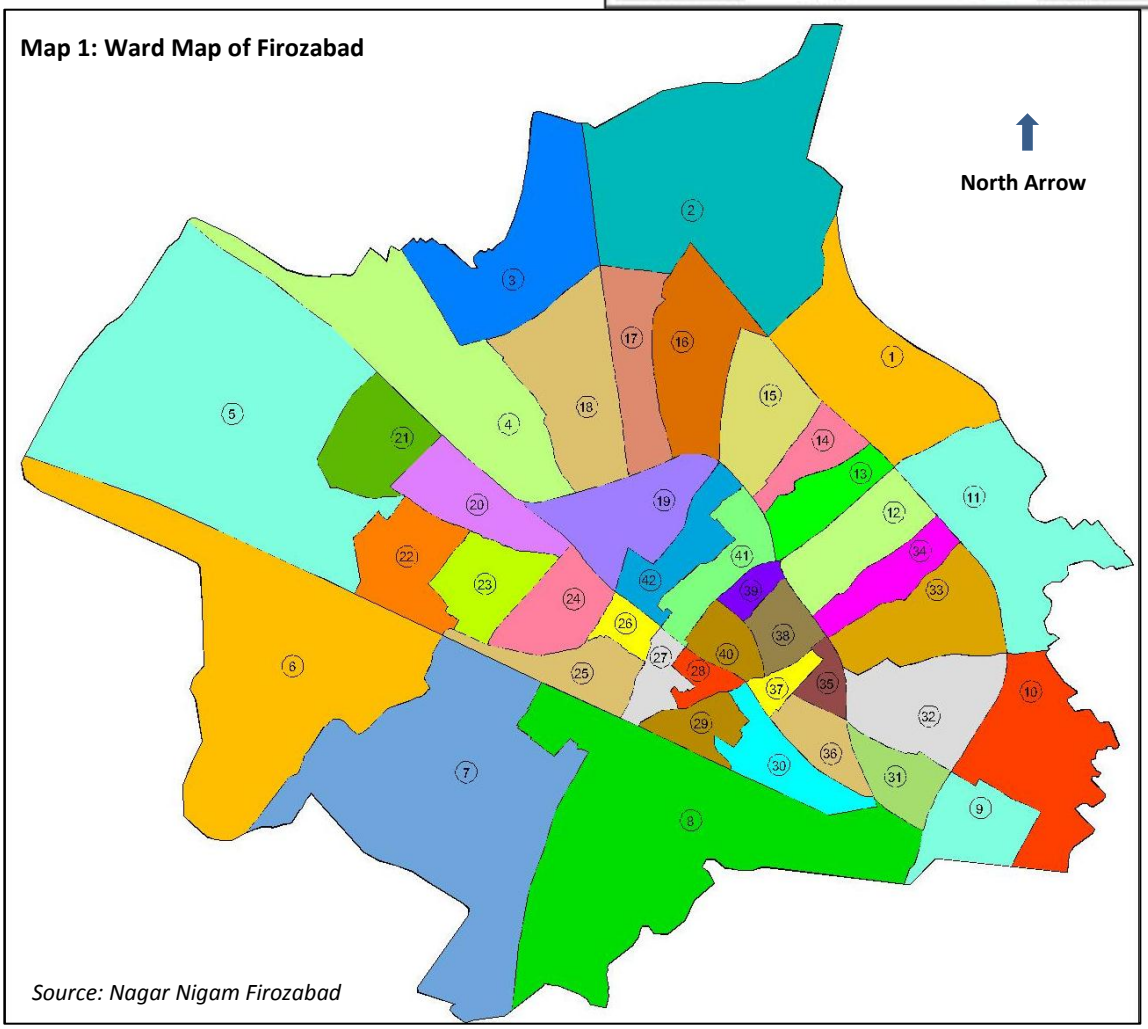
The average annual rainfall is 715.2mm. The climate is sub-humid and enjoys a day climate except during the monsoon season. About 90% of a rainfall takes places from June to September. During monsoon surplus water is available for deep percolation to ground water. There is a meteorological observatory at Agra, the record of which may be taken as representative meteorological conditions in the district. May is the hottest month, the mean maximum temperature is 41.80°C and in June temperature may reach over 48.00°C with onset of the monsoon in June, the day temperature decreases 50°C to 60°C. In November day and night

temperature steadily drops and January is the coldest month with mean daily minimum temperature of 7.40°C and mean daily maximum temperature of 22.20°C. The mean monthly maximum temperature is 32.40°C and mean monthly minimum temperature is 19.10°C.

Location Map of Firozabad



Map 1: Ward Map of Firozabad



Source: Nagar Nigam Firozabad

The geographical area of the Firozabad city is 34.90 sq. kms in year 2011, the city has divided into 42 wards. In 2011 Census 13 villages has been merged into Firozabad city. Firozabad had become Nagar Nigam in 2014. City administration is headed by the City Commissioner.

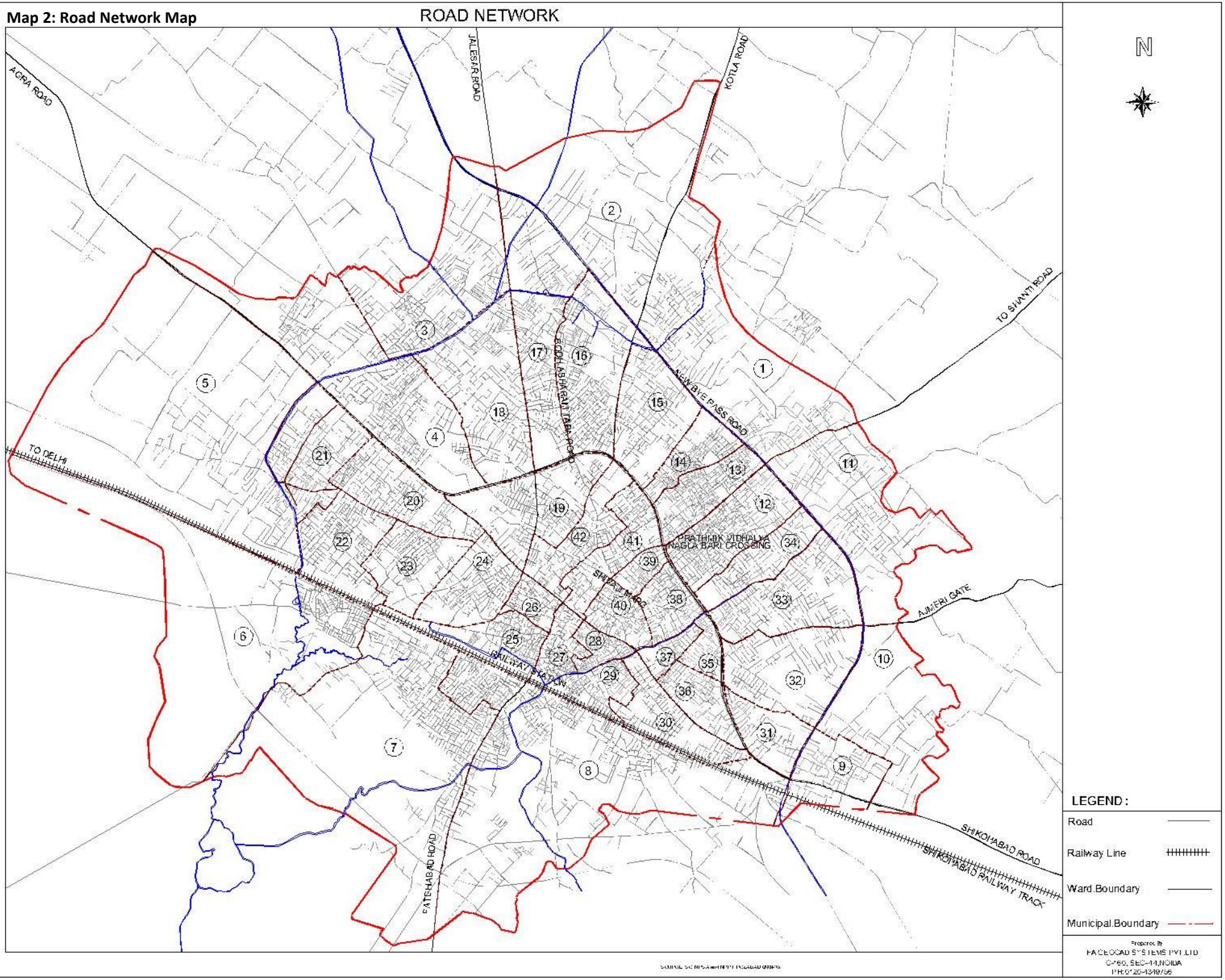
3.1.2 Road Transport

The available multiple modes of public transport in the city are taxis, cycle rickshaws, auto rickshaws. The city is 40 kms east from Agra on National Highway 2 which makes it an important stopover for the transport vehicles on this highway. Firozabad hence is connected to several bus services to the Western and Eastern parts of Uttar Pradesh state. Due to proximity to Agra and hence the borders of Uttar Pradesh with Rajasthan, Madhya Pradesh states several inter-state bus services also serve the city.

3.1.3 Railways

Firozabad lies in the north Central Railway Zone and is well connected by trains with all major cities namely Delhi, Jammu Tawi, Amritsar ,Mumbai, Lucknow, Kanpur Bhopal, Bilaspur, Gwalior, Jabalpur, Rajapur, Varanasi, Agra. The city is well connected to Kanpur, Allahabad, Jhansi and other neighboring cities also Tundla Junction railway station in the Tundla town (20 km west of Firozabad city on National Highway 2 of the Firozabad District is a major railway of North Central Railways. Figure 1 shows the district boundary map of Firozabad and location of Firozabad city in the district.

Map 2: Road Network Map

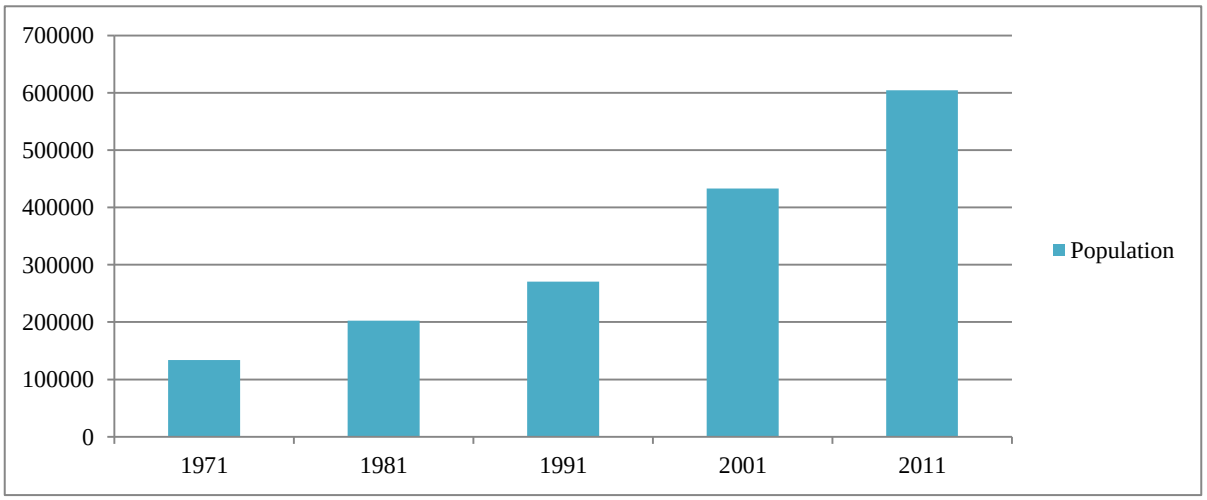


3.1.4 Demographic Data

3.1.4.1 Population Trend of Firozabad City

As of 2011 India census, Firozabad city had a population of 604214 of which males constitute 319415 (53%) of the population and females 284799 (47%).

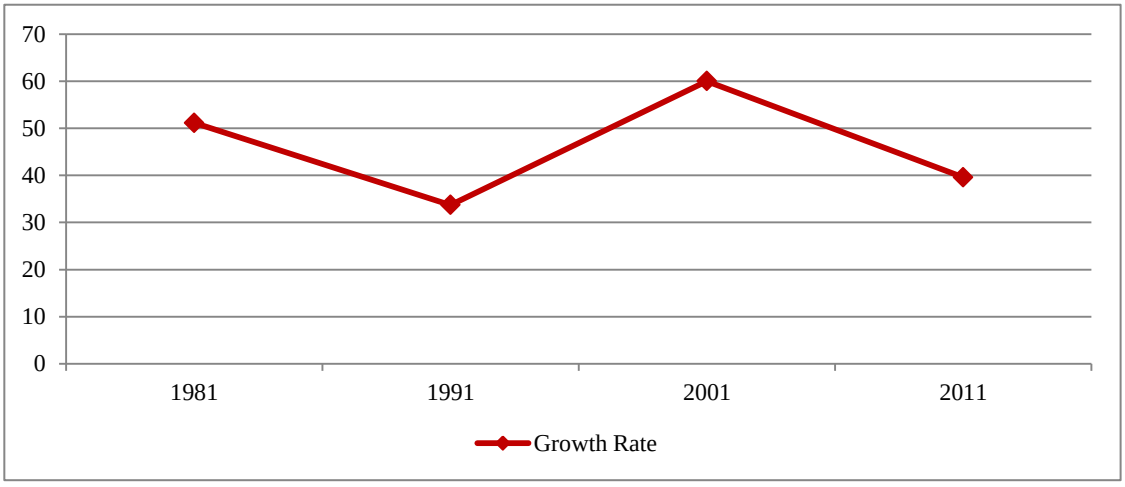
Figure 8: Trend of Population in Firozabad



Source: Census of India, GOI

The city has witnessed significantly high population growth rate of about during 39.58% 2001-11, which is one of the high in urban India.

Figure 9: Population Growth Rate



Demographically, city is primarily having residential population with total number of households at present are 99833.It indicates the great housing and development activities in the city in last decade. However, the average family size has decreased from 7.01 to 6.05 in 2011. The total

literate population of Firozabad is 342252 (56.64%), which is lower than the national average of 74.04%.Male literacy is 57.85%, and female literacy is 42.15%. In Firozabad, 14.59% of the population is under 6 years of age. Besides, slums /vulnerable population clusters are scattered throughout the city. The total slum population of the city is 65696 in year 2011 which shows the migration of poor people from surrounding rural in search of work in Firozabad city as per Census of India 2011.

3.1.4.2 Sex ratio

With regards to Sex Ratio in Firozabad, it stood at 892 per 1000 male. The average national sex ratio in India is 940 as per latest reports of Census 2011 Directorate. In 2011 census, child sex ratio is 896 girls per 1000 boys.

3.1.5 Overall City and Infrastructure Status

Table 5: City Status

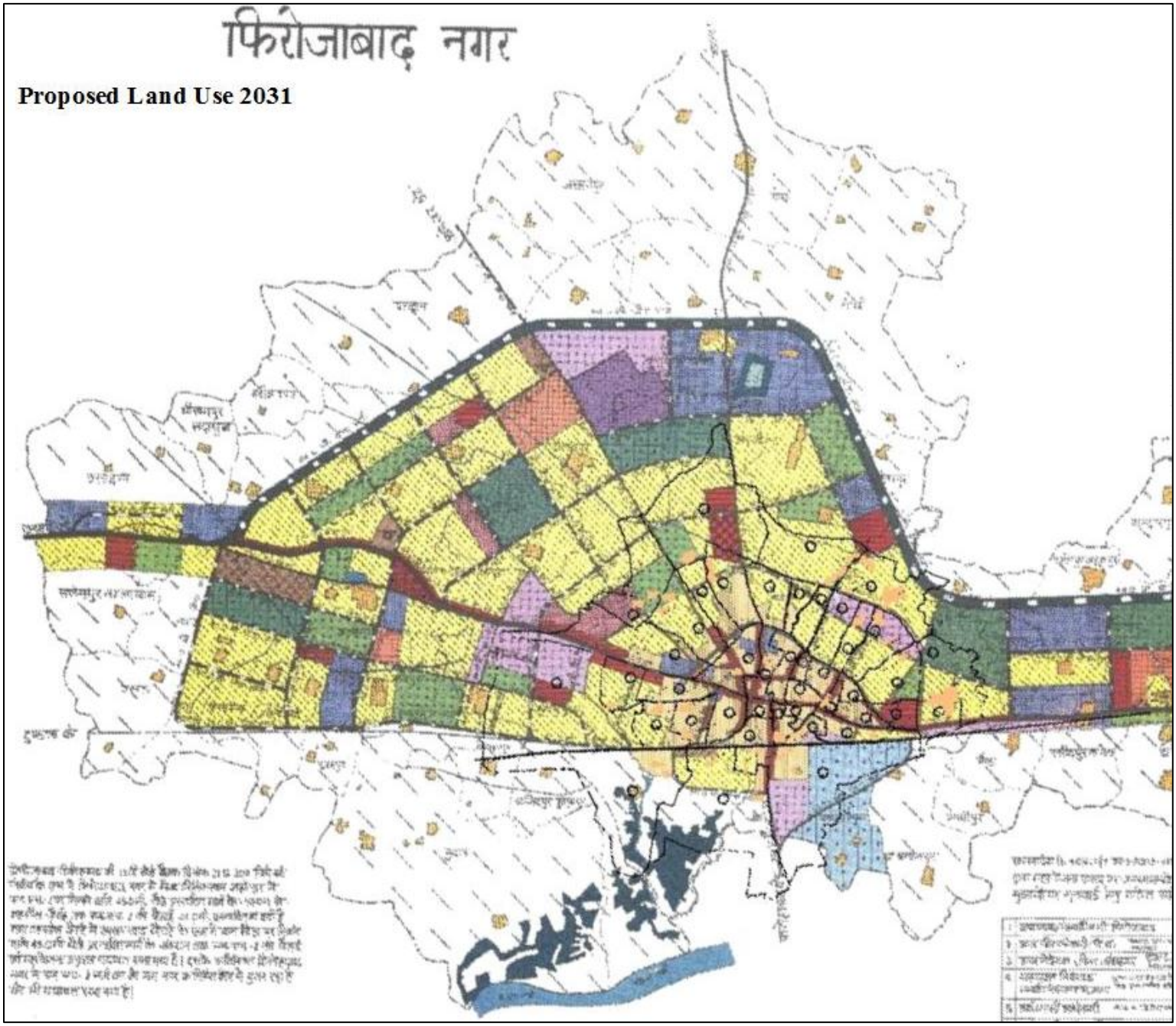
S. No.	Parameters	Value and Range
1.	Total Population	604214
2.	No. of Households	99833
3.	Average Household Size	6.05
4.	Slum Population	65696
5.	No. of Slums	83
6.	Literacy Rate	56.64%
7.	Wards	42
8.	City Area	34.90 sq.km
9.	No. of Markets	6
10.	No. of Public Toilets +Mobile Toilet(1 Operational)	6 +2
11.	No. of Sabzi Mandi	2
12.	No. of Bus Station(Public & Private)	1
13.	No. of Railway Station	1
14.	No. of Primary Schools	43
15.	No. of Inter Colleges	31
16.	No. of Degree Colleges	6
17.	Cinemas	09
18.	Post Office & Sub Post Office	1+6
19.	Government Hospital	2
20.	Nursing Home	14

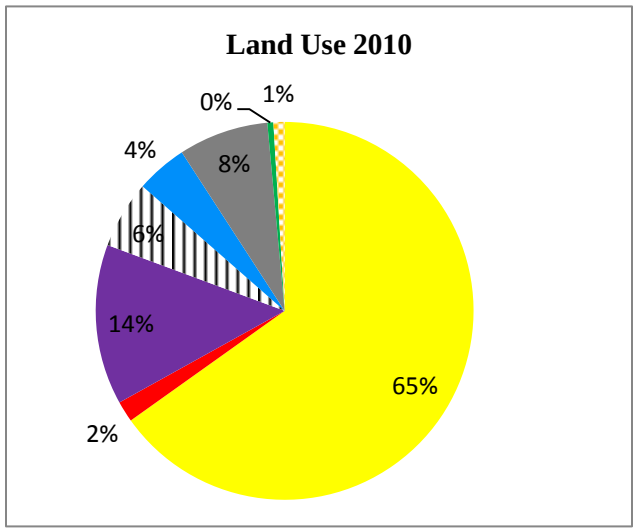
Source: Nagar Nigam, Firozabad

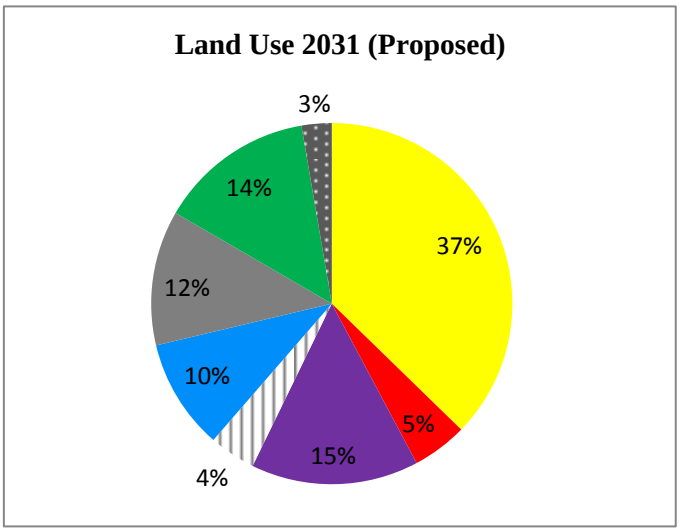
3.1.6 Land Use Pattern

According to the Master Plan of Firozabad Shikohabad 2031 the city is having 65% of residential area, Industrial area covering 14% area and only 2% of the area covers under the commercial activity. Firozabad 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.

Map 3: Proposed Land Use of Firozabad







Source: Master Plan of Firozabad Shikhohabad 2031

Residential | Commercial | Industrial | Govt Offices
Public /semi public | Transportaion | Parks/open spaces | Sewerage Plant

Firozabad City is having total 99833 numbers of household as per census 2011. Firozabad is famous for its bangle industry which is mainly done at household level. According to the Census 22979 of total population engaged in Household industry.

3.1.7 Economy

Traditionally Firozabad is known for its bangle industry. It is famous for glass and bangle manufacturing industry and about 400 glass industries registered. Half of the production of these units is exported besides this there are countless number of household bangle manufacturing and assembling units. These industries are famous throughout the world.

	Total Workers	Main Workers	Marginal Workers	Household industry Workers
Total	**205092**	**160398**	**44694**	**22979**
Male	154078	128290	25788	15646
Female	51014	32108	18906	7333

Source: Census 2011

3.2 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 Firozabad has population of 604214 persons. The population of Firozabad has increased from 432866 persons in 2001 to 604214 in 2011, recording a decadal growth rate of 40 percent.

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

3.2.1 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 (last year known) + n*x where Pn, Population of the year to be known

n = number of decades

x = average arithmetic increase per decade

3.2.2 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, $Pn = P_{\text{year known}}(1+rg)^n$

3.2.3 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.

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

where **Pn** = population of the year to be known

n = number of decades

x = average arithmetic increase per decade

y = average incremental increase per decade

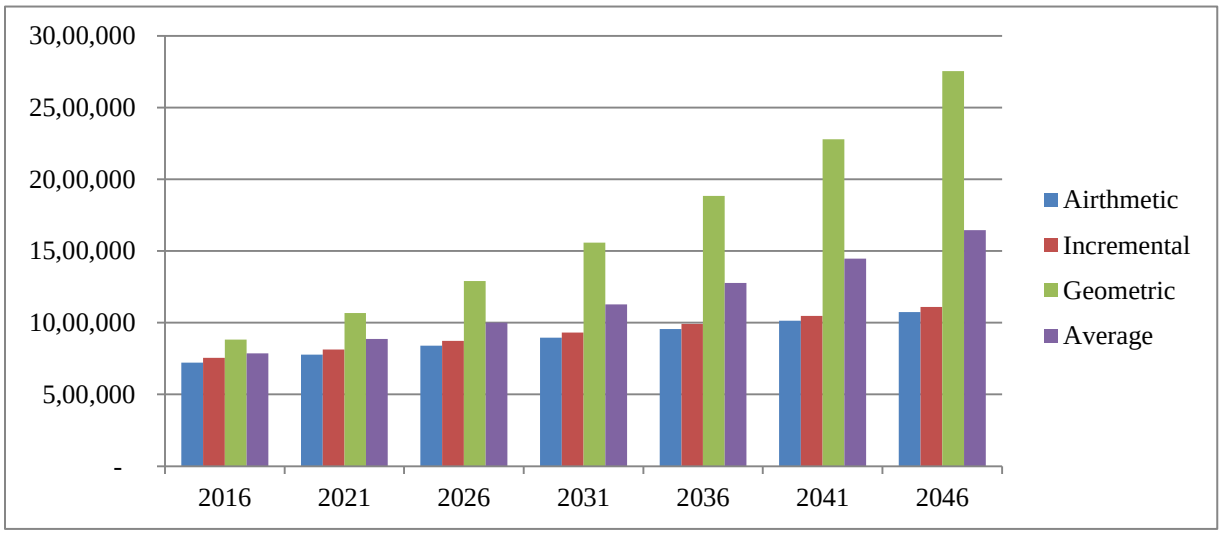
The population projection for Firozabad has been carried out for 30 years at an interval of 5 years and result are summarized in Table below –

Table 6: Population Projection of City

Year	Arithmetic	Incremental	Geometric	Average
2011	604214	604214	604214	604214
2016	**721,802**	**756,093**	**882,826**	**786,907**
2021	778,378	812,763	1,067,129	886,090
2026	839,390	873,681	1,289,909	1,000,993
2031	896,257	930,619	1,559,198	1,128,691
2036	956,977	991,268	1,884,704	1,277,650
2041	1,014,068	1,048,415	2,278,166	1,446,883
2046	**1,074,565**	**1,108,856**	**2,753,768**	**1,645,730**

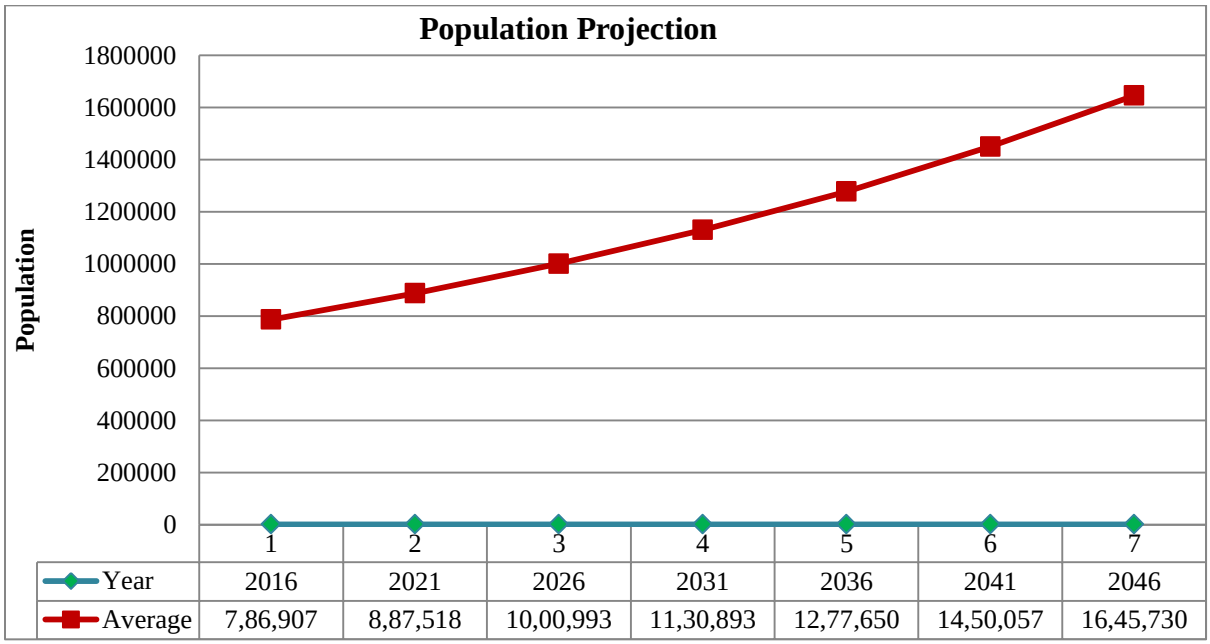
Source: Calculated Value

Figure 10: Projected Population by Different Methods



Source: Calculated Value

Figure 11: Average Population Projection



Source: Calculated Value

3.3 Projections of Water Demand, Solid Waste & Sewage Generation

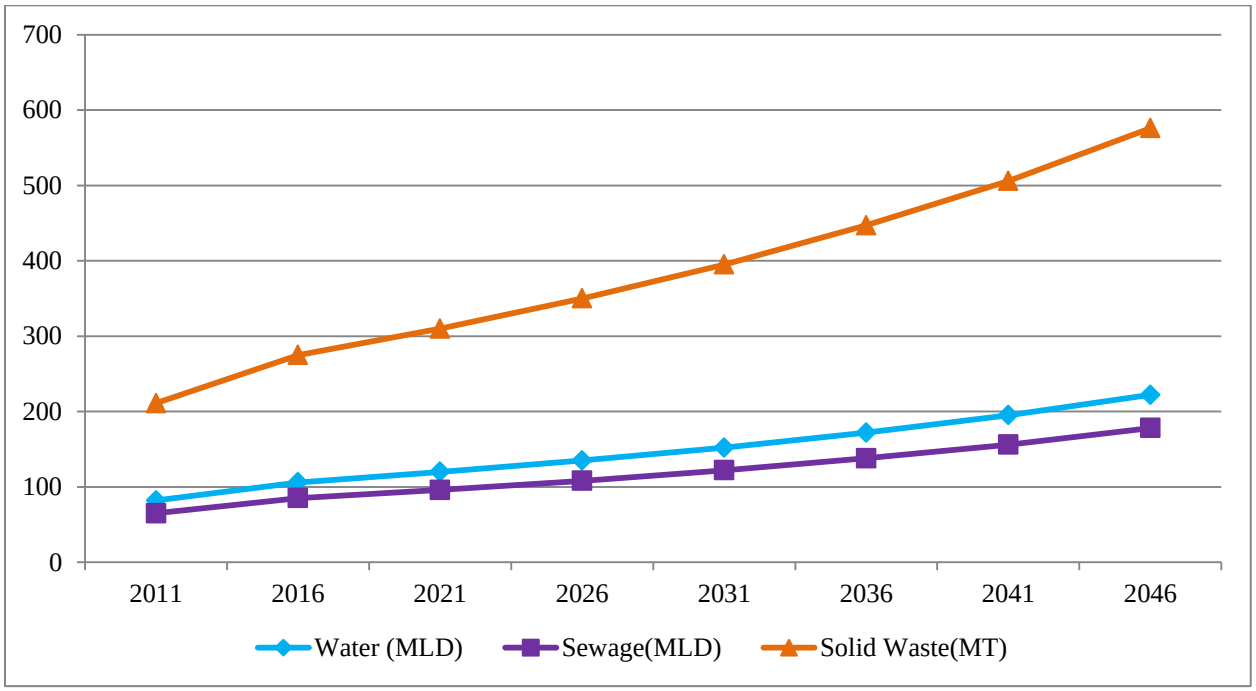
As per recommendations of Section 2.2.8.3 of the CPHEEO Manual, city level water demand has been projected considering 135 LPCD for residential population and sewage generation as 80% of the water demand. Solid waste generation is taken as 350 gm. per capita as prescribed by CPHEEO. Considering the projected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

Table 7: Projected Infrastructure Demand of the City

Year	Population	Water (MLD)	Sewage(MLD)	Solid Waste(MT)
2011	604214	82	65	211
2016	**786,907**	**106**	**85**	**275**
2021	886,090	120	96	310
2026	1,000,993	135	108	350
2031	1,128,691	152	122	395
2036	1,277,650	172	138	447
2041	1,446,883	195	156	506
2046	**1,645,730**	**222**	**178**	**576**

Source: Calculated Value

Figure 12: Projected Infrastructure Demand



Source: Calculated Value

Gross Water Supply demand will be 120 MLD in 2021 and increase to 172 MLD in 2036 and 222 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 place due to a combination of population growth and increase in per capita consumption to 311 MT in 2021, 447 MTD in 2036 and 576 TPD in 2046.

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

3.3.1 Ward wise population

The population of Firozabad city in 2011 was 604214 and Firozabad has total 42 wards. Wards 33, 34 and 35 have highest population in comparison to other wards of the city. While the wards 24 and 27 are exhibiting lowest population in the city of Firozabad. The ward wise population and male female population of all the 42 wards of Nagar Nigam, Firozabad is presented in Table below.

Table 8 Ward Wise Population Firozabad City

Ward No.	Households	Population	Male	Female
1	3181	18483	9730	8753
2	4411	25652	13585	12067
3	4760	27884	14890	12994
4	3132	18237	9835	8402
5	4026	25458	13513	11945
6	2292	12770	6829	5941
7	1816	10409	5508	4901
8	2720	15879	8529	7350
9	2678	15706	8357	7349
10	2751	16747	8768	7979
11	3777	22370	12069	10301
12	4573	29255	15306	13949
13	1339	7467	3934	3533
14	2688	15429	8221	7208
15	1862	10853	5839	5014
16	3278	19011	10119	8892
17	4887	27368	14551	12817
18	3934	23324	12524	10800
19	1265	7747	4087	3660
20	922	5158	2803	2355
21	3293	19279	10379	8900
22	1500	7925	4174	3751
23	1104	6501	3427	3074
24	1046	5415	2822	2593
25	1176	6386	3332	3054
26	1398	8231	4349	3882
27	1011	6343	3359	2984
28	722	3987	2058	1929
29	958	6073	3246	2827
30	1382	8932	4596	4336
31	1720	10562	5682	4880
32	3103	18407	9715	8692
33	4786	31389	16271	15118
34	4653	30263	15749	14515
35	4825	32508	16822	15687

36	1088	7396	3788	3608
37	997	6263	3342	2921
38	1103	7822	4083	3739
39	1146	8364	4373	3991
40	396	2785	1450	1335
41	928	6856	3568	3288
42	1206	7320	3835	3485

Source: Census of India, 2011

3.3.2 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 65696. The percentage of slum population in the city is 10.8 per cent of the total population. As per DUDA there are 84 slum pockets. The slum population in the city has been spread over in all wards. As per Census, the household (HH) size in slums works out to be 6.86, which is more than the HH size of the total population (6.00).

Table 9 Name of the Slum

S. No.	Slum Name	S. No.	Slum Name
1	Basath	43	Anand Nagar
2	Phulbadi	44	Kheda
3	Om Nagar	45	Ojha Nagar
4	Sant Nagar	46	Mayapuri
5	Chhar Bagh	47	Tilak Nagar
6	Shyam Nagar	48	Dakhal
7	Ram Nagar	49	Nagla Karan Singh
8	Azaad Nagar	50	Satya Nagar
9	Nagla Vishnu	51	Krishna Nagar
10	Labour Colony	52	Santosh Nagar
11	Md. Tila	53	Bodh Nagar
12	Bhojpura	54	Tapa Khurd
13	Katra	55	Kashi Ram Vihar

14	Nayi Basti	56	Sailai
15	Karbala	57	Pratap Nagar
16	New Preetam Nagar	58	Ambedkar Park
17	Dev Nagar	59	Sarjeevan Nagar
18	Purushottam Nagar	60	Samrat Nagar
19	Murli Naagar	61	Narayan Nagar
20	Bhim Nagar	62	Vijay Nagar
21	Himayupur	63	Nagla Bari
22	Nagla Pachiya	64	Mirza Nagla Bada
23	Dholpura	65	Nagla Mirza Chhota
24	Rahana	66	Kashmiri Gate
25	Laxmi Nagar	67	Ramgarh
26	Nehru Nagar	68	Tade Wala Baghiya
27	Kaushalya Nagar	69	Sheetalkhan
28	Mathura Nagar	70	Mohammadpur
29	Kakrau	71	Hajipura
30	Jhalkari Nagar	72	Jatavpuri
31	Elan Nagar	73	Ghalib Nagar
32	Bajrang Nagar	74	Rahmat Nagar
33	New Ramgarh	75	Asraf Ganj
34	Indra Nagar	76	Mashroor Ganj
35	Shanti Nagar	77	Kothi Navi Ganj
36	Tapa Kala	78	Tees Futa
37	Bhagwan Nagar	79	Prem Nagar Dak Bagla
38	Ram Krishan Nagar	80	Rasulpur
39	Lohiya Nagar	81	Purana Rasoolpur
40	Bodh Ashram Nagar	82	Nibuwala Bagh
41	Dammamal Nagar	83	Durgesh Nagar
42	Kabir Nagar	84	Asfabad

Source: DUDA

4 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.

4.1 City Level Status

In the city, total numbers of water supply connections are 40741, which is only 39% 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 57.44 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 10: Water Infrastructure

Indicator	Status
Sources of Water	Ground Water
Coverage of Water Supply	39%
Per capita supply of Water	9.4 LPCD
No. of Tube Wells	189 nos.
No. of CWR	14 nos.
No. of Over Head Tanks	25 nos.
No. of Hand Pumps	1110(310 Not Working)
Water Treatment Plant (WTP)-	Nil
Length of Line(Total)	710 kms
Length of distribution network	656 kms

Source: Nagar Nigam Firozabad

There are total 40741 water connections in the city which includes households and commercial connections also.

Table 11: Water Connections of City

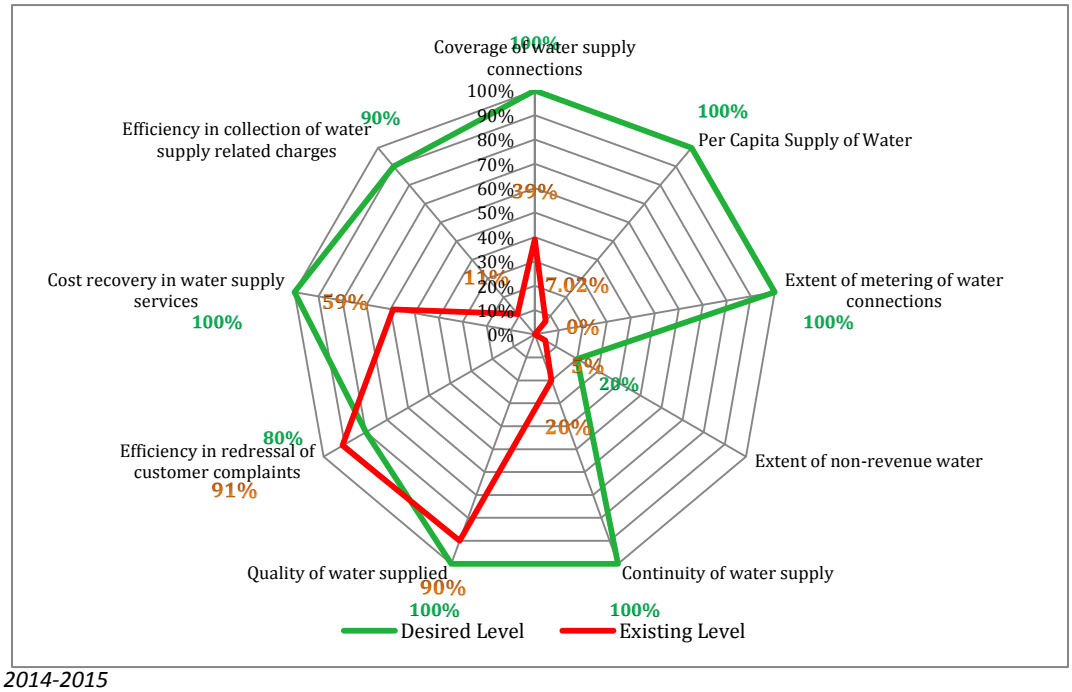
S. No.	Type of connection	Number
1	Total Households	99833
2	Number of Service Connections	40741
3	Household service connections	38252
5	Duration of supply daily	6 hrs on average

Source: Nagar Nigam Firozabad

Table 12: Service Level Benchmark of Water Supply, Firozabad

Indicators	Desired Level of Service	Existing Level of Service
Coverage of water supply connections	100%	39%
Per Capita Supply of Water	135lpcd	9.4 lpcd
Extent of metering of water connections	100%	0%
Extent of non-revenue water	20%	5%
Continuity of water supply	24hrs	5 hrs
Quality of water supplied	100%	90%
Efficiency in redressal of customer complaints	80%	91%
Cost recovery in water supply services	100%	59%
Efficiency in collection of water supply related charges	90%	11%

Figure 13: Water Supply in Firozabad

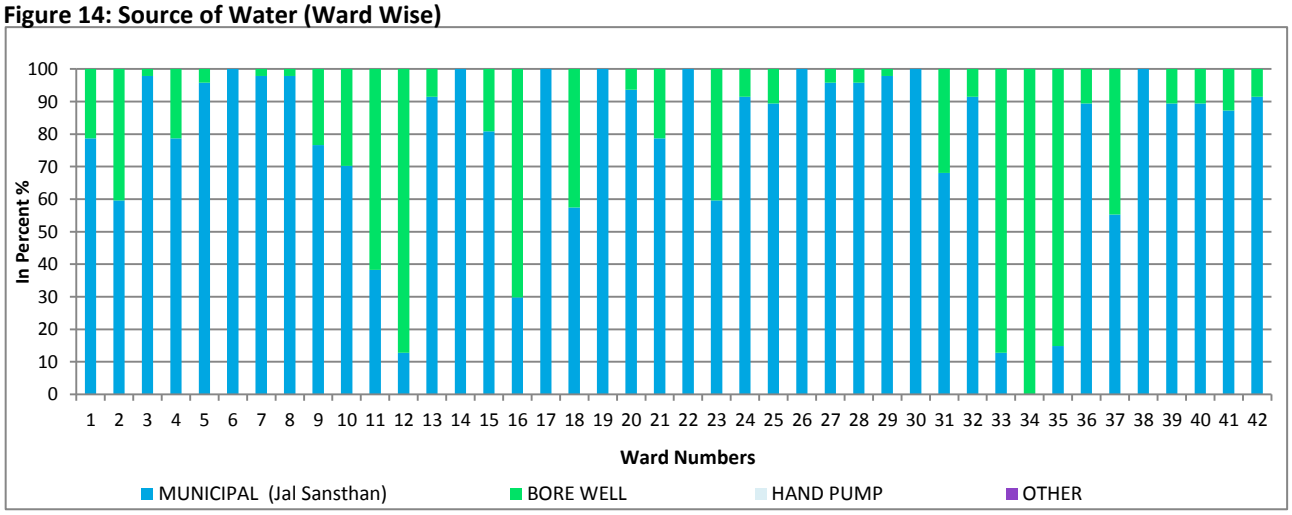


Source: SLB 2014-2015

4.1.1 Source of Water

As per primary survey, in all the wards the major source of water is Municipal water and Bore wells.

Figure 14: Source of Water (Ward Wise)



Source: Primary Survey, 2015

Photograph: Source of Water (Mathura Nagar)

Source: Primary Survey, 2015

As per Secondary Sources the Firozabad city is relying only on ground water sources. There are 189 Tube Wells and 14 CWR located in Firozabad.

Water is drawn from 189 tube wells and 1110 Hand Pumps located in the various parts of Firozabad Municipal Corporation. Out of total water production 20% is wasted in leakages, and available water to the public is hardly 57.4 MLD, which is supplied to household population (604214 current population as per Census). As per the standard of 135 lpcd, the present water demand for domestic use in Firozabad Municipal Corporation is 82 MLD.

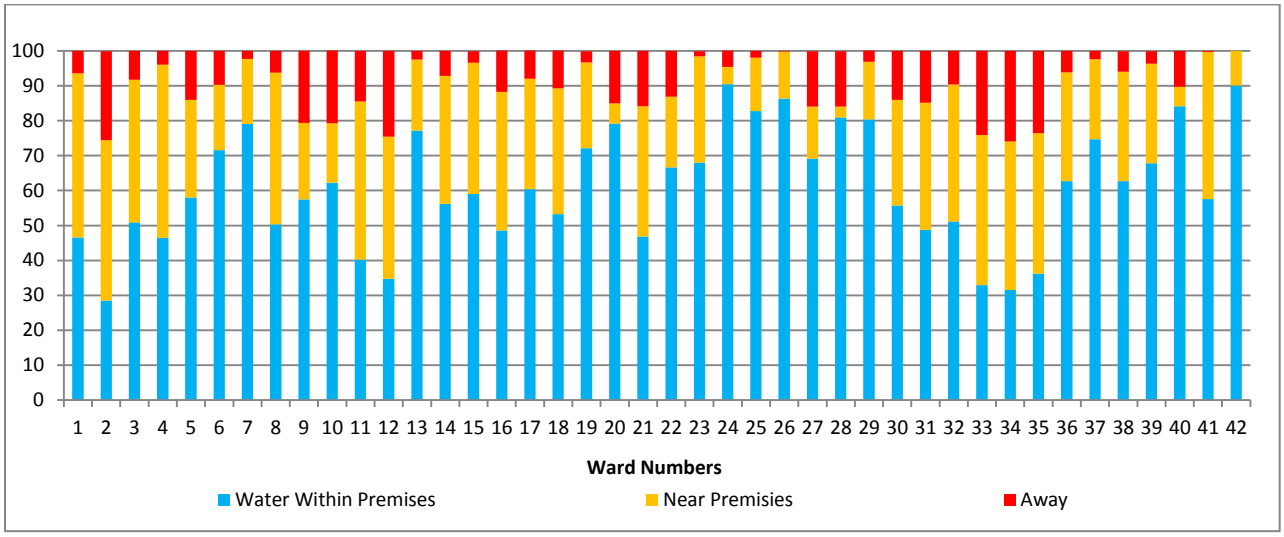
Tube wells

There are in total 189 tube wells in the city from which the water is supplied for drinking purpose.

Hand pumps

There are 1110 hand pumps out of which 310 are not in operational condition installed across the town functioning in the city in which the people are directly taking water for their domestic purpose.

Figure 15: Location of Drinking Water



Source: Census, 2011

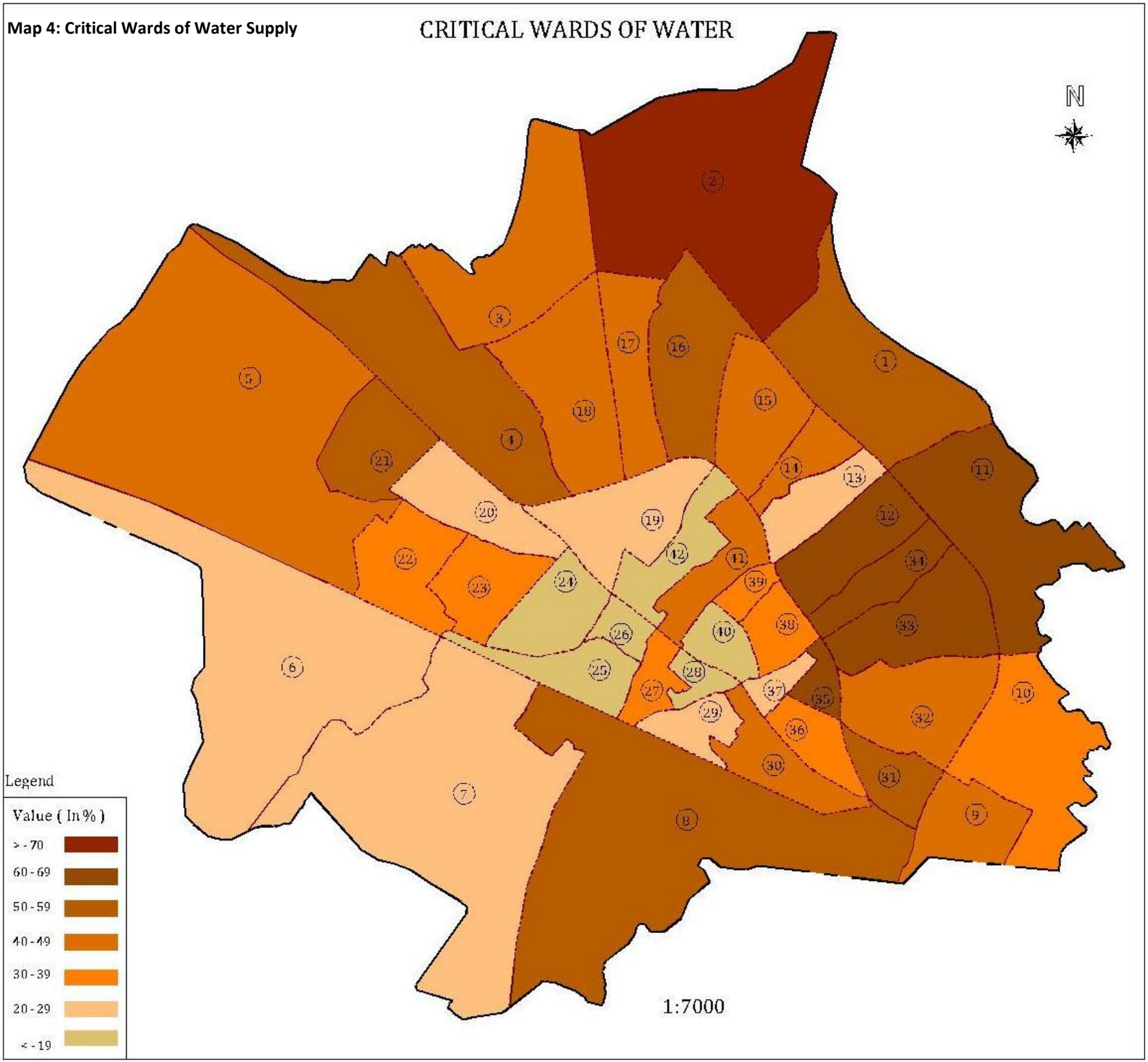
Table 13: Location of Drinking water (Ward Wise)

Ward No.	Total Households	Water Within Premises	Near Premises	Away
1.	3181	1481	1497	204
2.	4411	1261	2026	1124
3.	4760	2423	1946	392
4.	3132	1455	1553	124
5.	4026	2336	1125	566
6.	2292	1640	429	223
7.	1816	1436	338	42
8.	2720	1369	1180	171
9.	2678	1539	586	553

Ward No.	Total Households	Water Within Premises	Near Premises	Away
10.	2751	1714	468	571
11.	3777	1521	1711	546
12.	4573	1590	1857	1125
13.	1339	1034	272	33
14.	2688	1511	986	192
15.	1862	1099	700	62
16.	3278	1593	1298	387
17.	4887	2950	1547	391
18.	3934	2094	1416	425
19.	1265	912	311	41
20.	922	730	53	138
21.	3293	1542	1227	523
22.	1500	999	305	197
23.	1104	751	336	18
24.	1046	947	51	48
25.	1176	974	180	22
26.	1398	1206	189	3
27.	1011	699	151	162
28.	722	584	22	116
29.	958	770	158	30
30.	1382	770	419	193
31.	1720	839	625	256
32.	3103	1587	1216	300
33.	4786	1576	2058	1152
34.	4653	1469	1978	1205
35.	4825	1749	1941	1136
36.	1088	682	338	67
37.	997	745	228	24
38.	1103	692	345	65
39.	1146	777	327	42
40.	396	333	22	41
41.	928	535	391	3
42.	1206	1087	119	0
Total HHs	**99833**	**52996**	**33923**	**12910**

Source: Census of India, 2011

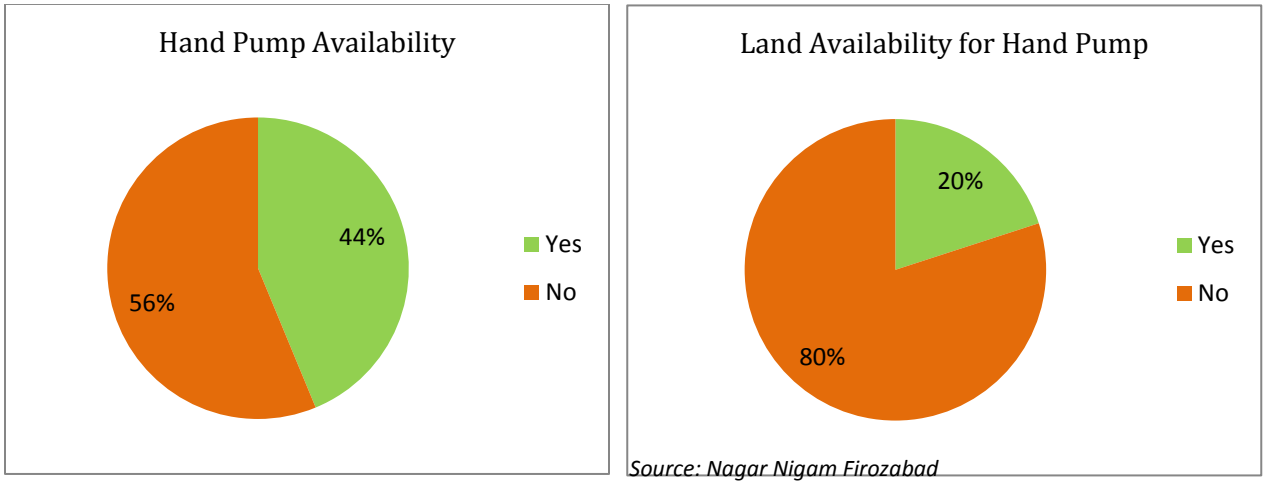
Map 4: Critical Wards of Water Supply



4.1.2 Water Availability in Primary Schools

There are 45 Primary Schools in Firozabad where water facility is not available for the children. In the school premises the land is also not available for the hand pump.

Figure 16: Water Facility in Primary Schools

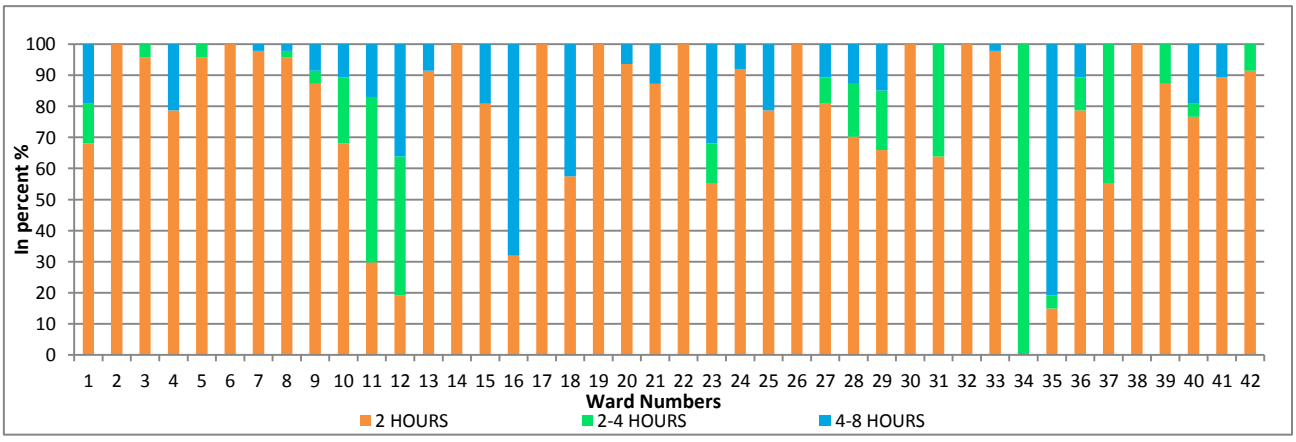


Source: Nagar Nigam Firozabad

4.1.3 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 17: Frequency of Water Supply (Ward Wise)

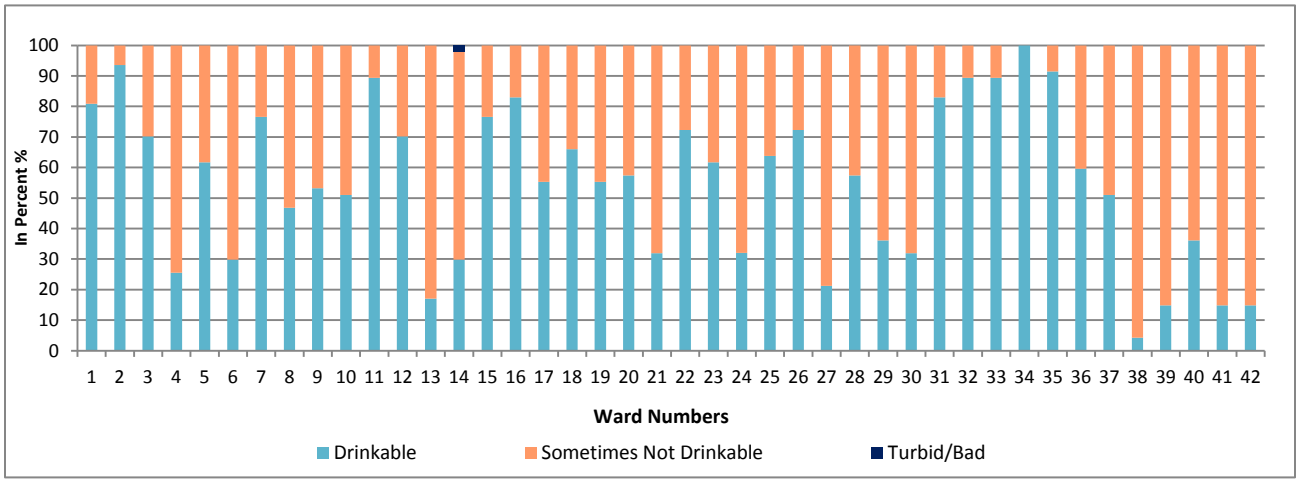


Source: Primary Survey, 2015

4.1.4 Quality of Water

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

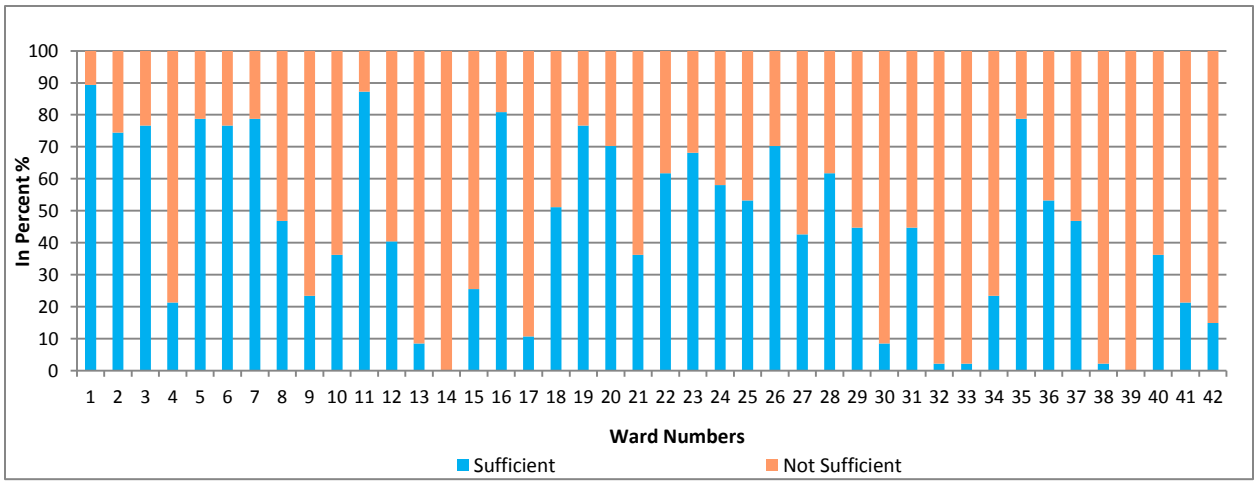
Figure 18: Quality of Water (Ward Wise)



4.1.5 Water Sufficiency

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.

Figure 19: Water Sufficiency (Ward Wise)

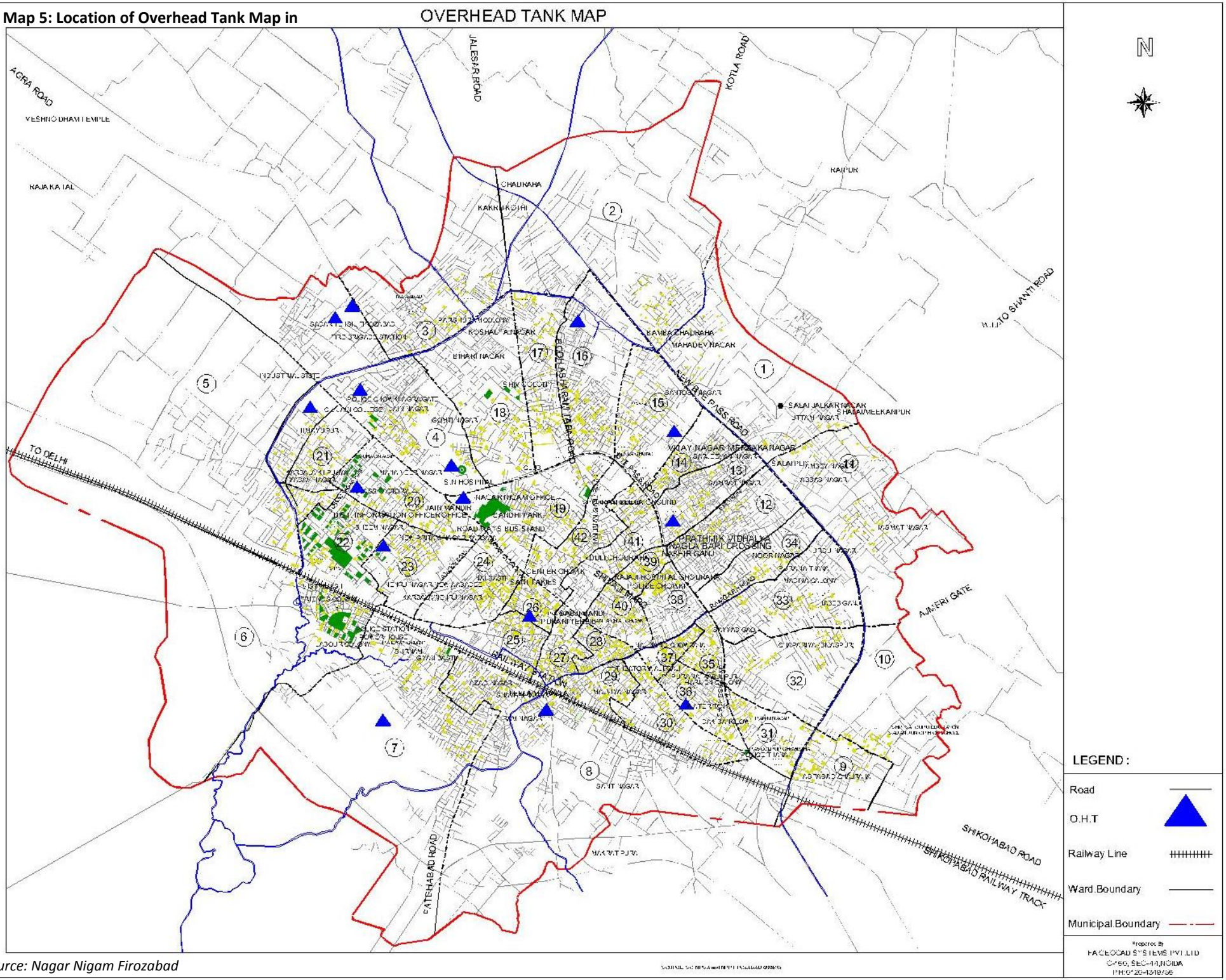


Source: Primary Survey, 2015

4.1.6 Storage

Presently, clear water being collected in Overhead Tank Clear Water Reservoirs (CWR. Over all 14 CWRs and 25 Overhead Tank have been constructed in the city. The total capacity of the Overhead Tank is 20.90MLD and CWRs are 23000 KL.

Map 5: Location of Overhead Tank Map in



Source: Nagar Nigam Firozabad

4.1.7 On Going Projects

There is an on Going project Firozabad Reorganization Water Supply Scheme which is handling the water supply problem in the city.

Presently the major issue in the city is the depletion of ground water. Because of this the quality of water is going down in the city.

Table 14: Proposed Reservoirs under FRWSS

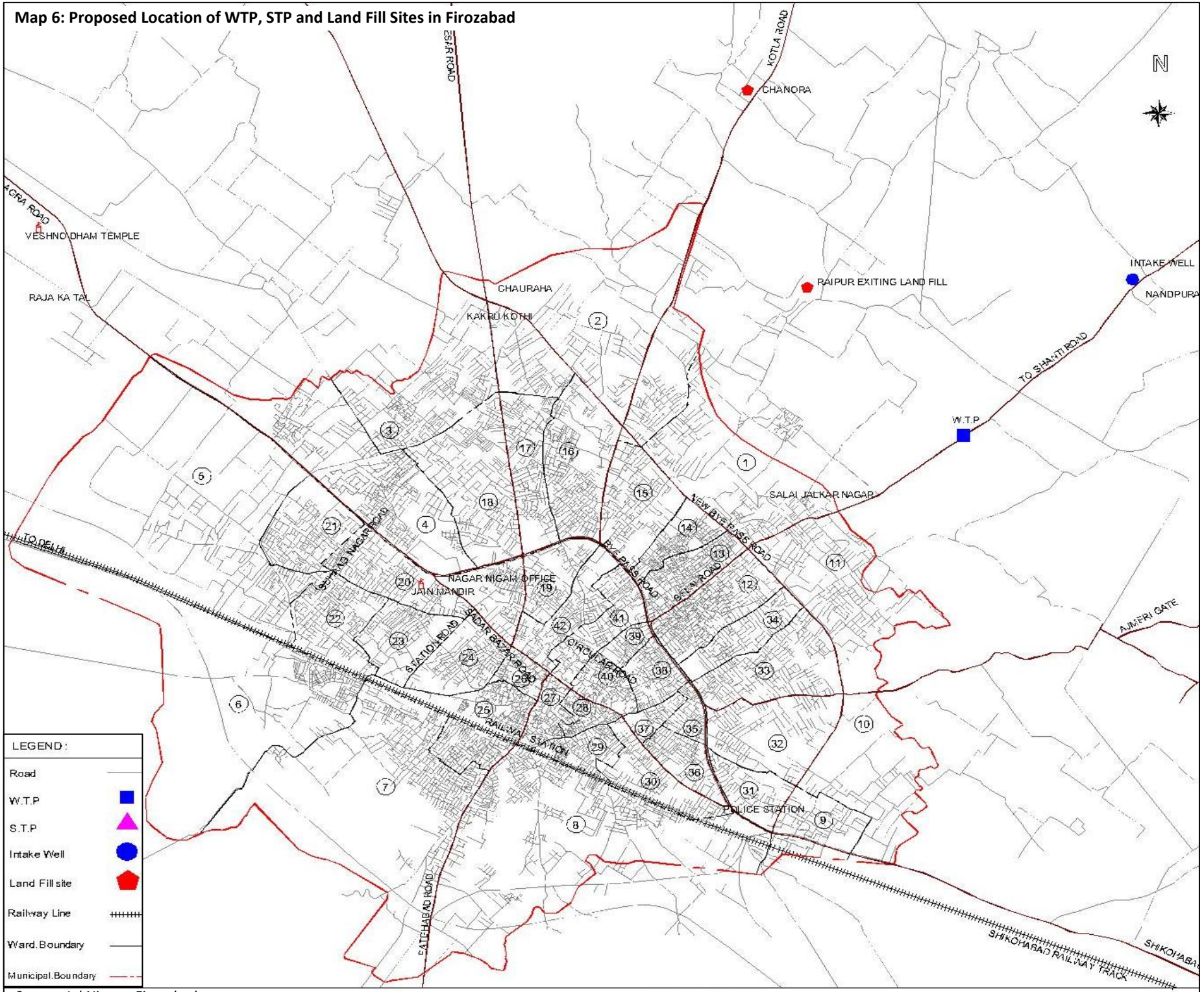
S. No.	Area	Zone	O.H.T		CWR		Tube Well		
			Proposed(kl)	Existing(kl)	Proposed(kl)	Existing(kl)	Proposed(kl)	Existing(kl)	Defunctional
1	Deedamai	15	3400	0	2110	0	0	5	0
2	Ramgarh Thana	15A	3900	0	2310	0	5	0	0
3	Lalpur	16	500	0	390	350	0	1	0
4	Vibahv Nagar	1B	900	1000	1200	250	2	10	5
5	Rihana Kakrau	13	1300	0	820	0	0	3	0
6	(Tapakalan)Mayapuri	13A	600	1100	340	800	0	3	0
7	Sati Ashram	2A	0	1500	0	250	0	4	0
8	Salai	14	700	1200	490	600	0	3	0
9	Nagla Pasi	19	1000	450	850	0	0	3	0
10	Tapa Khurd	19A	1000	450	850	0	0	3	0
11	Labour Colony	10	0	1225	0	600	0	5	2
12	Sant Nagar	11	800	1500	1230	150	0	7	1
13	Datauji (Nagla Vishnu)	17A	0	1100	0	0	0	2	0
14	Parashnath Ramleela Ground	2B	0	1000	340	500	1	11	8
15	Nagla Bari	5	0	1600	780	800	0	10	5
16	Parmeshwar	8	1700	0	1060	0	0	4	0

	Gate								
17	Old Mushifi	9	0	600	290	1000	2	5	0
18	Prempur Raypura	18	700	0	400	0	2	0	0
19	Suhag Nagar	3A	0	1200	860	150	0	7	1
20	Mahavir Nagar	3B	430	1000	0	600	1	7	3
21	Agra Gate	4	0	1650	980	650	2	14	10
22	Himayupur, Nagla Pachiya	12	700	400	700	0	0	5	0
23	Asfabad	17	900	1100	470	750	0	3	0
24	Ambedkar Nagar	6	1200	0	730	0	0	3	0
25	Rasulpur	7	0	1365	0	950	0	9	4
26	Ganesh Nagar	1A	0	350	430	0	0	5	1
27	Dholpur Himayupur	12A	0	1200	560	0	0	5	0
	Total		**19730**	**20990**	**18190**	**8400**	**15**	**137**	**40**

Source: Jal Nigam Firozabad

At present there is no Water Treatment Plant in the city. Under this Project one WTP has been proposed in Salai.

Map 6: Proposed Location of WTP, STP and Land Fill Sites in Firozabad



Source: Jal Nigam, Firozabad

4.1.8 Demand and Gap Analysis

Table 15: Demand and Gap of Water

S. No.	Category	Number
1.	Total Households	99833
2.	Number of Service Connections	40741
3.	Household service connections	38252
4.	Commercial Connections	2627
5.	Households without Water facility within Premises	46921 (47%)
6.	Duration of supply daily	6 hrs on average
7.	Total water Supplied daily	57.4 MLD
8.	Length of Distribution Network	656 km +**54 km (Proposed)**

Source: Nagar Nigam, SLB and Calculated Values

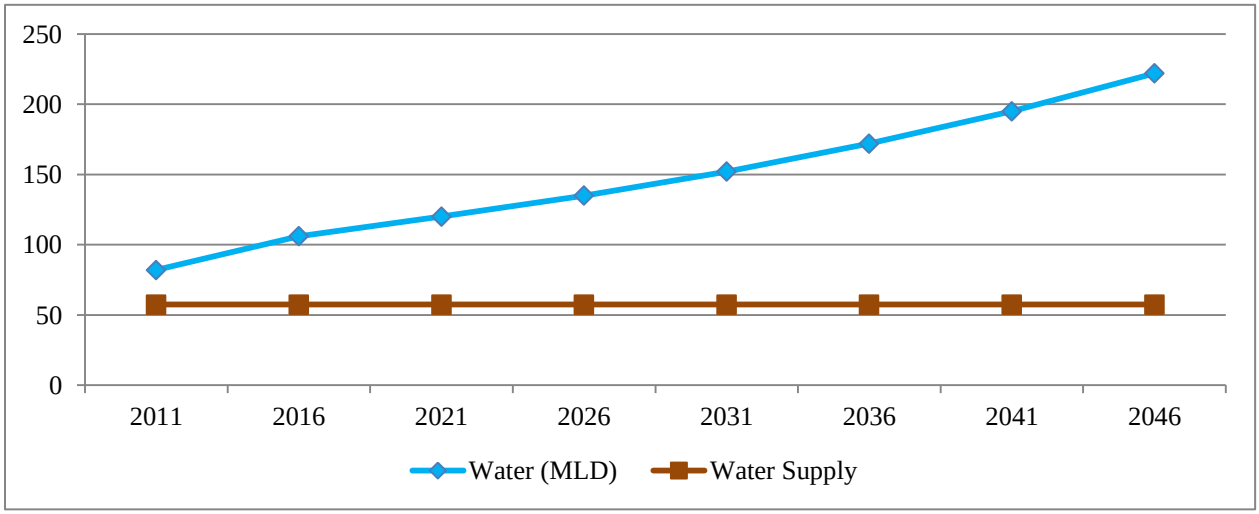
Table 16: Gap after FRWSS

S. No.	Indicator	Gap(2016)	Gap(2046)
1.	Gap in Household Connection	61581 (61%)	233668 (86%)
2.	Water Supply Gap	49 MLD	165 MLD
3.	Water Supply Network	54[1] km	Nil
4.	Reservoir	48.69 MLD	164.69 MLD
5.	WTP	Nil	112 MLD

Source: FRWSS and Status of Water Supply, Wastewater Generation and Treatment in Class-I Cities & Class-II Towns of India

4.2 Current and Projected Water Demand

Figure 20: Projected Water Demand



Source: Calculated Value

[1] Firozabad Reorganization Water Supply Scheme proposed to construct 54 km network by 2017

Table 17: Present & Projected Water Demand

Year	Population	Water Demand (MLD)	Water Supplied (MLD)	Gap in Supply (MLD)
2011	604214	82	57.4	25
2016	**786,907**	**106**	**57.4**	**49**
2021	886,090	120	57.4	63
2026	1,000,993	135	57.4	78
2031	1,128,691	152	57.4	95
2036	1,277,650	172	57.4	115
2041	1,446,883	195	57.4	138
2046	**1,645,730**	**222**	**57.4**	**165**

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 2016 is 786907 *135 KLD.

4.3 Gap Analysis

Water sector is having the major problem in Firozabad 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 18: Gap Analysis

S. No.	Indicator	Gap(2016)	Gap(2046)
1	Total Households	99833	271920
2	Gap in Household Connection	61581 (61%)	233668 (86%)
3	Non Domestic Use	7 MLD	10 MLD
5	Duration of supply daily	18 hrs	18 hrs
6	Water Supply Gap	49 MLD	165 MLD
7	Reservoir	45.69 MLD	164.69 MLD
8	WTP	Nil	112 MLD

Source: Calculated Value

- Gap in water demand is 49 MLD
- Gap in domestic connection is 61581 (62%)
- Gap in water supply network is 54 kms (8%)
- No water treatment plant is there.

- Quality of water is poor.
- Ground water depletion in the center part of the city.

4.4 SWOT, Issues and Priorities

The given table captures the SWOT analysis for Water within Nagar Nigam

Table 19: Access to Toilet SWOT

Strength	Weaknesses
• Good coverage of pipe network (more than 80%) • Connection fees and user charge framework in place.	• High NRW levels; no previous audit data on loss levels. • Likely water shortage • Groundwater exploitation and pollution are key concerns • Low connections (38% of properties) and poor service levels • High O&M costs
Opportunities	**Threats**
• Plans to augment supply by 120 MLD from Firozabad Reorganisation Water Supply Scheme can alleviate water availability concerns. • Potential to expand access to entire TUA by initiating a regional water master plan • Potential to address service delivery gaps through a time-bound performance improvement program	• Inadequate focus on O&M • Poor cost recovery and collection efficiency • Execution capacity and weak local financials could constrain implementation • Ground water exploitation and pollution is a concern

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

- **Service delivery in Water Supply within NN 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 NN and other extended areas within Nagar Nigam.
- **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 can 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 Nigam and there is insufficient involvement of Nagar Nigam 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.

4.5 Conceptual Basis and Best Practices

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.

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.

4.5.1 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.
- Lower per capita water supplied to the population of the city.

4.6 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 20: Goals, SML Term Targets

Parameter	Unit	Norm	SLB	Short Term	Medium Term	Long Term
Coverage	%	100%	39%	✓		
Per Capita Supply	LPCD	135	131		✓	
Non-Revenue Water	%	20%	5%		✓	
Metered connections	%	100%	0%		✓	
Continuity	Hours	24.00	5			✓
Complaints Redress	%	80%	91 %	✓		
Quality of Supply	%	100%	100%	✓		
Cost Recovery	%	100%	59%		✓	
Collection Efficiency	%	90%	11%		✓	

Table 21: 13th Finance Commission: Declaration of Service Level Benchmarks

Indicators	Norm	Current	Target
Coverage of water Supply Connections	100%	39	41
Per capita supply of water	135	131	135
Extent of metering of water Connections	100%	0	0
Extent of Non-Revenue Water	20%	5	20
Continuity of Water Supply	24.00	5	6
Quality of Water Supplied	100%	100	100
Efficiency in redressal of customer complaints	80%	90	80
Cost Recovery in water Supply Service	100%	59	62
Efficiency in collection of water supply related	90%	11	12

4.7 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 (2015-2017), whereas the subsequent years over the plan timeline until the year 2046 predominantly involve incremental procurements for augmentation of the services or replacements.

Table 22: Rate for Proposed Water Supply network

S. No	Item	Unit	Rate(Lakh)
1	Construction cost for water network	1 KM	29.00
2	Construction cost of WTP for	1MLD	8.00
3	Construction of Overhead Tank	1 MLD	82
Total Cost			
1	Construction Cost for water network	54Kms	1566.00
2	Water Treatment Plant	2(220MLD)	1760.00
3	Overhead Tank	48.69 MLD	4017.2
Total Capital Investment			**7343.00**

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. 73.43 Crores

4.8 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 23: Timeline Indication

Phase	Year	Activity
Immediate	2016-2018	• 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	• Construction of new facilities in core city (balance) and peripheral areas. • Groundwater depletion must be stopped in the central part of the city. • 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	• Augment existing infrastructure as per the demand • Water connections to every households with available resources • 100% efficiency of revenue collection.
Long-Term	2035 - 2046	• Augment existing infrastructure as per the demand • Water Treatment Plant for the future population demand.

4.9 Recommendations

The DPR should consider 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 Firozabad.

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 24: Recommendation, Water Supply

Actions	Recommended Body
Strengthen Baseline information on water and sanitation indices	NN
• 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/NN
• 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./NN
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./NN
Constitute a Water and Sanitation Committee to implement water tariff policy which could be formed from among the CTF members.	State Gov./NN

Initiate measures to increase penetration of piped connections; implement measures to improve and sustain collection efficiency.	NN
Implement differentiated area based tariffs among residential connections; progressively shift to volumetric tariffs for all connections.	NN

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

5 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.

5.1 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.

The vision of the NUSP is to make Indian cities open defecation free, which will be possible only when all the residents of the cities will have universal access to toilet facility. Thus access to toilet facility is one of the main components of the rating which was given to the Indian cities under National Rating and Award Scheme for Sanitation for Indian Cities.

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 Nigam Firozabad has performed very poorly in this section.

5.2 Present condition

According to Census 2011, the total population of Firozabad is 604214 and the number of households is 99833. Among these households, only 85 % have toilet facility within the premises and rest of the 15% of the population either going for open defecation or using public toilets like Sulabh complex.

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 need.

Table 25: Gap of Toilet Facility

S. No.	Description	No.	%
1	Total number of Households	99833	
2	Number of households having latrine facility within the premises	84858	85
	Gap	**14975**	**15**

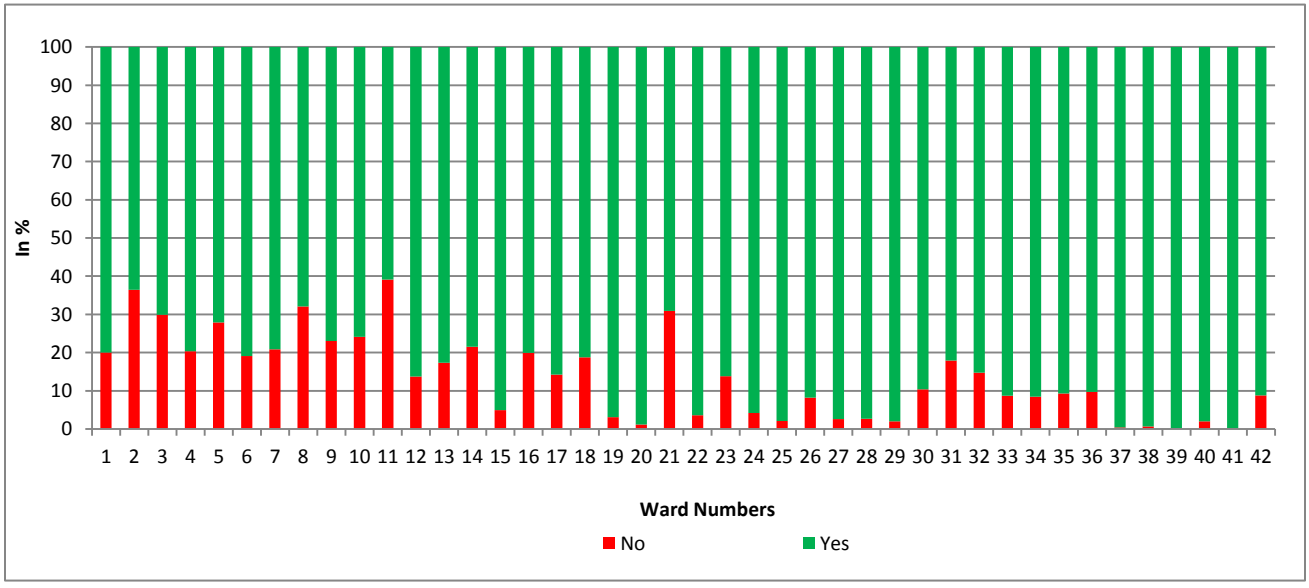
Source: Census 2011

Here under Swachh Bharat Mission (SBM) Nagar Nigam Firozabad 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.

5.2.1 Availability of Toilet Facility at household level (Ward Wise)

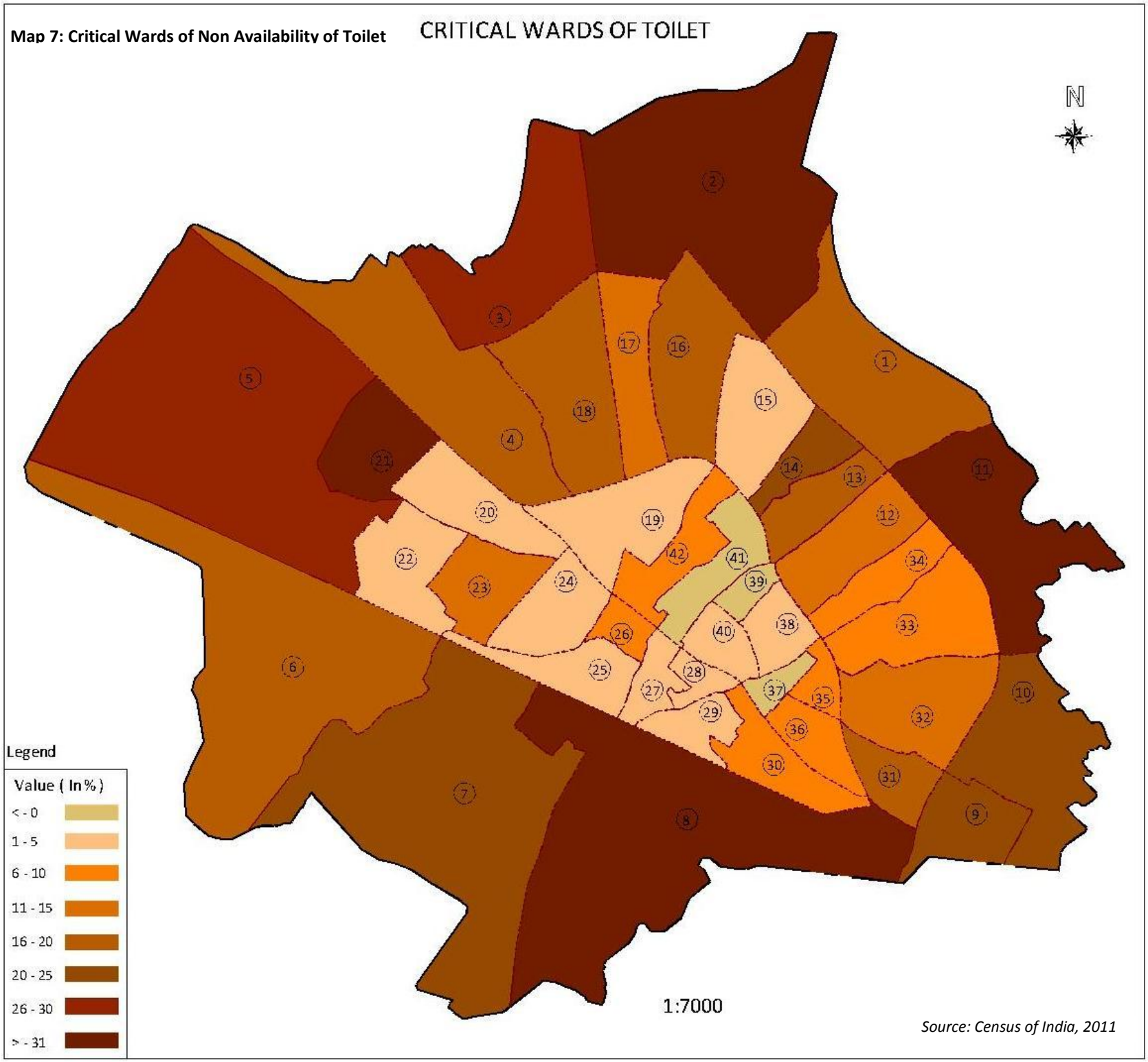
As the figure below depicts about the availability of toilet facility at household level, the condition is worst in the 1, 2,8,11, 21, and others.

Figure 21: Availability of Toilet Facility at household level (Ward Wise)



Source: Primary Survey, 2015

Map 7: Critical Wards of Non Availability of Toilet



Source: Census of India, 2011

Table 26: Ward wise toilets facility in Firozabad

Ward No.	Households	Number of households not having latrine facility within the premises	Number of households not having latrine facility within the premises (in %)	Number of households having latrine facility within the premises	Number of households having latrine facility within the premises (in %)
1.	3181	637	20	2545	80
2.	4411	1606	36	2805	64
3.	4760	1422	30	3338	70
4.	3132	638	20	2494	80
5.	4026	1123	28	2903	72
6.	2292	437	19	1855	81
7.	1816	379	21	1437	79
8.	2720	873	32	1847	68
9.	2678	616	23	2062	77
10.	2751	664	24	2087	76
11.	3777	1478	39	2299	61
12.	4573	630	14	3943	86
13.	1339	232	17	1107	83
14.	2688	579	22	2110	78
15.	1862	92	5	1770	95
16.	3278	652	20	2626	80
17.	4887	698	14	4190	86
18.	3934	738	19	3196	81
19.	1265	39	3	1226	97
20.	922	11	1	911	99
21.	3293	1019	31	2274	69
22.	1500	54	4	1446	96
23.	1104	152	14	952	86
24.	1046	44	4	1002	96
25.	1176	25	2	1151	98
26.	1398	115	8	1283	92
27.	1011	26	3	985	97
28.	722	19	3	703	97
29.	958	19	2	939	98
30.	1382	144	10	1238	90
31.	1720	309	18	1411	82
32.	3103	458	15	2645	85
33.	4786	416	9	4370	91
34.	4653	393	8	4260	92

Ward No.	Households	Number of households not having latrine facility within the premises	Number of households not having latrine facility within the premises (in %)	Number of households having latrine facility within the premises	Number of households having latrine facility within the premises (in %)
35.	4825	448	9	4377	91
36.	1088	106	10	982	90
37.	997	4	0	993	100
38.	1103	8	1	1095	99
39.	1146	1	0	1145	100
40.	396	8	2	388	98
41.	928	1	0	927	100
42.	1206	106	9	1100	91

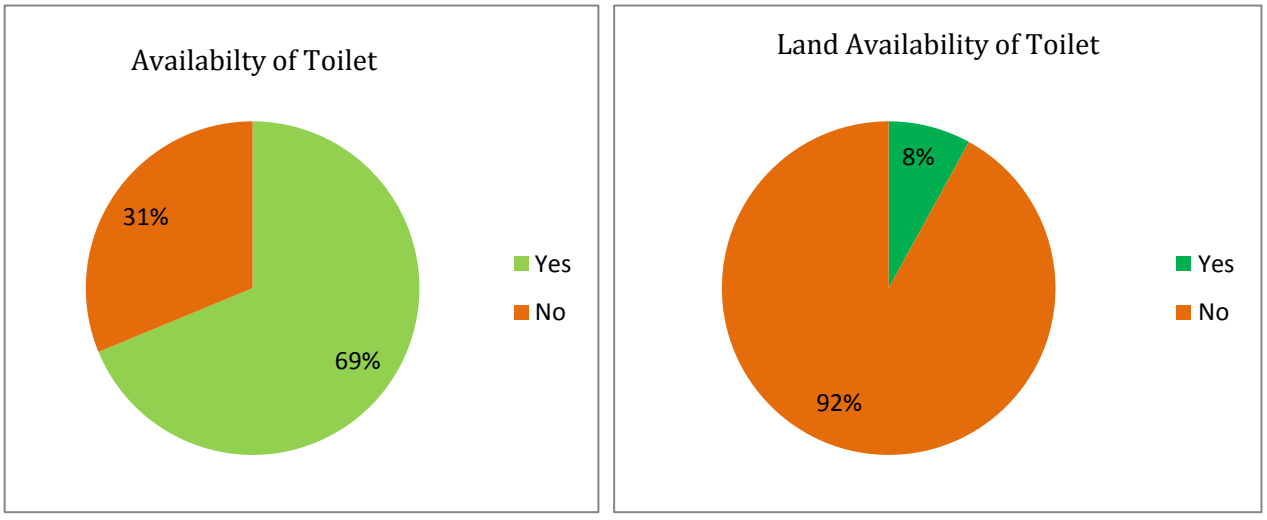
Source: Census, 2011

5.2.1.1 Toilet Facilities in School

Below is the table showing the number of schools in which toilet facilities are not available neither they are having the land to build the toilet within the premises.

In the Primary Schools of Firozabad 25 Schools do not have Toilet Facility out of 88 schools. In these schools 23 schools do not have land for the toilet facility within the premises

Figure 22: Toilet facility and Land Availability in Schools (for Toilet)

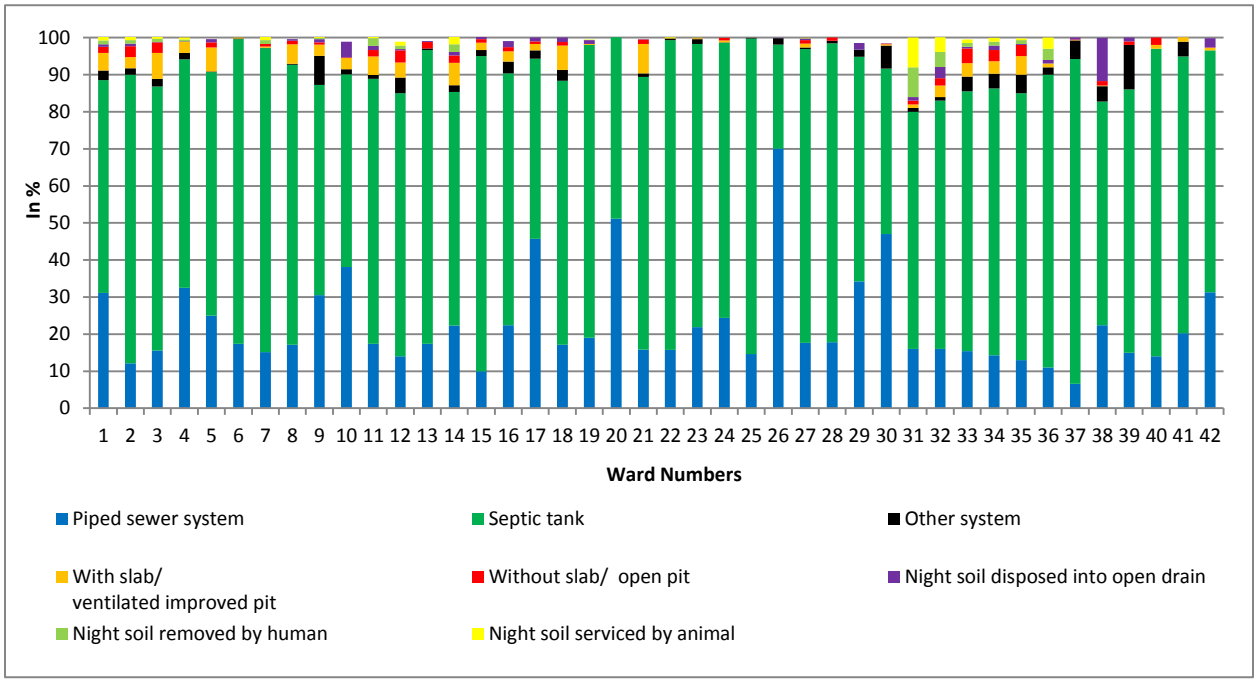


Source: Nagar Nigam Firozabad

5.2.2 Type of Toilet Facility (Ward Wise)

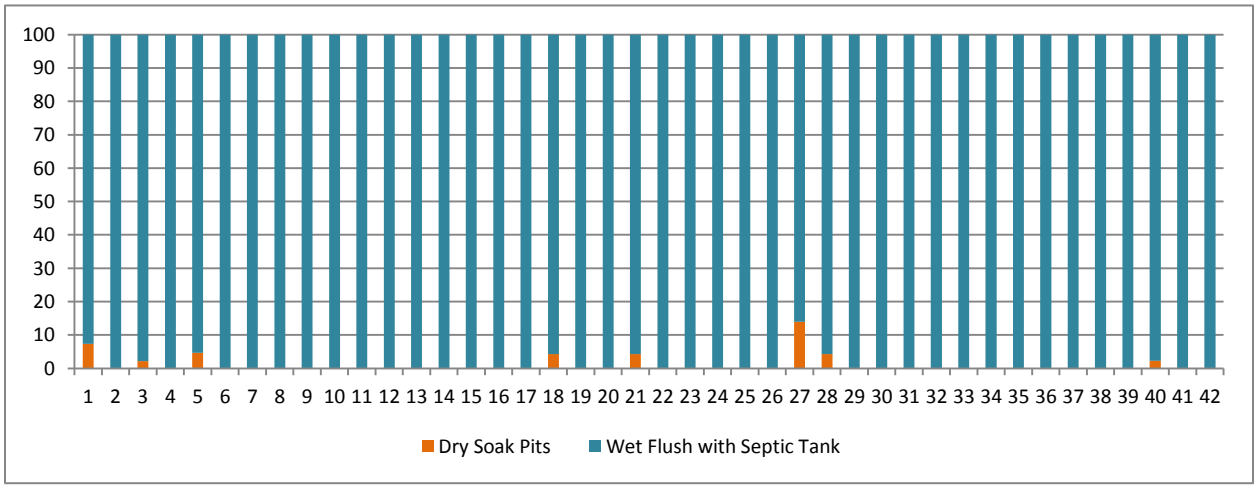
As can be witnessed through graph below, most of the respondent reported access to individual toilets. Non availability of toilet was reported in 23,27,29,30,31,33,40 and 41 wards. On the other hand all these people those doesn't have toilet facility at household level, shares neighbor's toilet or goes to outside for Open Defecation.

Figure 23: Type of Toilet facility (Ward



Source: Census of India, 2011

Figure 24: Type of Toilet Facility (Ward Wise)

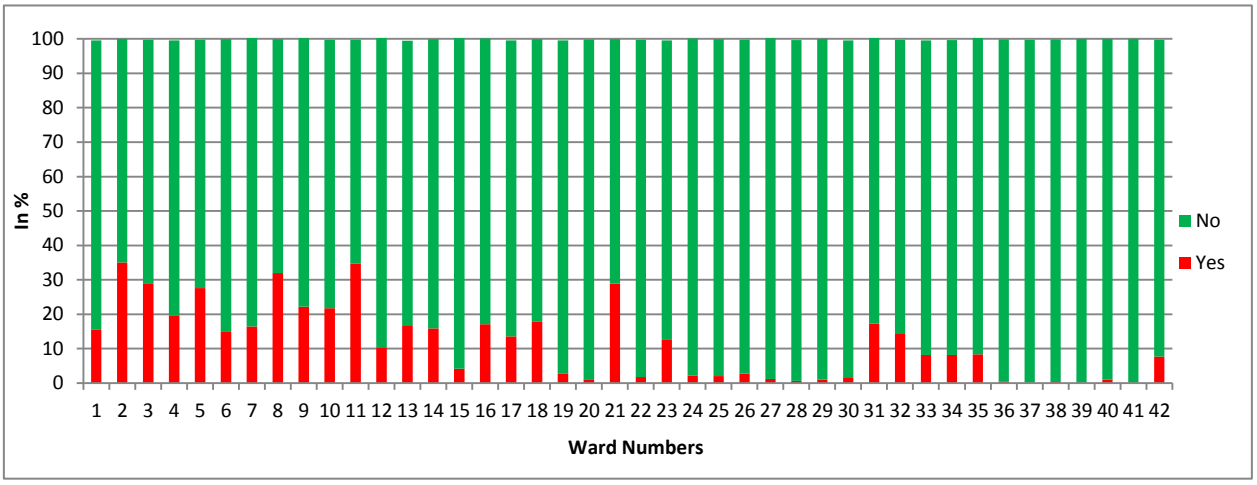


Source: Primary Survey, 2015

5.2.3 Open Defecation (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 25: Open Defecation (Ward Wise)

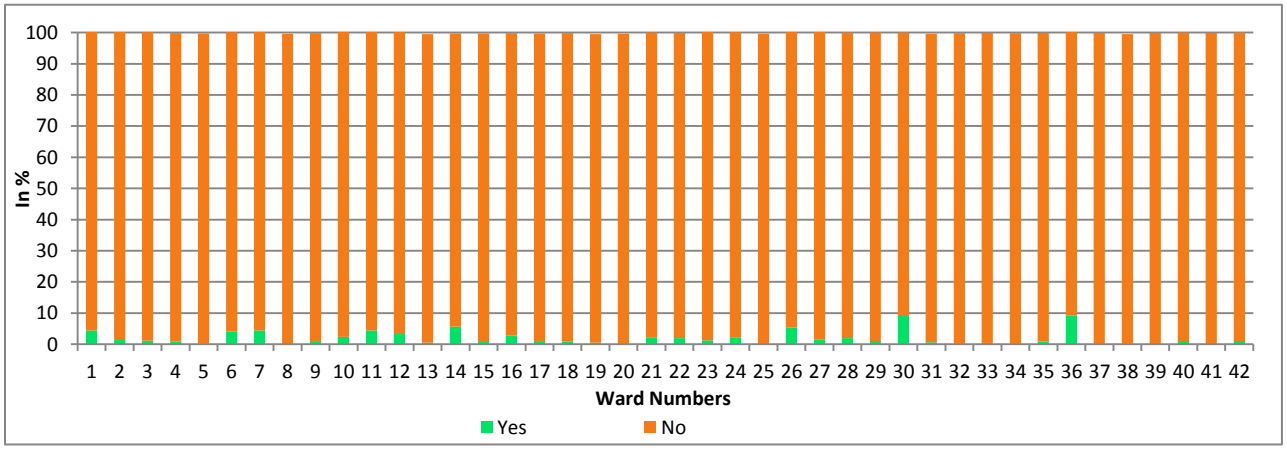


Source: Primary Survey, 2015

5.2.4 Presence of Community Toilet in Locality (Ward Wise)

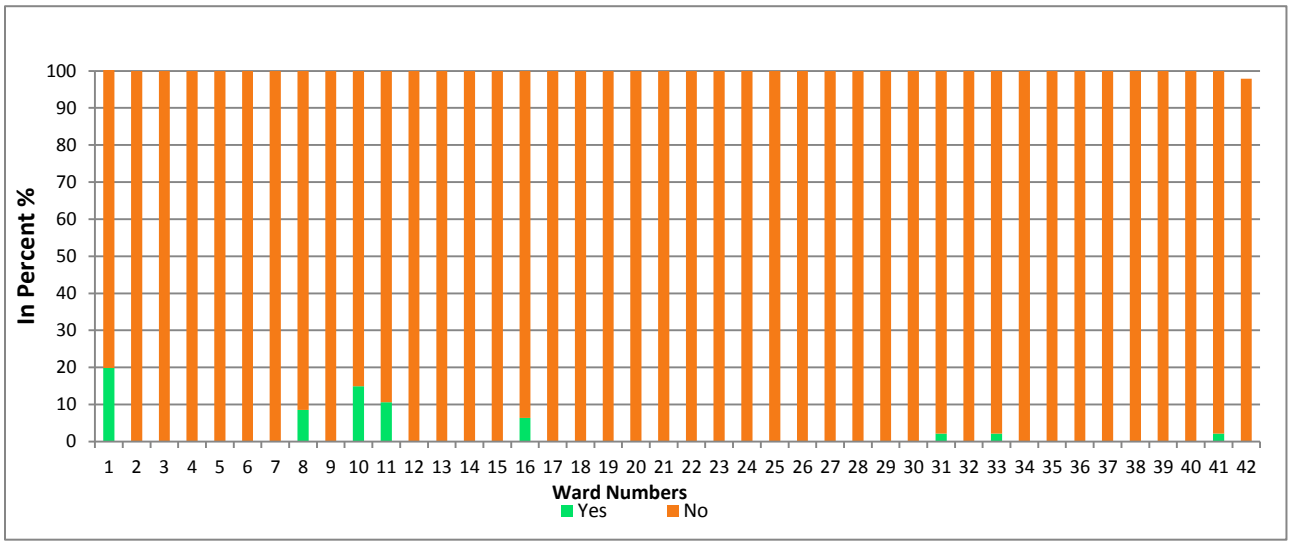
People are using Public Toilets as an alternative source. The inner city wards are having the Public Toilet Facility but the outer areas are devoid of the Community Toilets. The Community Toilets has been proposed not in the outer areas but in the inner city area only which needs to be taken into consideration.

Figure 26: Use of Community Toilet (Ward Wise)



Source: Census of India, 2011

Figure 27: Community Toilets in Locality (Ward Wise)



Source: Primary Survey, 2015

As evident from the figure most of the respondents reported absence of community toilet facility in their concerned residential area. It is well known that Community toilets are critical for reaching the goal of open defecation free city.

Public Toilets

There are total 16 sulabh complexes within corporation area of Firozabad. There are 2 mobile toilets but only one is in working condition.

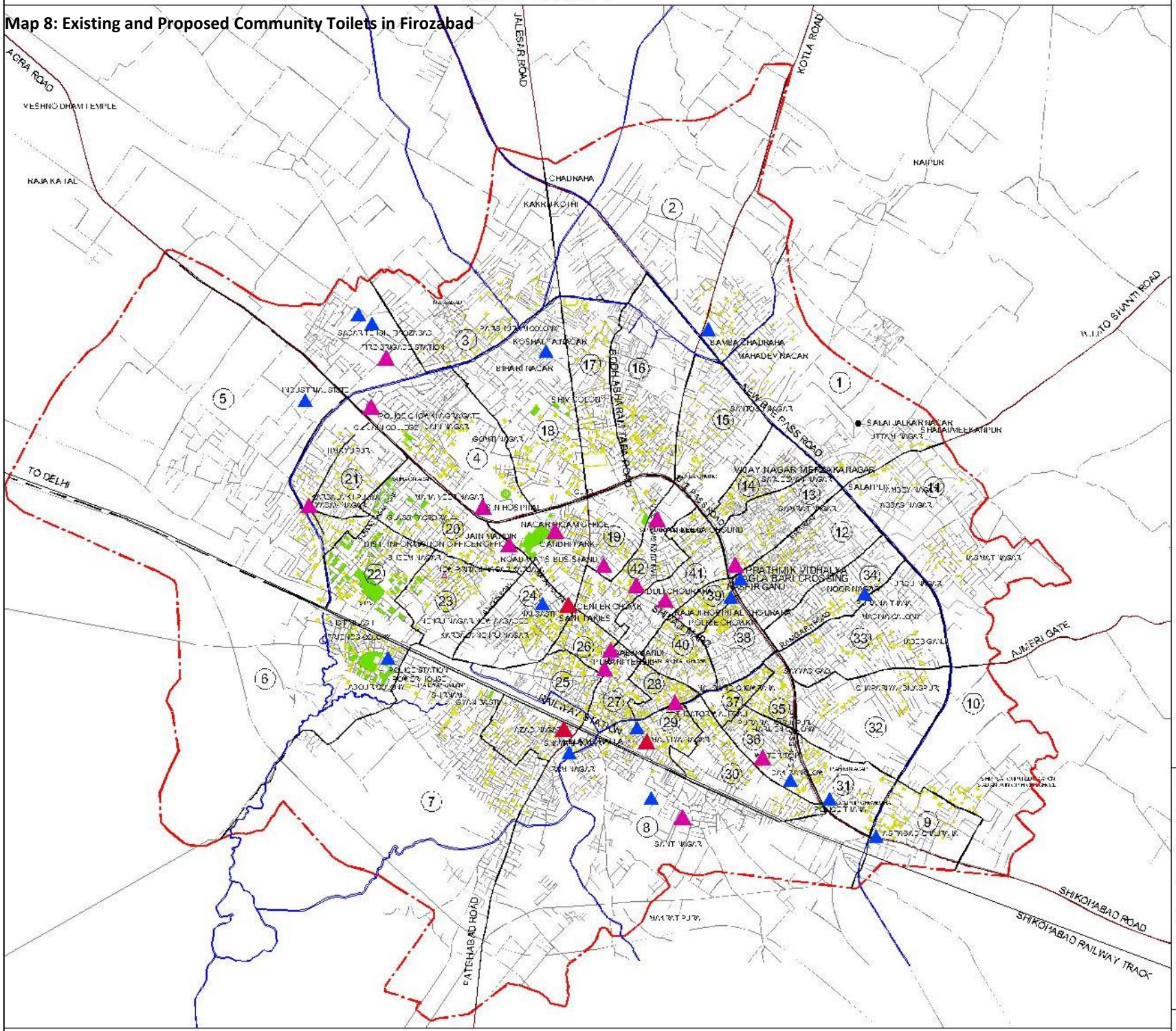
Community Toilets

There are 5 community toilets in the Firozabad which is normally built for a group of households in backward area.

There are 15 and 5 Proposed Community Toilets of 10 seats by Development Authority and Nagar Nigam respectively in different parts of the city.

TOILET FACILITY

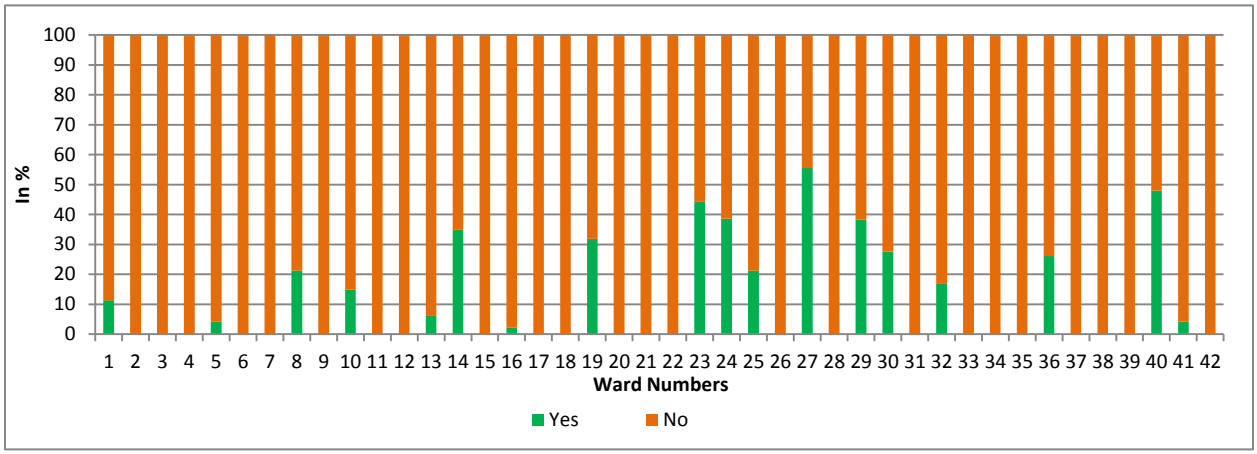
Map 8: Existing and Proposed Community Toilets in Firozabad



5.2.5 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 Physically Handicapped toilet. This facility should provide for physically handicapped people for the sustainable and holistic development of city.

Figure 28: Willingness to Pay for Physical Handicapped Toilet (Ward Wise)



Source: Primary Survey, 2015

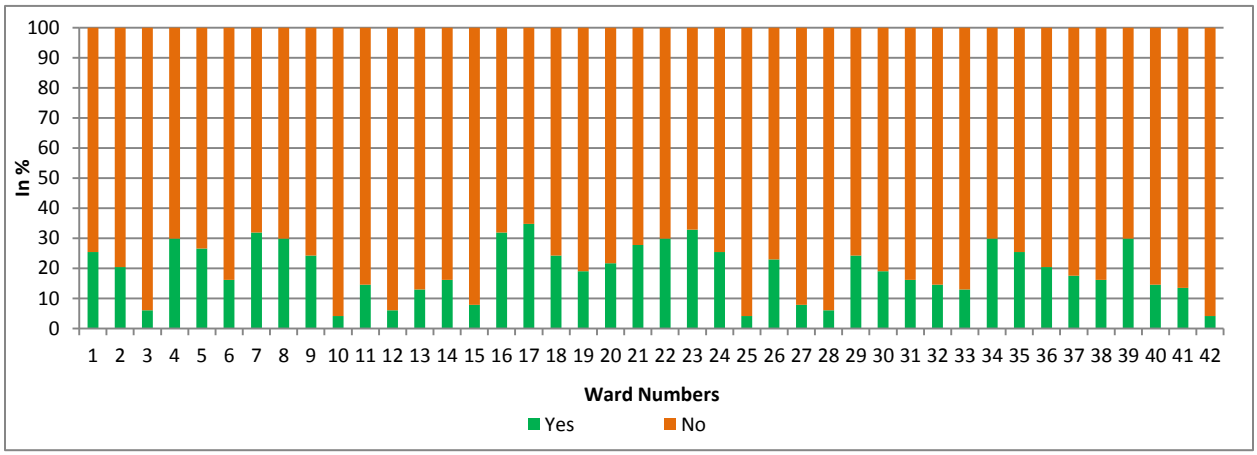
5.2.6 Willingness to pay for Physically Handicapped Toilet

In all the wards few people wants to contribute for the Physical Handicapped Toilet.

5.2.7 Willingness to Contribute to O& M for Toilet (Ward Wise)

In the residential areas of Firozabad 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 Firozabad.

Figure 29: Willingness to Contribute to O& M for Toilet (Ward



Source: Primary Survey, 2015

5.3 SWOT, Issues and Priorities

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

Table 27: Access to Toilet SWOT

Strength	Weaknesses
• Good Coverage for Toilets Access even if temporary • General awareness on sanitation hygiene is good. • People themselves want change in the city.	• 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**
• Open defecation is limited to selected low-income pockets • People desire individual in house toilets • Limited identifiable areas with no toilet	• 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 Nigam 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 Nigam accountable for it.

5.4 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 Firozabad 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. Firozabad is doing a good work on awareness programs. About 10000 forms has been filled to sanction money to the beneficiaries under this scheme.

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

- Communal 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.
- Communal or public toilets are only acceptable if they provide effective service for women and children.
- Communal 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.

5.5 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.

5.6 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 28: Access to Toilet Supply, SML Term Targets

Parameter	Unit	Norm	Baseline/ward number
Open Defecation			
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%
Access to Public Toilets	**F**loating Population/Public	-	5%
Access to Community Toilets	Slum Dwellers/Community		0

In case like Firozabad 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.

5.7 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 29: Gap Analysis

S. No.	Description	No.
1	Number of households not having latrine facility within the premises	14975
2	Community Toilets (1 for each Slum Pocket)	100
3	Public Toilet (For Floating Population)	27
4	Numbers of Primary Schools not having toilet facility	25

- At present there are 99833 households exists in which 14975 households does not have toilets in their premises.
- Firstly up gradation of existing toilets is a priority and then addition of more 27, 10 seater for Public Toilets is must.
- Community toilets maximum 100 sulabh complex (10seater) 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.

5.8 Financial Options

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

Table 30: Unit Costs for Construction of Toilet (Households, Community and Public Complex)

Component	Total units	Cost for one unit	Rate (INR in Lakh)*
Household Toilets	14975	8000	1198.00
Community Toilets Complex	100 (10 seats with bathing unit)	65,000	0065.00
Public Toilets complex	27 (10 seats)	75,000	0020.00
Total capital investment			**1283.25**

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

Construction costs for public toilets and community toilets in Firozabad 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. 20,000 (household) for construction of one toilet seat. The construction expenditures for one community complex translate 65,000 and 75,000 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 Firozabad has to mobilise funds in the range of Rs. 12.83 Crores approximately for achieving 100% sanitation access for the communities in Firozabad City.

5.9 Cost Recovery Options

The challenge for Firozabad 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.

5.10 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 31: Timeline Indication

Phase	Year	Activity
Immediate	2016-2019	• 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	• Construction of new facilities in core city (balance) and peripheral areas • Promotion of individual household toilets through subsidies/incentives
Mid-Term	2026 - 2034	• 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	• Augment existing infrastructure as per the demand • Endure provision of 1/35 seat/user ratio for residential areas.

5.11 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 32: Recommendation, Access to Toilets

Actions	Recommended body
Prepare and Implement a city wide Public and Community Toilet Development/Rehabilitation Plan	NN
• identify locations, configuration and sizing of Public and Community Toilets	
• Replace dilapidated open urinals with enclosed toilets where feasible and required	
• Provide Community Toilets, starting with identified locations with high OD prevalence	
• Provide Public Toilets starting with identified areas having high floating population	
Implement a comprehensive inspection/monitoring protocol for Toilet monitoring and upkeep	NN/UPSIDC
• Render existing toilets usable through designated accountability among sanitation officials	
• Engage local stakeholders in maintenance, monitoring and oversight of shared toilets	
• Periodic Third Party Audit of facilities and reviews	
Strengthen basis and capacity through formulation of bye-laws and guidelines	State Gov.
• 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	NN/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 use	
Initiate actions to improving financial sustainability	NN/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 behaviour change

c) Fix accountability, Enforce Standards, and Strengthen Monitoring

d) Assess financing needs and address them innovatively to ensure Sustainable operations.

6 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.

6.1 Present Condition

Old Sewer line is only in Suhaag Nagar, New line has been constructed but not in the operational. Jal Nigam of FZD takes the work to sewer line in 2008. The 80% sewer line work has been completed. Old sewer pump station at Suhaag Nagar and Malviya Nagar are out of work. According to public view of sewer line that it is inappropriate proportional to population. Six inch pipe is used in lying sewer line but minimum city need two foot pipe for sewer line.

6.1.1 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 604214 populations is 65 MLD in Firozabad city. As the people in Firozabad are using their own summer sevel for the water consumption, the waste water is more than the water supplied by municipal. The total water supplied is 57.4 MLD. At presents only 21 % (147 kms) area covered by the sewer network.

Table 33: Sewerage Infrastructure within the City

Indicator	Description
Population	604214
Total water supply	57.4 MLD
Waste generate	65 MLD
Sewerage Network	21%(147 km)
STP	67 MLD**(Proposed)**

Source: Nagar Nigam Firozabad

As of now there is no waste water treatment facility. Indiscriminate disposal of waste water through storm water drain is detrimental to environment, groundwater contamination and public health.

6.1.2 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.

6.1.3 Treatment and Disposal

Off Site

The laid sewerage system in not being accessed by people therefore there is no offsite treatment of water is happening.

On Site

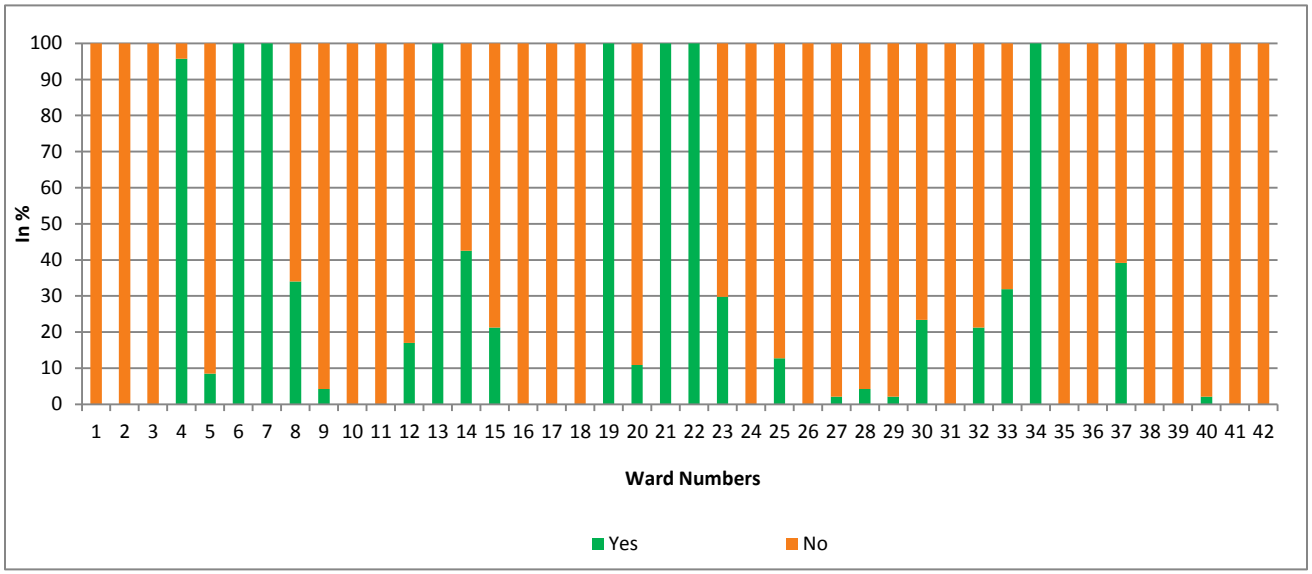
There are many households in Firozabad which discharge their black water (from toilets) into septic tanks and soak pits. The grey water from kitchens and bathrooms is discharged into open drains without treatment. At present the extent of households relying on the septic tank or coverage of septic tanks in household & slums for wastewater disposal is not know.

6.1.4 From Primary Survey

- 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.

In the residential areas of Firozabad city most of the ward are devoid of the sewerage line. Only few wards are having sewerage line and that is not operational ward 4, 5, 6, 7, 8, 13,14,19,21,22,23,25,27,28,29,30,32,34,37 and 40.

Figure 30: Sewerage Line (Ward Wise)

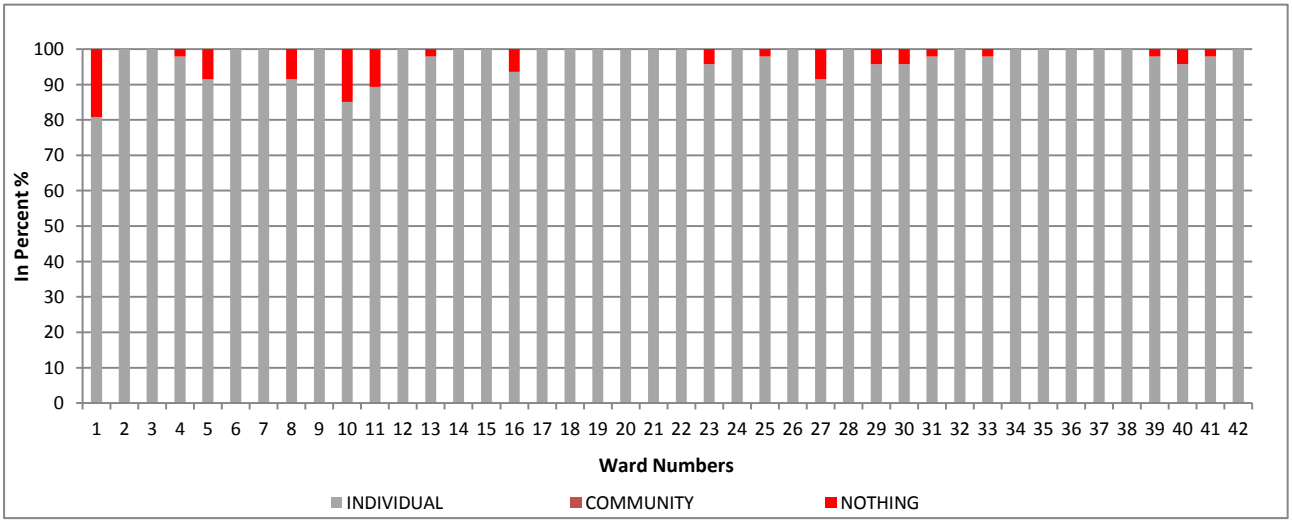


Source: Primary Survey, 2015

New Sewerage Line has been constructed in Arya Nagar, Azad Nagar, Railway Colony, Suhaag Nagar, Labour Colony, Karbala, Bhim Nagar, Vibhav Nagar, Vijay Nagar, Nagla Bari, Jatav Puri, Rasoolpur, Akashwani Road, Deedamai, Nai Basti, Hanuman Ganj, Nagla Mirza etc.

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

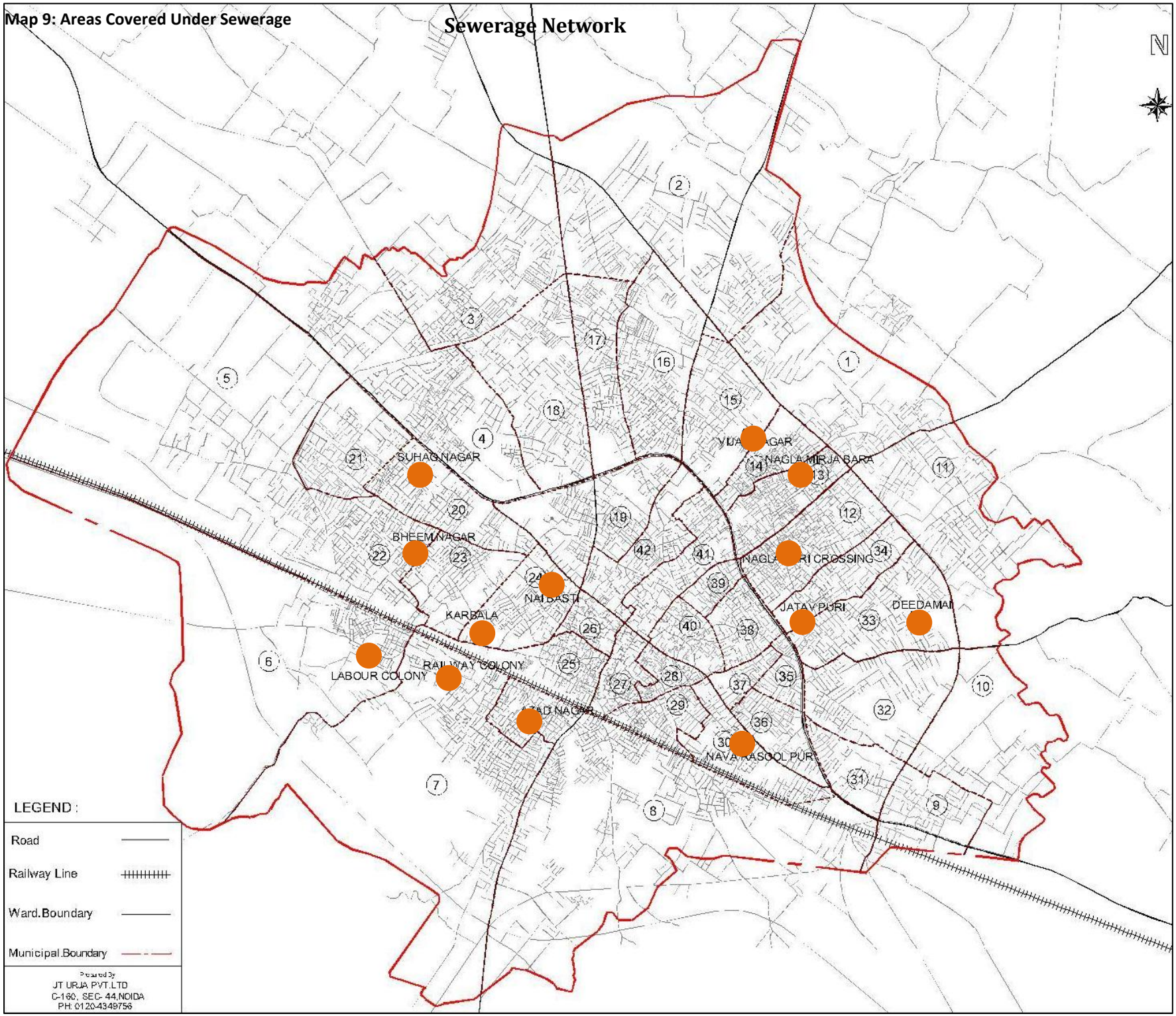
Figure 31: Type of Septic Tank (Ward Wise)



Source: Primary Survey, 2015

Map 9: Areas Covered Under Sewerage

Sewerage Network



6.2 SWOT Issues and Priorities

Table 34: Waste Water Management SWOT

Strength	Weaknesses
• Prevalent use of septic tanks	• In spite of coverage people not accessing sewer connections • 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**
By some initiatives, campaign and awareness program Nagar Nigam can gain confidence of people and convince them to access laid network. • There is potential to improve connections / cost recovery in offsite sanitation. • Potential for introducing bye-laws and regulation for onsite sanitation and septage management.(frequency of de sludging)for onsite sanitation	• 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. • Absence of Treatment Quality Monitoring in case of people resisting connections.

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

- Limitations of existing sewerage system due to lack of access by people.
- Flows of grey water and in some cases black water into water bodies going unchecked.

6.3 Current and Projected Sewage

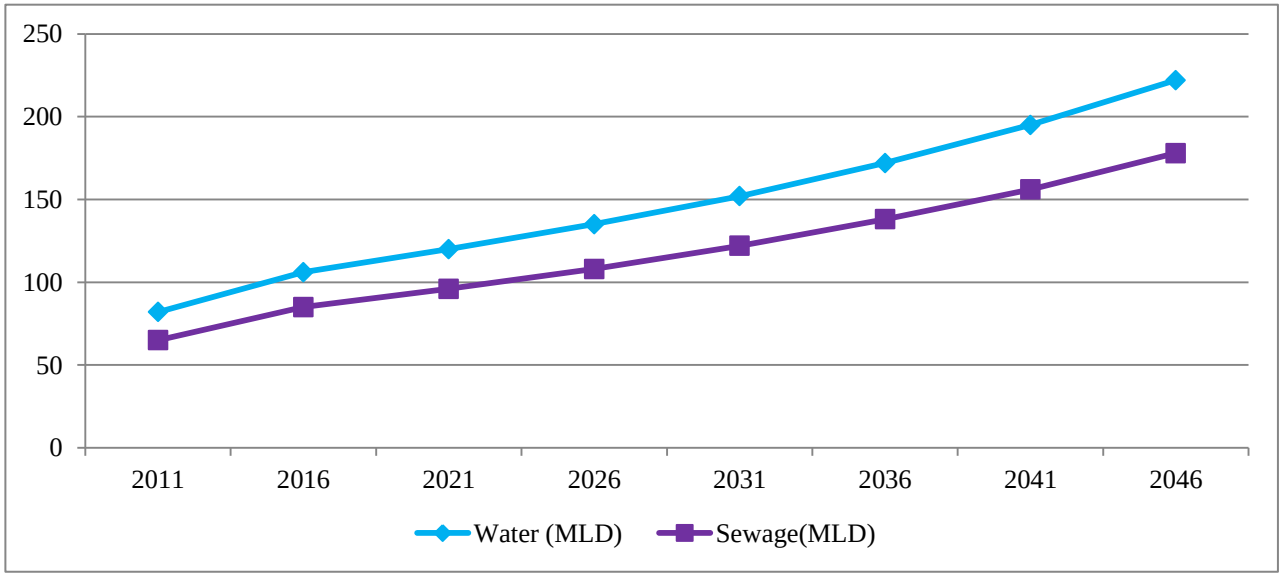
Table 35: Present and Projected Water and Waste Water in MLD

Year	Population	Water Demand (MLD)	Sewage(MLD)
2011	604214	82	67(present)
2016	**786,907**	**106**	**85**
2021	886,090	120	96
2026	1,000,993	135	108
2031	1,128,691	152	122
2036	1,277,650	172	138
2041	1,446,883	195	156
2046	**1,645,730**	**222**	**178**

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 32: Water and Waste Water Projections



Source: Calculated Value

6.4 Gap Analysis

- At presents only 21 % (147 kms) area covered by the sewer network remaining 563 kms (79 %) required.

- The households are not having connection to the sewerage network. Only the old city is having connection to the sewerage network. Sewer connections for each household (99833) are required.
- Sewerage Treatment Plant also required.

Table 36: Gap of Sewerage

Indicators	Existing	Existing (in %)	Present Gap(2011)	Present Gap (in %)
Sewerage Line	147 km	21	**563 km**	**79**
STP	0	0	**67 MLD**	**100**

Source: SLB and Census of India, 2011

Under the JNNURM (UIDSSMT) there is a proposal of 1 STP (67 MLD) in Sufi Sahab Mazaar to overcome with the gap.

6.4.1 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.

6.4.1.1 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.

In the area covered with a sewerage network, efforts should be made to connect all households to the sewerage network. Even in this alternative, there is a possibility that a few households will still be served by on-site sanitation systems – mainly pit latrines. And Public sanitary conveniences will be directly connected to the nearest sewer line of the network.

6.4.1.2 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

6.4.2 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 37: 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 38: 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)

6.5 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 39: Rate for Proposed Sewerage Network

S. No	Item	Unit	Rate(Lakh)
1	Construction cost for Sewerage Network	1 KM	30
2	Construction cost of STP	1MLD	15.00
Total Cost			
1	Length of Sewage Network NP2 R.C.C 300mm Dia. Pipe	563 kms	16890
2	Cost of Sewage Treatment plant	23.4 MLD	35.1
Total cost			**1723.50**

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

The approximate cost for implementation of this recommendation is Rs. 17.24 Crores

6.6 Cost Recovery Options

The challenge for Firozabad 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.

6.7 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 40: Phase wise Implementation Plan

Phase	Year	Activity
Immediate	2016-2018	**Collection** Firozabad 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. Provision of household sewer connection in all wards **Conveyance** Rehabilitation of missing links and worn out network in existing sewerage system
Short-Term	2019 - 2024	**Collection** Provision of household sewer connection in un-served areas in all sewerage zones for remaining households **Treatment** Provision for STP **O&M and M&E** Establish O&M and M&E systems
Mid-Term	2025 - 2034	**Conveyance** Provision of sewerage network Extension of sewerage network Replacements of components **Treatment** Provision of new STPs for uncovered areas Augmentation of STP capacity **O&M and M&E** Regular O&M and M&E of entire sewerage system
Long-Term	2035 - 2046	**Conveyance** Provision of sewerage network in newly extended areas **Treatment** Augmentation of STP capacity

	Replacements of components **O&M and M&E** Regular O&M and M&E of entire sewerage system

6.8 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 41: Recommendations, Waste Water Management

Actions	Recommended body
Initiate a connection drive to increase penetration of sewerage connections covering black and grey water flows;	NN
Waste-water recycling should be priority; explore further opportunities to meet SLB norms in the medium to long term	NN /Jal Kal
Action plan for using treated sewage for horticulture, irrigation, industrial & other non-potable use in order to conserve fresh water.	NN / 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	NN /State Gov.
Establish a waste-water quality monitoring protocol in coordination with CPCB	NN
Regulate tariffs for desludging / cleaning	NN

7 SOLID WASTE MANAGEMENT

Solid waste Management is an obligatory function of Firozabad Nagar Nigam. 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**..

7.1 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 158 MT of solid waste is generated every day in the city. There have one vehicle depot (workshop) the waste transportation vehicles are operated, supervised and maintained at this workshop. The workshop is supervised by workshop in charge. At present this responsibility is given to Junior Engineer. Most maintenance and repair work is done here. Major Maintenance and repairs are outsourced on contract basis.

7.1.1 Waste Generation

Solid Waste Management is a critical issue in Firozabad city due to spread of area under its jurisdiction. Based on the population of the city, it is estimated that the City generates approximately 315 MT of solid waste and waste generated per day is 250gm/capita/day. Nagar Nigam is capable to clears only 40-50% of the waste through vehicles available with Nagar Nigam and staff engaged for the purpose.

Table 42: Daily Waste Generation within the City

S. No.	Source	Waste Collection (MT)	Percentage
1	Domestic	304.32	96.60
2	Shops/Commercial	2.98	0.95
3	Hospital waste	2.92	0.92
4	Industrial[2]	4.78	1.52
Total		**315(in 2 days)**	**100**

[2] Brief Industrial Profile Of District Firozabad

* collection and disposal activity is executed in 2 days

7.1.2 Domestic waste

Firozabad 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 Firozabad will generate 300 gms of solid waste per head per day. Thus this domestic sector will generate 315 Metric Tonne solid waste with the current population of 604214. 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.

7.1.3 Commercial Waste

The commercial waste includes the waste from hotels and eating establishments, shops, trading units, small street traders, etc. The daily waste generated is about 2.98 MT, which is 1.85 percent of the total waste generated in the town. It mainly comprises of paper, plastics and other in-organics, which are finding their way to the disposal yard along with the domestic waste.

7.1.4 Industrial Waste

4.74 MT of industrial waste is generated in the city per day. The industries (small and medium) mainly deal with glass and bangles making. The waste from industries is collected every alternate day

7.1.5 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 2.92 MT of bio-medical waste is generated in the city. An organization M/s Dutt Enterprises Ltd is responsible for collection, transportation and disposal of bio-medical waste. At present 2 Hospitals approximately 20 nursing home and 150 private clinics 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.

7.2 Collection & Transportation

7.2.1 Primary Collection System

Door to door collection service does not exist in the whole city. Machinery and equipment available with the Nagar Nigam 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 exiting temporary collection centers.

Primary Storage - In Firozabad 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 Nigam does not have sufficient staff and proper infrastructure for solid waste management.

7.2.2 Collection System

The waste collection and transportation activity is executed between 10AM and 3PM. approximately 28 waste collection points and approximate 135 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 Firozabad are provided by Firozabad Nagar Nigam. Health Officer, Chief Sanitary Inspector, Sanitary Inspector, Jamadar, Supervisor, Garage Supt. & sweepers are deployed under Municipal Commissioner. Cleaning work of a ward is looked after by administration through staff deployed at ward level.

Table 43: Working Staff for Solid Waste

S. No	Description	Value
1	Sanitary inspector	6
2	Total sweepers	540
3	Private contractor	592
4	Number Of Dustbin	135
5	Collection Point	28
6	Land Fill Site (existing)	Raipura
7	Proposed Landfill Site	Qutubpur Chanaura

Source: Nagar Nigam, Firozabad

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. Proper landfill site has not been developed by Nagar Nigam. Presently it is crudely dumped at Raipur village. Proper landfill site has been proposed at Qutubpur Chanaura total area under this site is 5.526 hectare but still not finalized.

Nagar Nigam has 540 sweepers and 6 sanitary inspectors. There is a deployment for 112 private contractors entrusted with cleaning and disposal on monthly contractual agreement. The details are not available.

7.2.3 Details of Equipment

The total fleet of vehicles engaged in transportation activity is 112 and each vehicle makes at least 2 trips to the final dumpsite. Below table illustrates the details of the fleet of vehicles.

Table 44: Details of Vehicles

S. No	Vehicle	Number
1	Heavy Vehicles	85
2	Medium Vehicles	15
3	Light Vehicles	12
Total		**112**

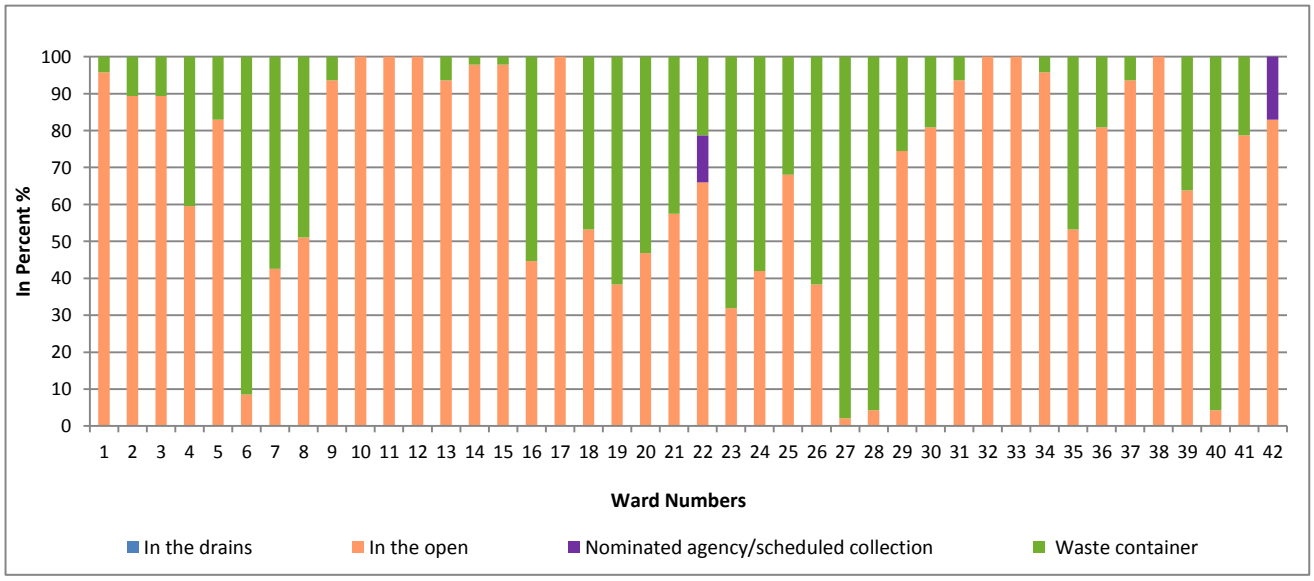
Source: Nagar Nigam, Firozabad

All vehicles used by the private concessionaire are tracked with Global Positioning System (GPS) that is a satellite based navigation system.

7.2.4 Method of Solid Waste Disposal facility (Ward Wise)

As per primary survey, in Firozabad 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 33: Method of Solid Waste Disposal facility (Ward Wise)



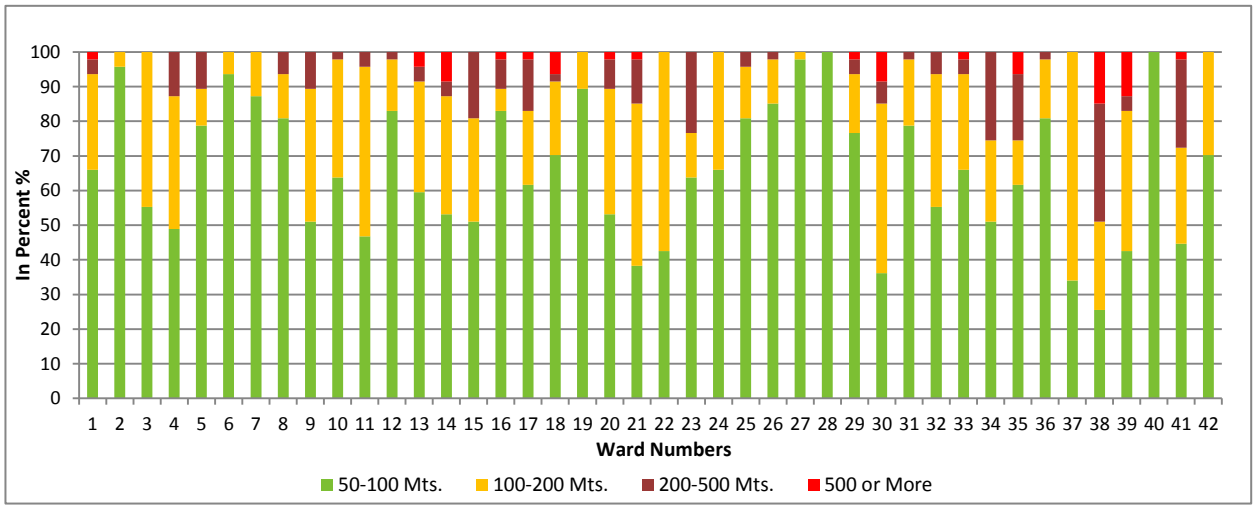
Photograph: Waste in the Open Areas (Mathura Nagar)

Source: Primary Survey, 2015

7.2.5 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 34: Distance of Waste Disposal Site (Ward Wise)



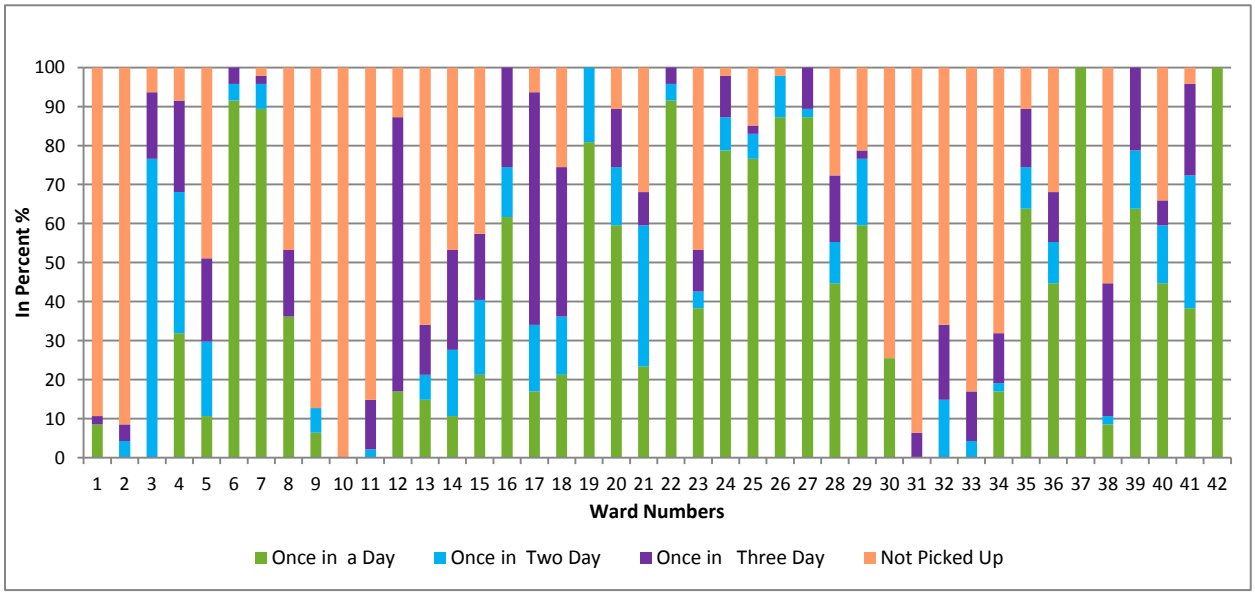
Photograph: Waste Container in Mathura Nagar

Source: Primary Survey, 2015

7.2.6 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 35: Frequency of Waste Collection (Ward Wise)

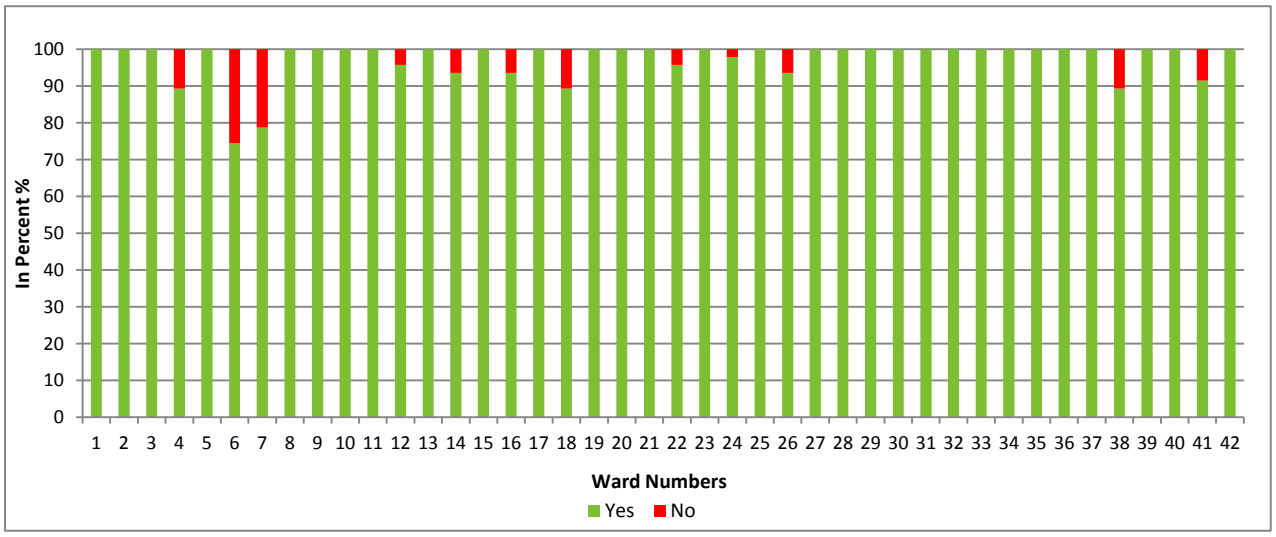


Source: Primary Survey, 2015

7.2.7 Presence of Designated Area for Garbage Disposal (Ward Wise)

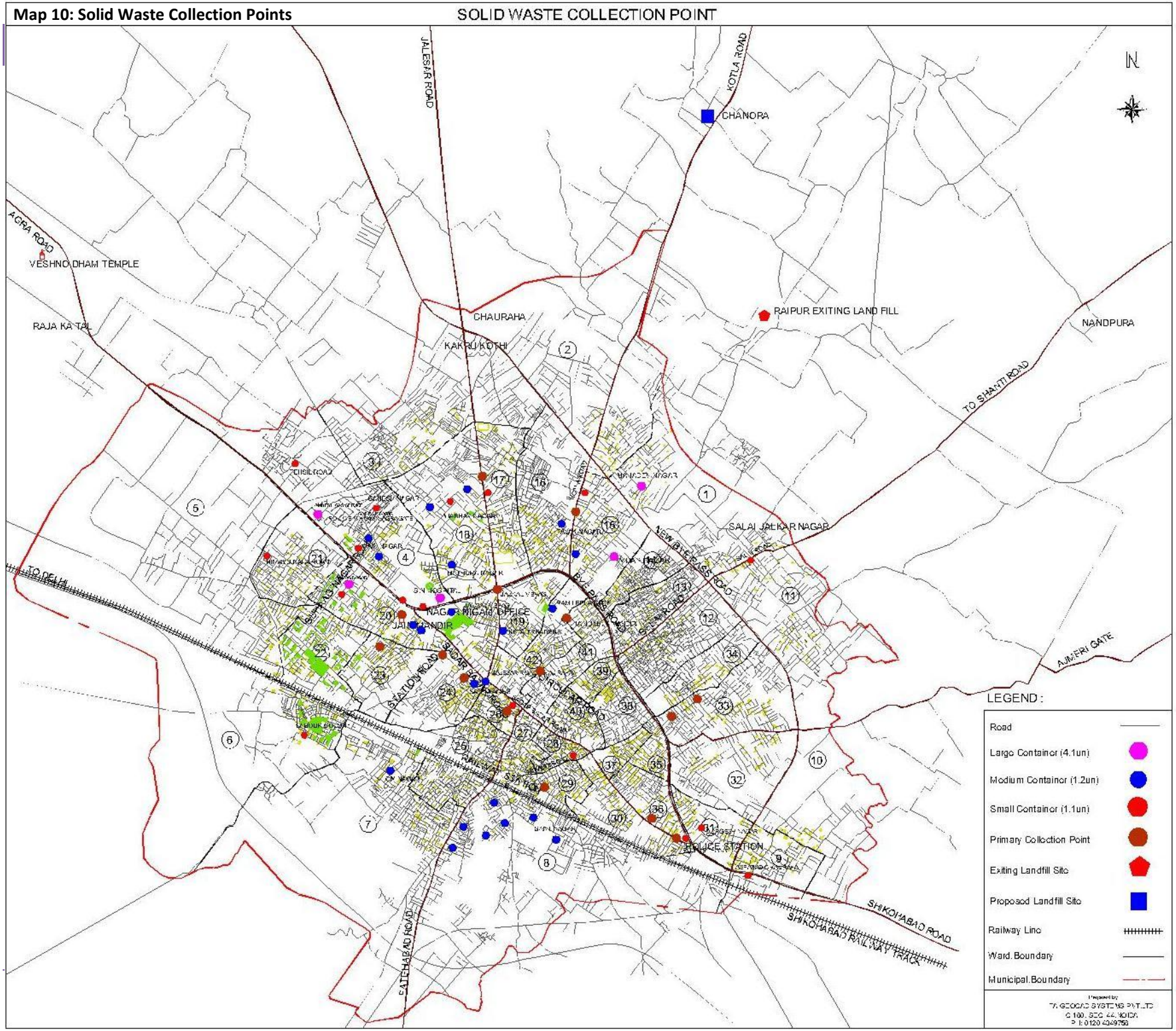
The presence of the garbage disposal area has been reported almost in all the wards of the city.

Figure 36: Presence of Designated Area for Garbage Disposal (Ward Wise)



Source: Primary Survey, 2015

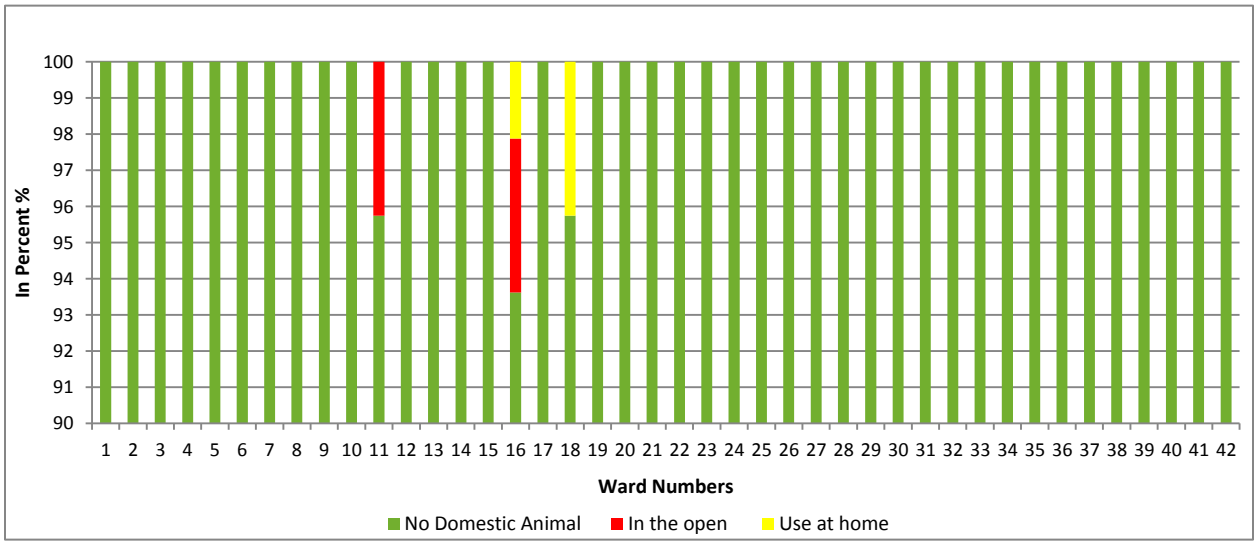
Map 10: Solid Waste Collection Points



7.2.8 Location for the Animal Waste Disposal (Ward Wise)

In all the wards most of the respondents reported not to have domestic animal, only in few wards 11, 16 and 18 are having domestic animals. Some of them use its waste at home others dispose in the open areas.

Figure 37: Location for the Animal Waste Disposal (Ward Wise)



Source: Primary Survey, 2015

Photograph: Condition of Solid Waste (Mathura Nagar)

Source: Primary Survey, 2015

As the photographs is showing the condition of vacant land filled solid waste. The people living in the nearby areas are using this vacant land as the dumping yard.

7.2.9 Treatment and Disposal

Firozabad town does not have any recognized system of Solid waste disposal due to lack of proper and sufficient number of equipment and lack of Public Awareness. Currently there is no waste treatment facility in the city and the waste is disposed randomly in low lying areas or local pond areas.

7.3 Current and Projected Solid Waste Generation

Table 45: Present waste generation and projections (Domestic)

Year	Population	Solid Waste(TPD)
2011	604214	211
2016	**786,907**	**275**
2021	886,090	310
2026	1,000,993	350
2031	1,128,691	395
2036	1,277,650	447
2041	1,446,883	506
2046	**1,645,730**	**576**

Source: Calculated Value

7.4 Gap Analysis

- Requirement of Bins-2493
- Door to Door Collection System
- Segregation of Solid waste
- Requirement of Staff

7.5 SWOT Issues and Priorities

- Service levels in SWM within Nagar Nigam 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 20 to 30% of the households are throwing the waste in nearby open land and in 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 46: Solid Waste Management SWOT

Strength	Weaknesses
• Compact city; amenable to city wide PPP initiatives	• 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**
• Exposure to modern waste management practices. • Proposed landfill site • Scope for generating revenue from processing • Scope for PPP interventions in secondary transfer and processing	• Health hazards • Filling of water bodies by wastes • Mixing of solid waste with waste water leading to choking of existing line network.

The key issues and priorities with respect to solid waste management within NN are summarized below.

7.6 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.

7.7 Vision and Goals

Vision

Litter- free through implementation of sustainable waste management practices.

Goals

Table 47: Solid Waste Management, SML Term Targets

Parameter	Unit	Norm	SLB	Short T	Medium T	Long T
Household coverage	%	100%	0%	✓		
Waste Collection Efficiency	%	100%	88%	✓		
Source Segregation	%	100%	0%		✓	
MSW recovery	%	100%	-		✓	
Scientific disposal	%	100%	-			✓
Cost recovery	%	100%	-	✓		
Cost Collection efficiency	%	100%	-	✓		
Complaints Redress	%	80%	96%		✓	
Collection Efficiency	%	100%	-		✓	

7.8 Functional Assessment

7.8.1 SWM Staff and Qualification

The department of solid waste management is under the administrative control of Health Officer who is assisted by Chief Sanitary Inspector, Project Coordinator, Sanitary Inspectors, Sanitary Dafedars and Safai Karmacharis.

Table 48: Staff Gap

S. No	Indicators	Present	Required
1	Executive Engineer	-	1
2	Assistant Executive Engineer		1
3	Assistant Engineer		2
4	Sanitary Inspector(1 per 50000 pop)	6	12
5	Sanitary Sub-inspector(1 per 25000 pop)	-	24
6	Sanitary Supervisors(1 for 12500 pop)	-	25
7	Sweepers(650to 750 RM per street)	540	938

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

7.9 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, scheduled rates of construction (Delhi) for activities. The following tables represent the major estimates for the various design stages as mentioned in the SWM.

Table 49: Fund Required For Solid Waste Management (Primary Collection)

Solid Waste Management	Cost(Lakh)
Community Bins (526 bins with capacity 0.5 Cum) in slum areas	8.28
Litter Bins (1314 bins with capacity 1.1.Cum)	52.54
Litter Bins (654 bins with capacity 0.5.Cum)	25.49
Primary waste collection (door to door waste collection) – street sweeping equipment	50.41
Safety kits(938)	4.69
Total	**141.41**

Source: JNNURM, 2014

The approximate cost for implementation of this recommendation is Rs. 14.14 Crores

7.10 Cost Recovery Options

The challenge for Firozabad 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.

7.11 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 50: Phase-Wise Implementation Plan

Phase	Year	Actions
Short Term	2016-2021	Initiate primary segregation , storage and door to door collection system Procurement of gears/equipments for street sweeping, waste transportation as per the SWM DPR 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	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	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

7.12 Recommendations

Actions	Recommended body
Give priority to any Initiatives in the form of DPR's made.	NN
Initiate actions to improve accountability, oversight and public participation.	NN
• 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	NN

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.	NN
Implement user charges for SWM towards achieving O&M cost recovery in long term	NN
Avail JNNURM and other state level grants available to implement an integrated PPP.	NN
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	NN

Priorities:

a) Prepare the DPR, focus on implementation and achieving SLB norms.

b) Clarify accountability and mobilize people support.

8 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 chocked 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. For better drainage system, plan made under the UIDSSMT scheme and 86 crore Rs release but the scheme is not working properly in various parts of the city.

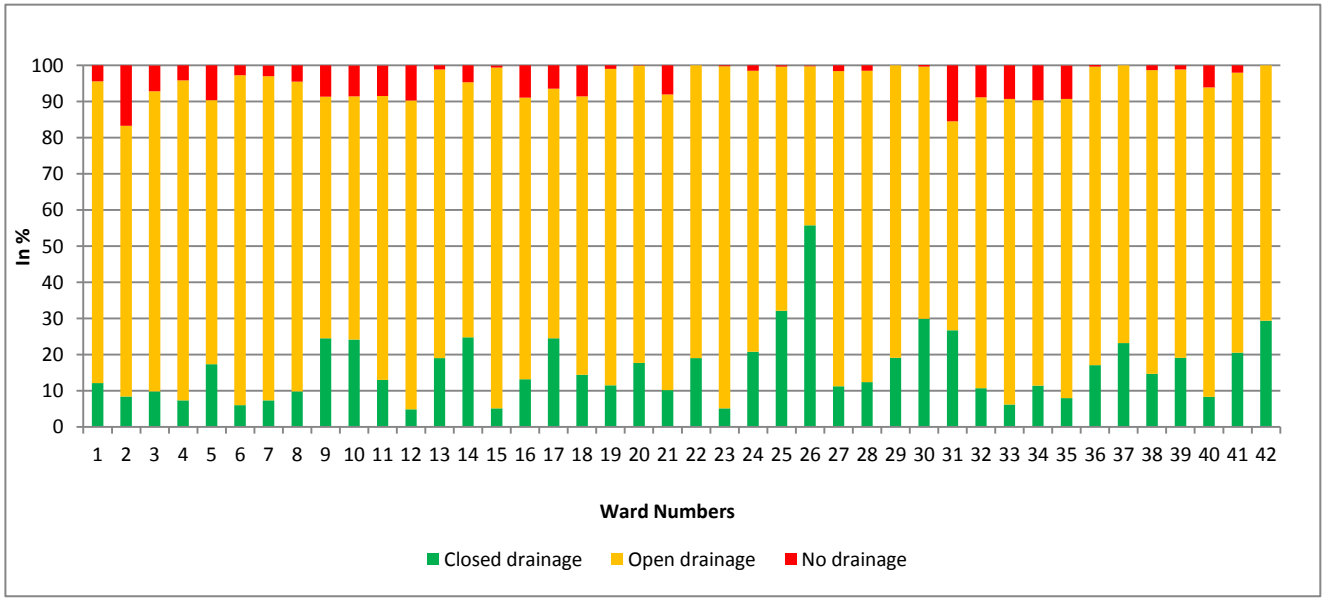
8.1 Present Status

There are 2 Main Nalahs named Mohammadganj Nalah and RehanaTapa Nalah which contains waste water of the city and drained into Yamuna. Some of drains/nalahs are bad in condition and these are damaged. Major problem in the city is cleaning of nalahs as 70% of nalahs are encroached upon. Residents have constructed houses/terrace on the nalahs.

8.1.1 Households Connected to Drainage

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

Figure 38: Households connected to Drainage (Ward Wise)



Source: Census of India, 2011

Map 11: Drainage Map of Firozabad

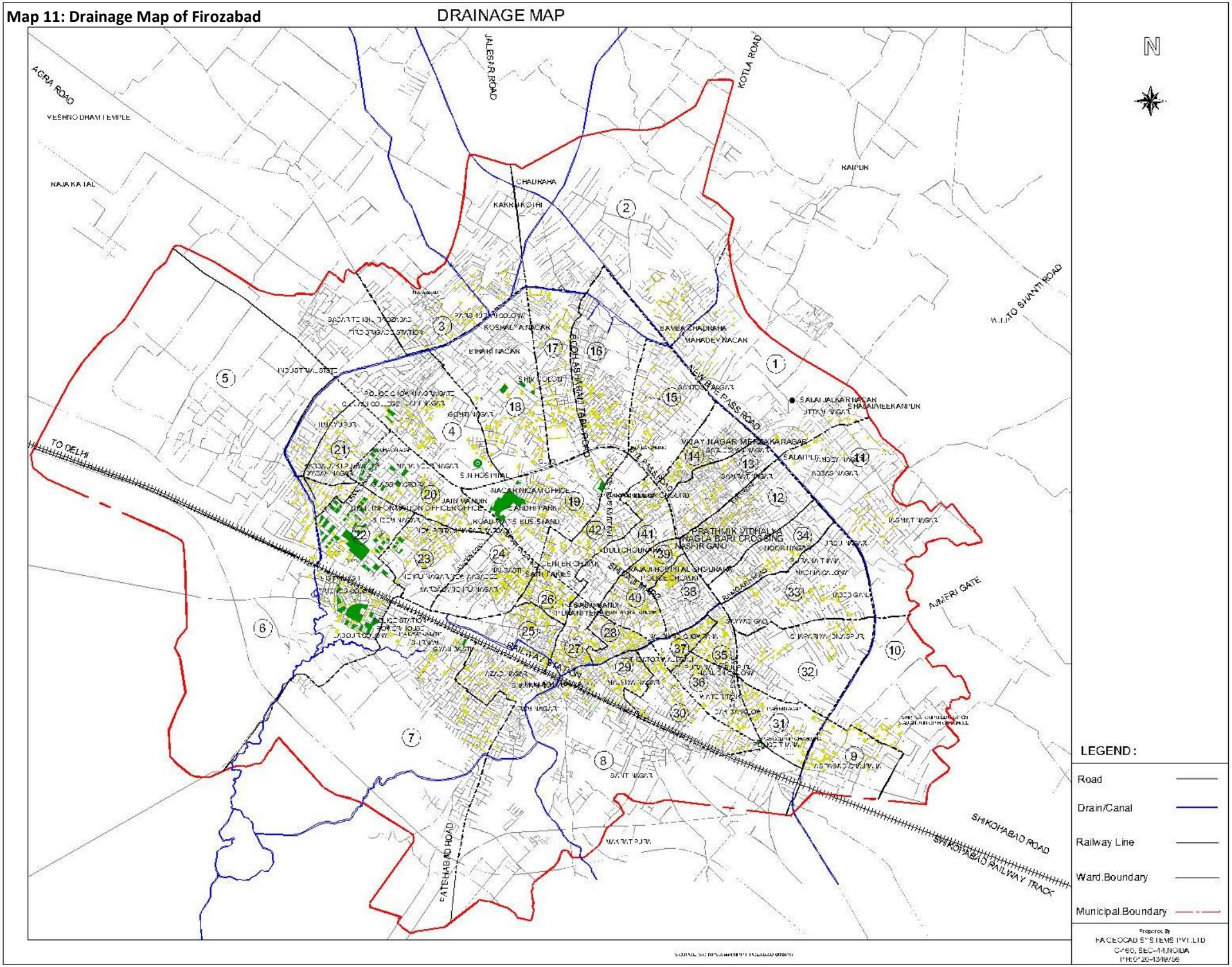


Table 51: Households Connected to Drainage

Ward No.	Closed drainage	Closed drainage (in %)	Open drainage	Open drainage (in %)	No drainage	No drainage (in %)
1	386	12	2657	84	138	4
2	373	8	3302	75	736	17
3	467	10	3954	83	337	7
4	230	7	2774	89	128	4
5	698	17	2940	73	387	10
6	138	6	2091	91	64	3
7	134	7	1628	90	54	3
8	267	10	2330	86	123	5
9	656	24	1790	67	232	9
10	664	24	1850	67	235	9
11	492	13	2967	79	316	8
12	224	5	3905	85	444	10
13	254	19	1070	80	15	1
14	666	25	1898	71	124	5
15	96	5	1755	94	10	1
16	433	13	2554	78	291	9
17	1200	25	3374	69	313	6
18	566	14	3033	77	335	9
19	145	12	1108	88	11	1
20	163	18	758	82	1	0
21	335	10	2693	82	265	8
22	285	19	1215	81	0	0
23	56	5	1045	95	2	0
24	218	21	813	78	16	2
25	377	32	795	68	4	0
26	780	56	615	44	1	0
27	113	11	882	87	16	2
28	90	12	622	86	11	2
29	183	19	775	81	0	0
30	413	30	965	70	6	0
31	459	27	994	58	267	15
32	331	11	2497	80	274	9
33	295	6	4046	85	445	9

34	531	11	3675	79	446	10
35	384	8	3996	83	444	9
36	186	17	899	83	4	0
37	231	23	766	77	0	0
38	162	15	927	84	14	1
39	219	19	915	80	13	1
40	33	8	339	86	24	6
41	190	21	719	78	19	2
42	355	29	851	71	0	0

Source: Census of India, 2011

Ward number 15, 23, 6, 7, 27, 28, 33, 4, 1, 3, 31 and 2 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.

8.1.2 Water Logging Areas

There are some areas which partially or permanentely submerge during rainy season or without rainy season these areas are Todowali Bagiya, Ramagarh, Ajameri Gate, Neer Nagar, Mahadev Nagar, Kishan Nagar, Kashmiri Gate, Kohinoor Nagar, Salai, Jalkari Nagar, Luvkush Nagar and Chhadamal Nagar, Karbala, etc.

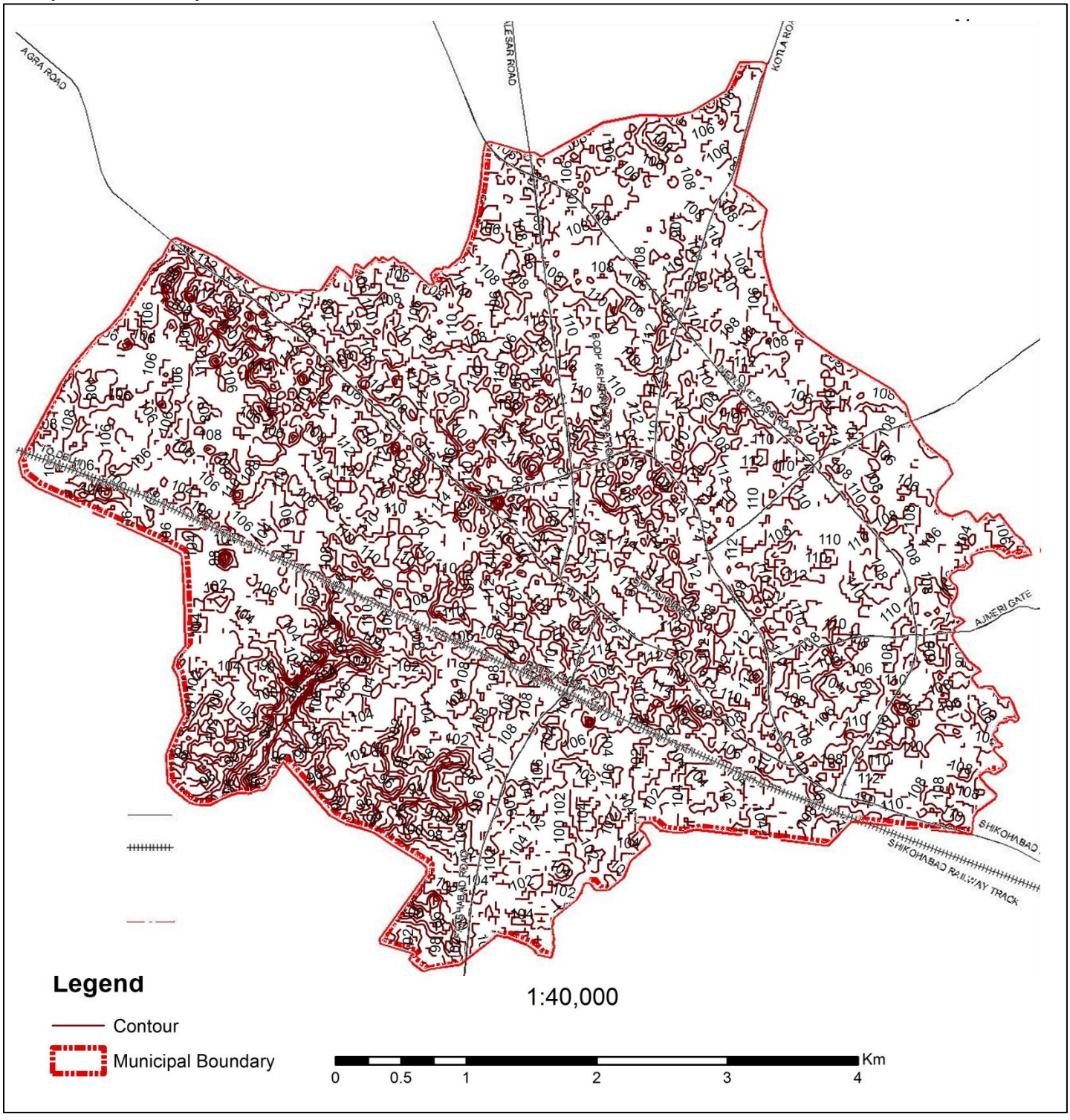
8.2 Gap Analysis

Table 52: Gap Analysis of Drainage

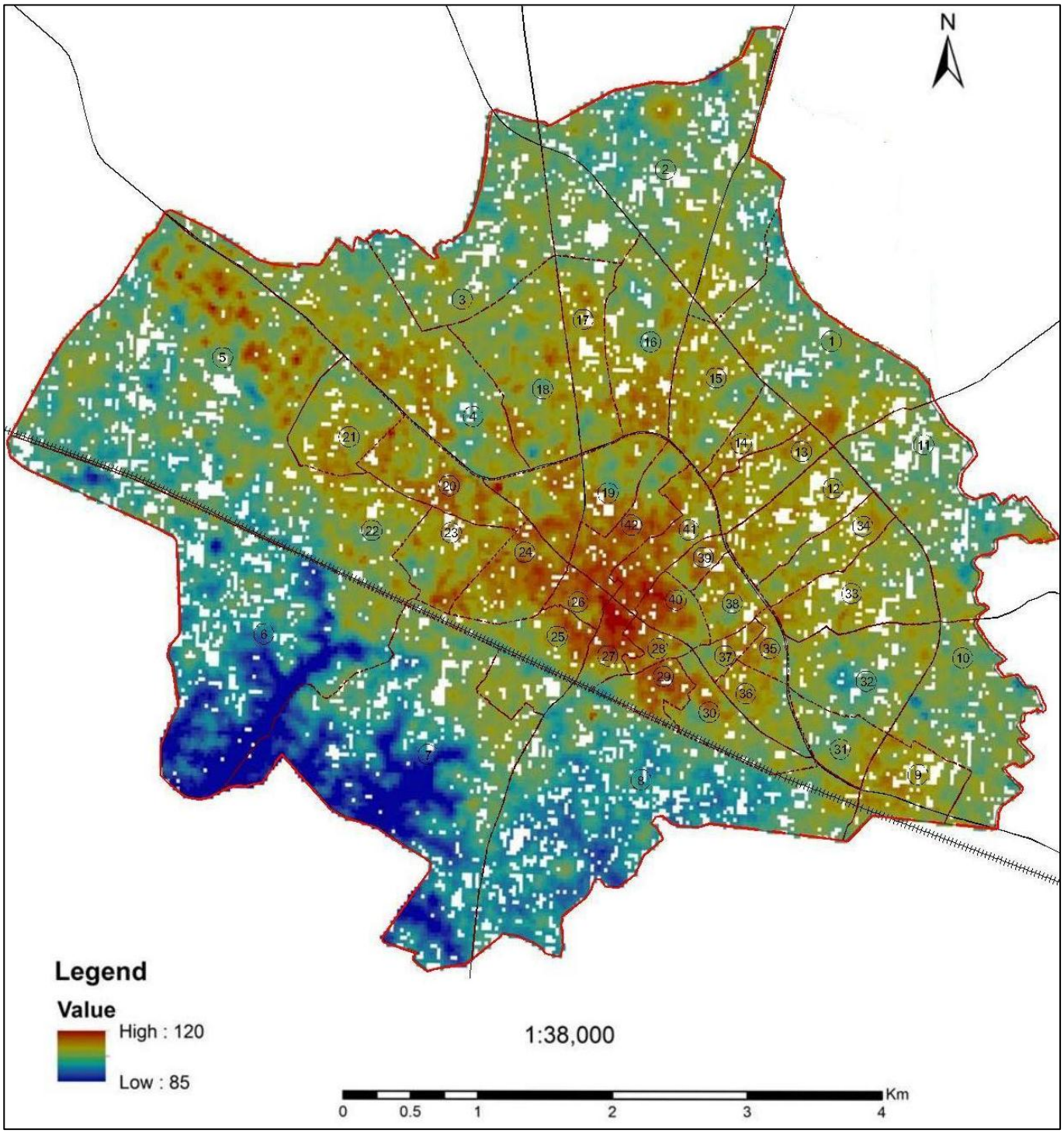
	HHs	In %	Remarks
Closed drainage	14481	15	
Open drainage	78782	79	**Should Covered**
No drainage	6570	7	**Gap**
Total	**99833**	**100**	**86%**

Source: Census of India, 2011

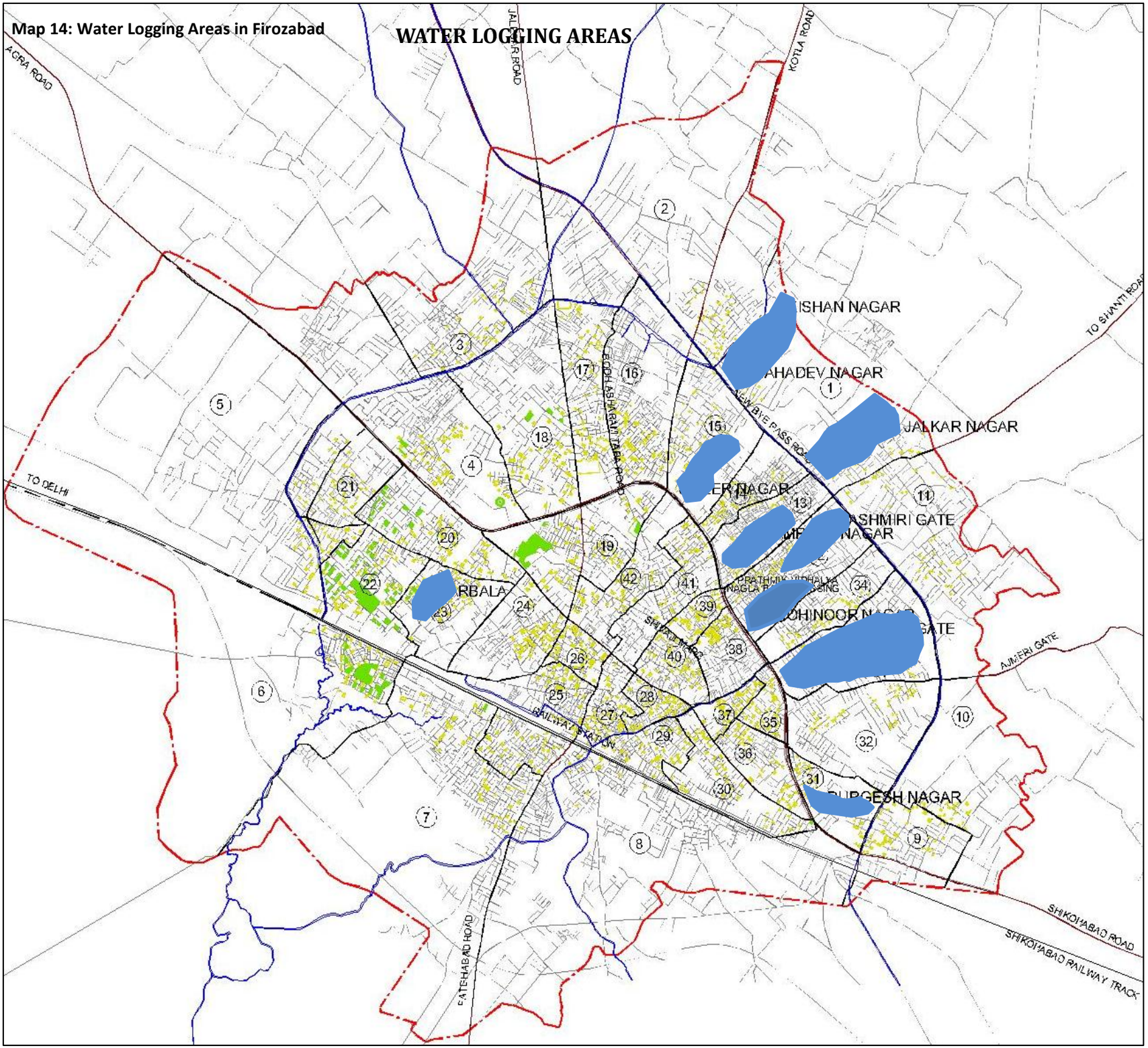
Map 12: Contour Map of Firozabad



Map 13: Slope Map



Map 14: Water Logging Areas in Firozabad



8.3 SWOT Issues and Priorities

Table 53: Drainage, SWOT

Strength	Weaknesses
✓ Topography of old town allows several parts to be drained off, other parts, of the town have quite flat.	✓ Grey and in some cases black water let out into drains ✓ Solid Waste being dumped into drains ✓ Poorly maintained drains
Opportunities	**Threats**
• Plans under UIDSSMT scheme.	• Health hazards due to poor maintenance and waste clogging

NN, Firozabad 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.

8.4 Vision and Goals

Vision

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

Goal

Table 54: Storm Water Management, SML Term Targets

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

8.5 Financial Options

Table 55: Cost Estimate for Drainage Improvement

S. No.	Item	Km	Rate (Lakh/Km)
1	Cost of drain (250mm)	1	32.67
2	Up gradation of Kutcha drain	1	12.10
Total			
1	Cost of New Drain	1051	34336.17
2	Up gradation of Kutcha drain	14	169.4
Total Cost			**34505.57**

Source: Calculated value as per Delhi Schedule of Rates

Assumption drain length should cover 150 % of concrete and dammar road length and 100% of Kutcha road network. Total road length in the Firozabad city is 710 Km.

Hence, 1065 km of drains are required out of which 14 km of kuccha drain exist. Thus there is a need of construction of 1051 km of new drain and upgrading 14 km of kuccha drain.

The approximate cost for implementation of this recommendation is Rs. 345.06 Crores

8.6 Timeline

Table 56 Phase wise Implementation Plan

Phase	Year	Actions
Immediate	2016-2019	□ Installation of grating points for collection of solid waste entering into storm water drains □ Conduct feasibility study for treatment measures □ Cleaning of drainage system – removal of silt and solid waste □ Database management – detailed mapping of natural and built storm water drains
Short-Term	2020 – 2024	□ Source control strategies - Construction of rain water harvesting structures □ Removal of unauthorised structures and encroachments on natural drains □ Construction of road side drains as per the drainage designs □ O&M and M&E systems

		□ Technical and O&M Manual
Mid-Term	2025 – 2032	□ Ensure 100% coverage by storm water drainage system □ Augmentation of storm water drainage system
Long-Term	2033 - 2046	□ Augmentation of storm water drainage system

8.7 Recommendations

- Under the UDISSMT 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.

9 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.

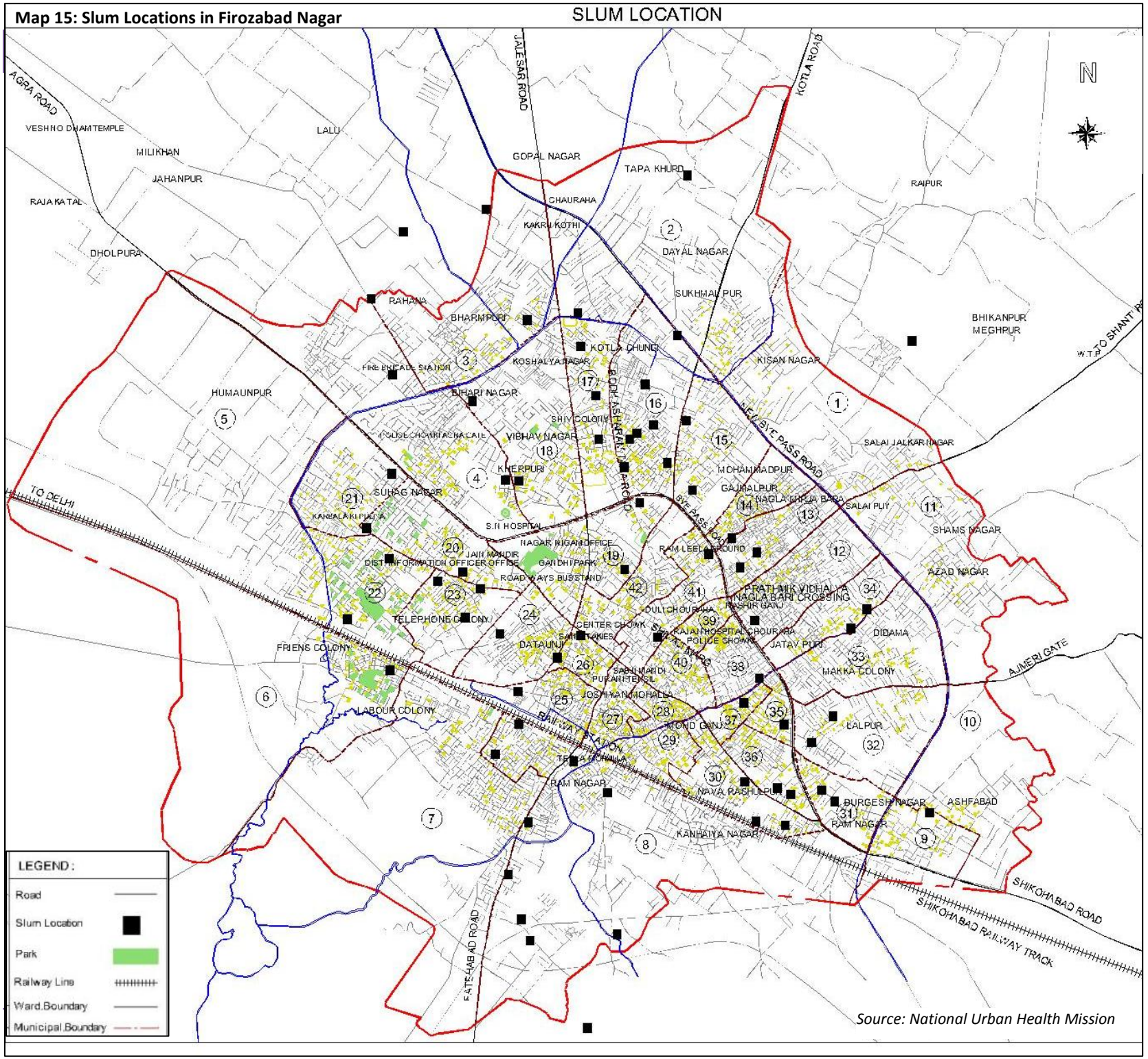
As per the Census 2011, the total slum population in the city is 65696. The percentage of slum population in the city is 10.8 per cent of the total population. As per NHM there are 84 slum pockets (Map. (The slum pocket wise population is given in Annexure). The slum population in the city has been spread over in all wards. As per Census, the household (HH) size in slums works out to be 6.86, which is more than the HH size of the total population (6.00).

Table 57: Slum profile in Firozabad city

S. No	Description	Value
1	Total Population of city	604214
2	Slum Population	65695
3	Slum Population as percentage of urban population	10.80%
4	Number of Notified Slums	84
5	Number of slums not notified	84
6	No. of Slum Household	11051
7	Households have individual water connections*	(20%)
8	Slums connected to sewerage network	Nil
9	Sanitation Facility	(15%)
10	Solid Waste	Nil
11	Storm Water Drainage	20%

Source: Censes 2011, National Urban Health Mission (Firozabad) and Nagar Nigam Firozabad

Map 15: Slum Locations in Firozabad Nagar



Source: National Urban Health Mission

9.1 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.

9.1.1 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.

9.1.2 Sanitation Facility

About 80 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.

9.1.3 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.

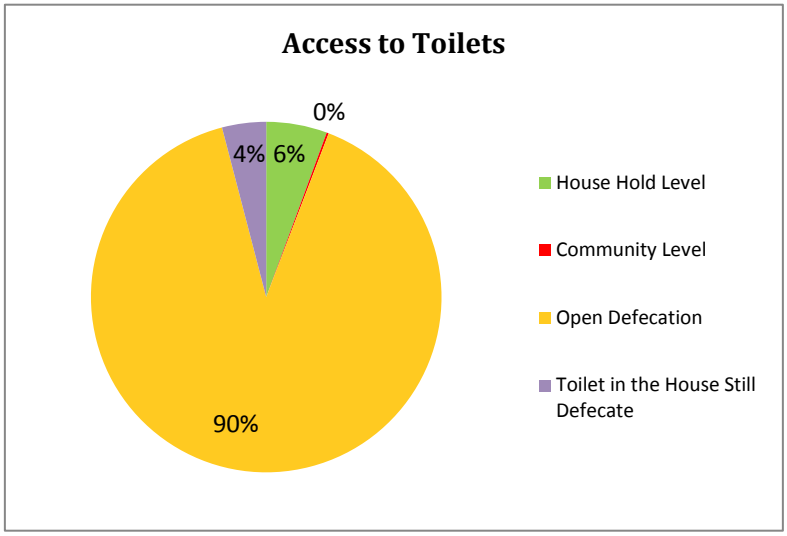
9.1.4 Solid Waste

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

9.2 Primary Analysis

9.2.1 Access to Toilets

Figure 39: Access to Toilets



Source: Primary Survey, 2015

A big share (90%) 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. Only 6% of total slum population is having toilets at Household level.

Photograph: Open Defecation in Slum Area (Gomti Nagar)

Source: Primary Survey, 2015

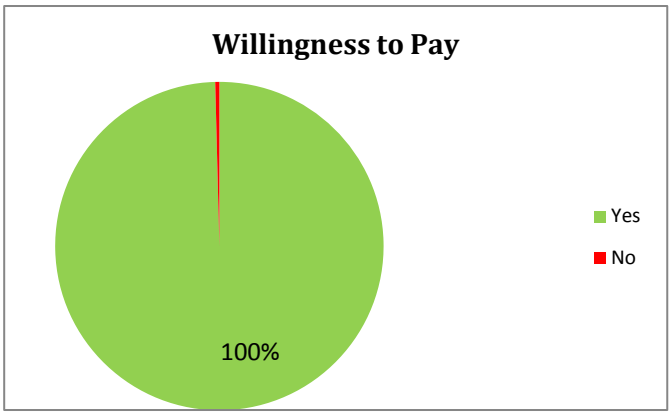
9.2.2 Access to Water at Household Level

All the respondents reported to get water from the Municipal Tanker at Community level.

9.2.3 Willingness to Pay

Every respondent those living in slum area reported that they are willing to pay for the Toilets and Sewer lines. The amount which they can contribute is 200-500 rupees. So Nagar Nigam 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 Firozabad city.

Figure 40: Willingness to Pay for Toilets and Sewers



Source: Primary Survey, 2015

9.3 Financial Options

District Urban Development Agency has been look after the slums in Firozabad city. Rajiv Awas Yojana has been proposed the plan for the eight slums in different part of the city. The below is the table showing the proposed cost of DPR of slums prepared under Rajiv Awaas Yojana.

Table 58: Project Cost

S. No	Sector	Project Cost	Central Share (50%)	State Share (50%)
1	**Water supply**	70.95	35.48	35.48
2	**Water Recharging**	3.41	1.70	1.70
3	**Storm Water Drain**	180.80	90.40	90.40
4	**Sewerage System**	78.09	39.04	39.04
Total		**333.25**	**166.62**	**166.62**

Source: RAY

9.4 Recommendations

The present scheme of RAY has been taken below areas as model for development. Amriti Nagar, Om Nagar, Elani Nagar, Shri Nagar, Rathour Nagar, Moti Nagar, Sati Nagar and Shanti Nagar. A whole slum approach has been adopted for providing entire slum pockets.

Table 59: Summary of Investment

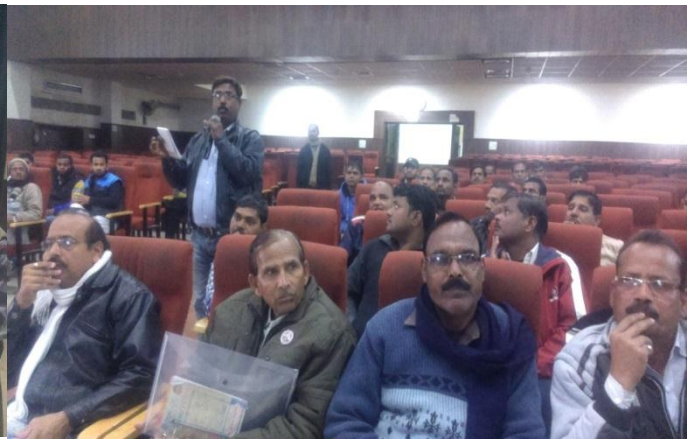
S. No.	Sector	Estimate cost(crore)
1	Water supply	73.43
2	Toilets (Individual, Public and Community)	12.83
4	Sewerage	17.24
5	Solid waste	14.14
6	Drainage	345.06
Total estimated investment		**462.7**

The approximate Project cost for implementation is Rs. 462.7 Crores

10 CSP SUPPORT PILLARS

10.1 City Sanitation Task Force

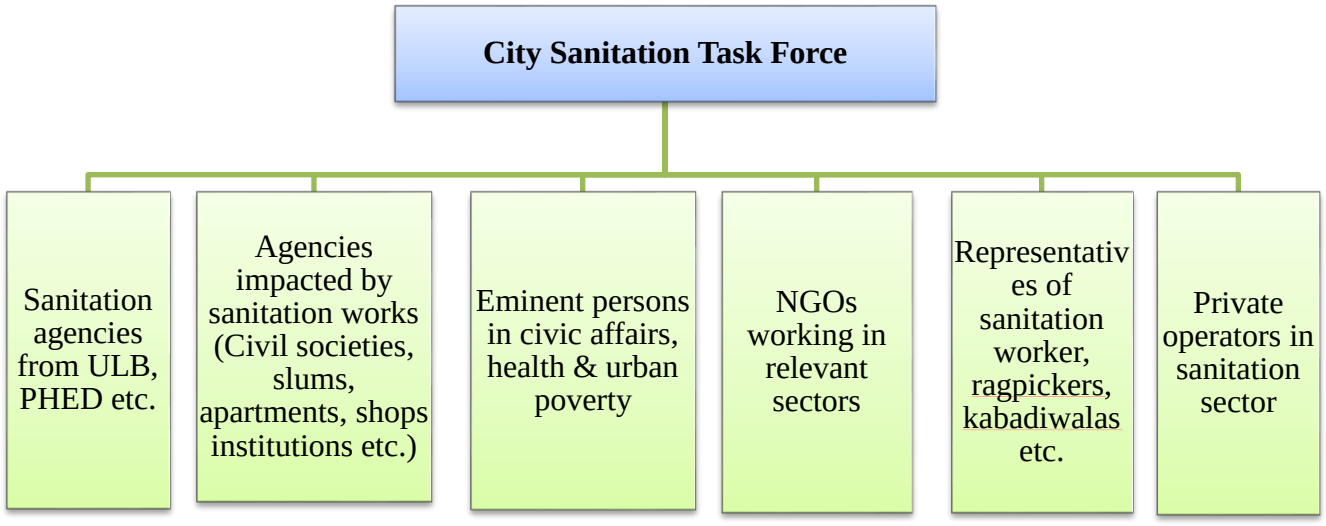
The first step in making the cities 100% sanitized is to elevate the consciousness about sanitation in the mind of municipal agencies, government agencies and most importantly, amongst the people of the city. Hence, it is one of the main recommendations and pre-requisites for the preparation of the city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



10.2 City sanitation task force members

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

Figure 41: 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

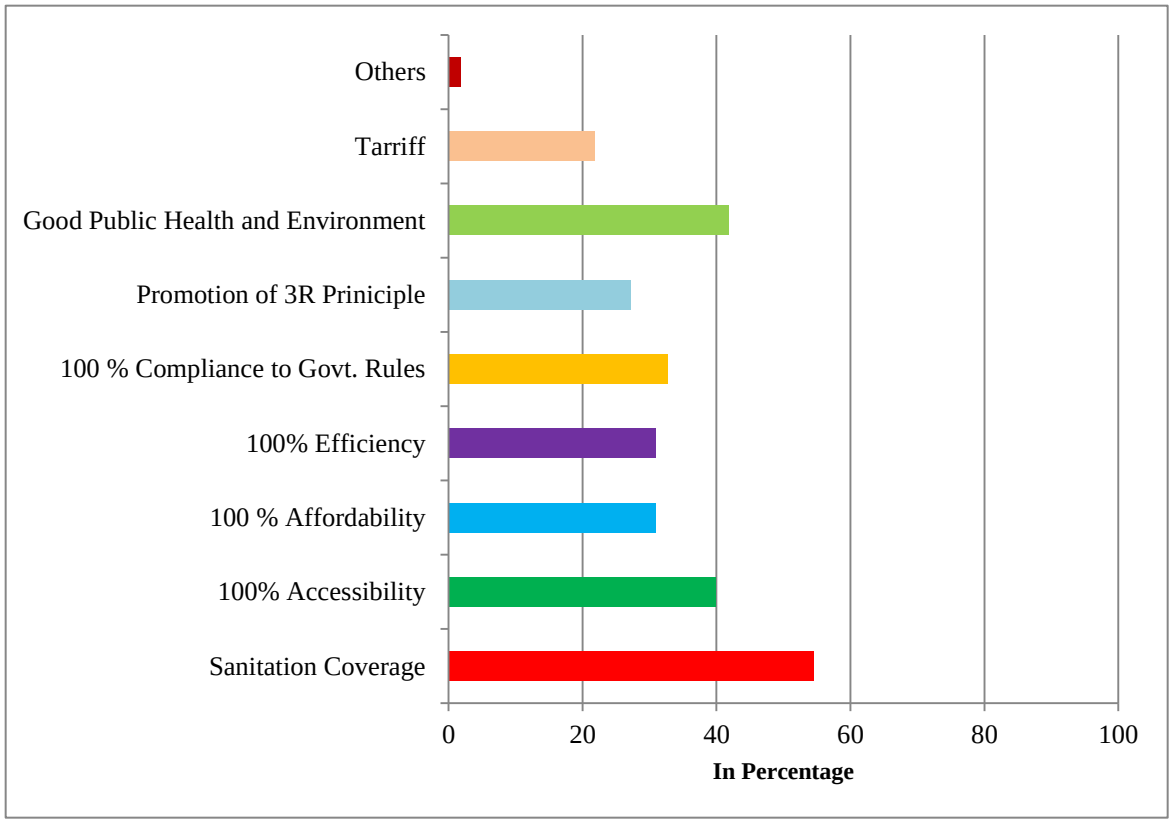
10.3 Responsibilities of CSTF

- 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).

10.4 Stakeholders Workshop Feedback

Before finalizing the CSP of Firozabad 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 42: Goals of City Sanitation

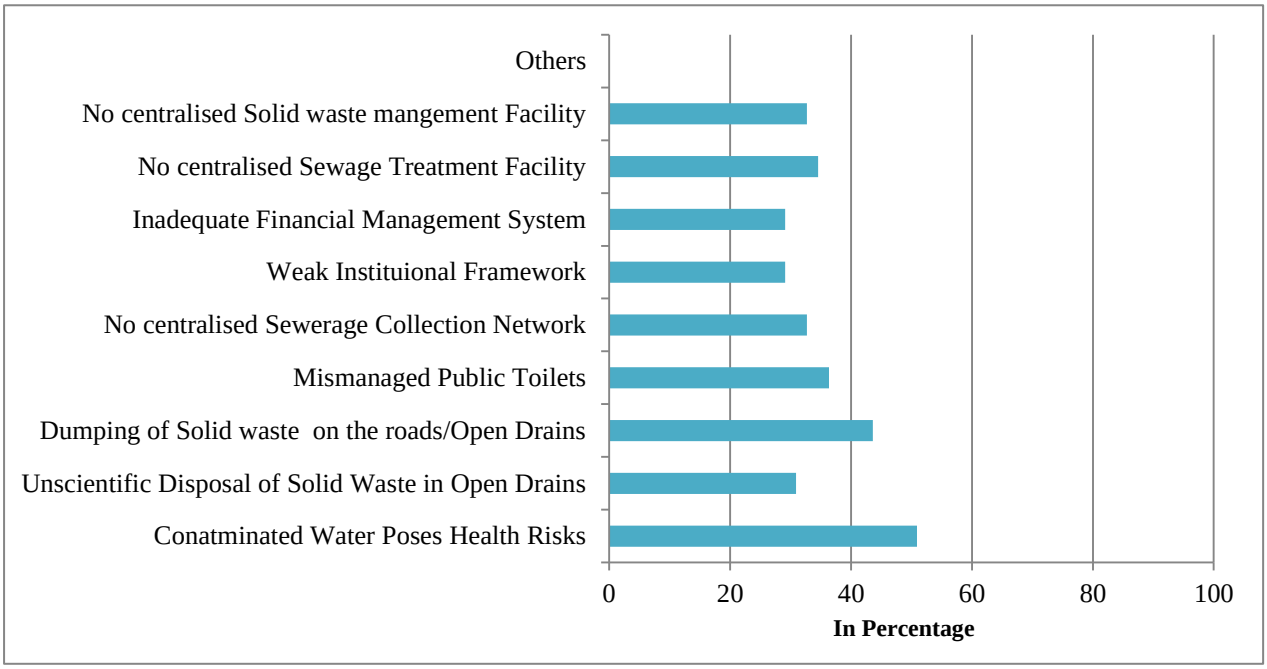


As evidenced from the figure above, 100% coverage and accessibility of sanitation services was given top most priority followed by affordability good public health and 100% efficiency.

Goals like 3R principal, Compliance with government rules were not given too much of priority. Surprisingly, awareness among people of Firozabad 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.

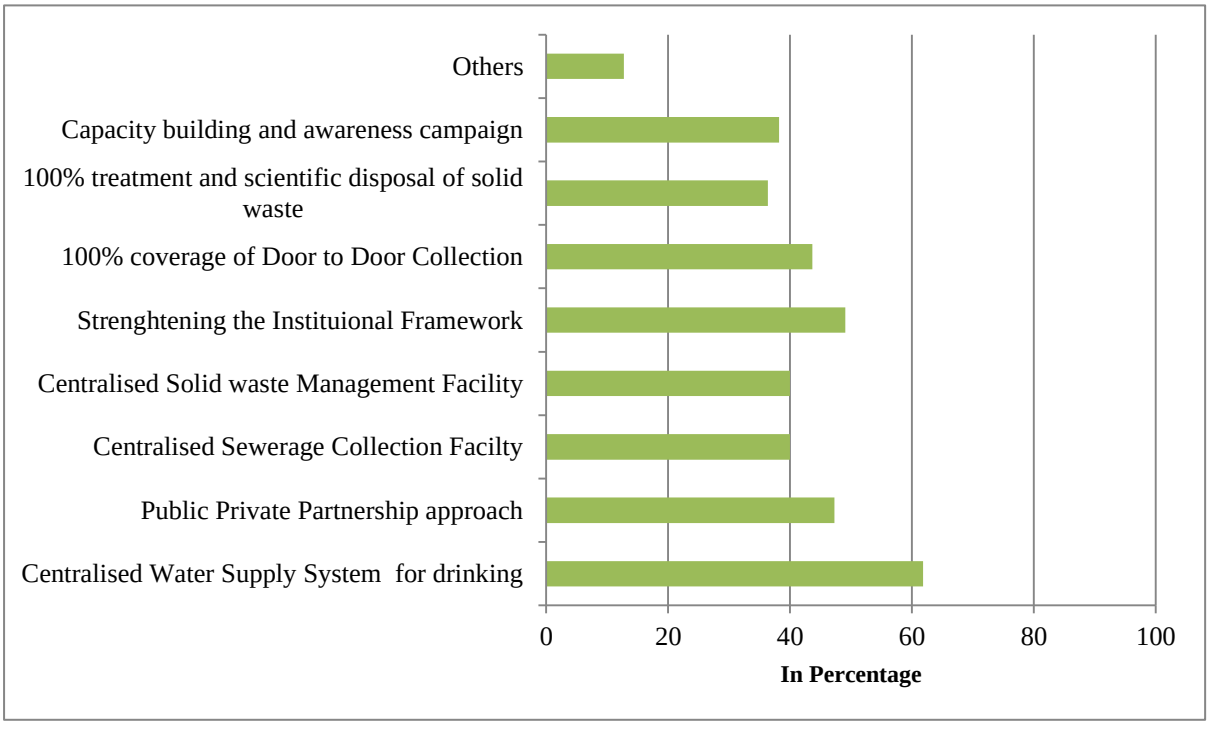
Figure 43: Key Projects Linked To Sanitation of City



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 44: Key Issues related to Sanitation of the City



The major concern comes to be the absence of centralized sewerage collection network and dumping of wastes in water bodies and open drains.

Firozabad already has some infrastructure like, sewer network in the city (needs to be accessed by people), and 12% water supply. Also the DPR for water supply and SWM have been prepared and are under execution. 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 lakes basic infrastructure there is no logic in conducting awareness campaigns, capacity buildings etc until the basic infrastructure is in place.

10.5 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 Nigam of Firozabad. 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 45: Proposed Organization Structure

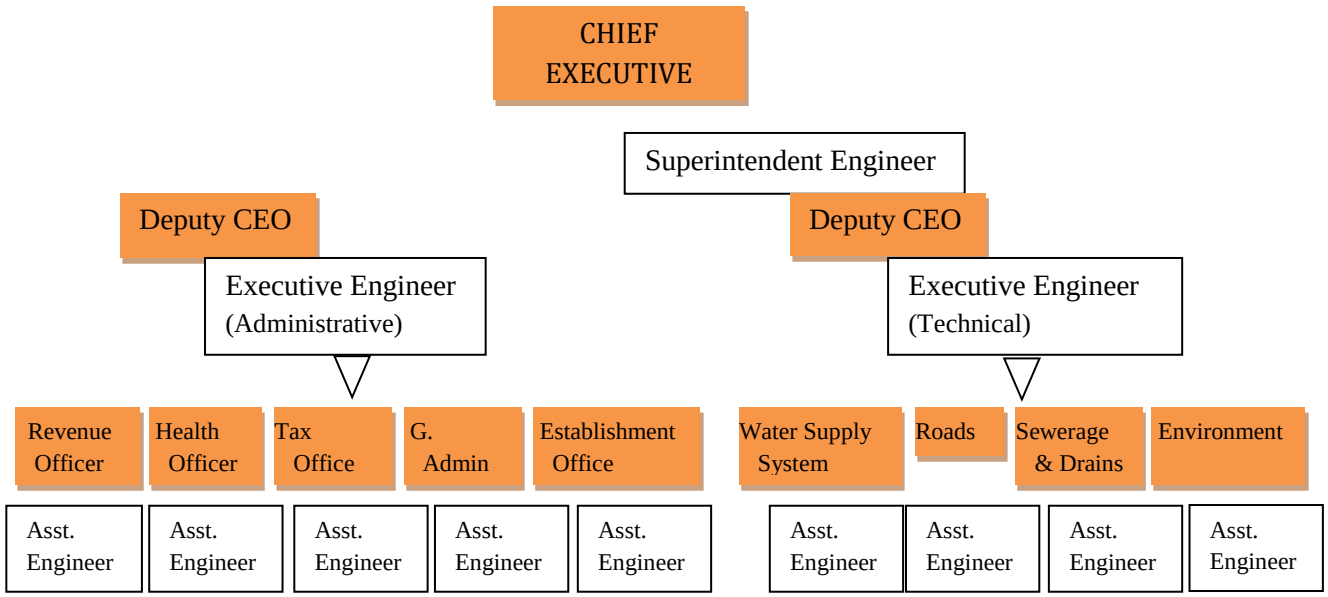


Table 60 Revised Institutional Responsibilities for Basic Services

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

10.6 Capacity building

A Detailed Training Needs Assessment is required to ascertain and validate the training requirements. NN 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.

10.6.1 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 61 Training needs across Sanitation plan Components

Sanitation Component	Senior Officials	Technicians / Operating Staff / Workers
All Departments	• Powers and Duties • Citizen Charter and commitments • Urban Reforms and JNNURM • Service Level Benchmarking • Procurement and PPPs • Use of Computers for Information system Improvement	• Rights and Responsibilities • Health and Safety • Citizen Charter and commitments
Water Supply	• CPHEEO Manual and norms • Developing a Water Supply DPR • Conducting a Water Loss Audit • Metered Supply • SLB Reporting	• 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	• 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	• 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	• Implementing Door-to-Door collection and source	• Collection efficiency • Segregation techniques

	segregation • Waste collection routing • Awareness generation and Community mobilization • PPPs and Contracting • Waste recovery and Landfill technologies	• Complaints Redresses • Cost Recovery • Safe work practices
Finance and Accounts	• Budget preparation and Reporting • Financial Management • MIS and Information Management • Auditing and follow up	• National Municipal Accounting Manual and local accounting rules • Accrual Accounting • Accounting software

10.6.2 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 NN, Firozabad 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.

NN 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 NN, Firozabad 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 NN, Firozabad 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.

10.6.3 Information Management

Updation of baseline information on sanitation indicators at a household level is critical for NN 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 62 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 connected	Yes / No
Covered under SWM Door-to-door collection	Yes/No
Practicing source segregation	Yes/No

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

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

10.6.4 Implementation Strategy

- For the capacity building and increase of awareness levels in the public, it is recommended that a third party is hired by NN, Firozabad 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 46: Approach to Address Awareness Generation

10.7 Recommendations

Table 63: Below Provides an Overall Accountability

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

- NN clearly has single point accountability for Shared Toilet Access, Solid Waste Management and planning and monitoring of Onsite 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 NN.

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- Engineering Economics, JNNURM 2004
- UDPFI Guidelines
- Manual of Solid Waste Management

ANNEXURE

CSTF Members

Nagar Nigam Firozabad
City Sanitation Workshop
Date :29-Dec-2015

S.No.	Name	Disignation	Mobile No	Signature
1	Nand Lal	E. O Shikohabad	9897233839	
2	Mukesh Kumar	Accountant Shikohabad	9690991111	
3	Devi Lal Sharma	J. E. Skb.	9358505913	
4	SANJAY SINGH KUSHWAH		9259955393	
5	Rajkumar Lawaniya	SFI Nagar Nigam Firozabad	7060115491	
6	Inderjeet Singh	C.S.F.I	9412178962	
7	Sandeep Bhargava	CSFI	9410290974	
8	Shyam Sunder	S.I	9897528021	
9	Liyakat Ali	W.W.E. Nagar P.P. Sirsaganj	9027119994	
10	Dinesh kumar	CSFI	9457712933	
11	[illegible]	[illegible]	[illegible]	
12	Rajeev Kumar Bharati	सफाई मित्र	9634502047	
13	Vinod Kumar	" "	09230742071	
14	N.L Kushwaha	S.F.I	7088118014	
15	Mahesh kumar	S.F.I	7088118015	
16	AJAY KUMAR	AE (E/M)	7088118010	
17	[illegible]	सफाई मित्र	[illegible]	
18	सुरेन्द्र रावत	लिपिक	9837304807	
19	[illegible]	जलकल विभाग पम्प चालक	8958[illegible]16054	
20	[illegible]	जलकल विभाग पम्प चालक	9568629234	
21	सुरेन्द्र सिंह यादव	जलकल विभाग पम्प चालक	9837740402	
22	[illegible]	जलकल विभाग पम्प चालक	9719940308	
23	[illegible]	[illegible]	8273121233	
24	S.K. SINGHAL.	JE, Nagar Nigam	9919766534	
25	P.K. Singh	JE Jalkal	7088118006	
26	[illegible]	जलकल विभाग पम्प चालक	9639847210	
27	[illegible] सिंह	सफाई मित्र	9837411961	
28	[illegible]	सफाई मित्र	96395[illegible]94	
29	पंकज कुमार	सफाई मित्र	9058895420	

Nagar Nigam Firozabad

City Sanitation Workshop **Date :29-Dec-2015**

S.No.	Name	Disignation	Mobile No	Signature
30	मीरा कुमारी	सफाईमित्र	8532080665	मीरा
31	पंकज सविता	सफाईमित्र	8865905813	Pankaj Savita
32	गौरव शुक्ला	सफाईमित्र	9058388137	Gaurav shukla
33	[illegible]	[illegible]	9927462254	[illegible]
34	DR. MOHD USMAN	R.M.O.	07417428595	Mohd Usman
35	Sandhya Itg.	[illegible]	8445880409	Sandhya Itg.
36	[illegible]		9410036727	[illegible]
37	भगवानदास [illegible]	सफाई मित्र	9456402721	[illegible]
38	[illegible]	सफाई मित्र	9219134292	Dinesh Sharma
39	[illegible]	M clerk	9837587470	[illegible]
40	डा० मनीराम सिंह		9847012556	[illegible]
41	[illegible]		9690767831	[illegible]
42	[illegible]	[illegible]	9411462832	
43	तारा चन्द	[illegible]	9897019351	तारा चन्द
44	ओम प्रकाश [illegible]	[illegible]	9760945841	ओमप्रकाश
45	रामनाथ		8006111160	
46	[illegible]	[illegible]	9258449506	[illegible]
47	नन्दकिशोर	[illegible]	8534931091	[illegible]
48	[illegible]	"	9917.866	[illegible]
49	सतेन्द्रपाल सिंह	"	8864911919	[illegible]
50	जगदीश [illegible]	"	9012[illegible]248	[illegible]
51	दिनेश चन्द	सफाई मित्र	8273618325	[illegible]
52	रमेशचन्द्र	सफाई मित्र	9639327690	[illegible]
53	[illegible]	[illegible]	9756204148	[illegible]
54	प्रदीप कुमार	सफाई मित्र	8445350007	प्रदीप कुमार
55	जितिन वर्मा	[illegible]	8791291532	[illegible]
56	[illegible]	मजदूर	8273470375	Rizwan [illegible]
57	मो० इरशाद	सफाई मित्र	7830812383	[illegible]
58	अशोक कुमार सिंह चौहान	E.O. नगरपालिका [illegible]	9451545421	[illegible]

Minutes of Meeting of Stakeholders Consultation

Date : 29th December 2015

Time : 1.00 p.m. – 3:00 p.m.

Venue : Nagar Nigam Paliwal hall (Conference Hall)

Guests: Commissioner (Ramautar Raman), City Magistrate (Ravinder Singh**),** Additional Commissioner (Pramod Kumar) 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) City Magistrate delivered a short lecture about street sweeping and public awareness.
2) First Participants highlighted the problem related to water that is being faced by their natives in their respective ward 39. He said water supply should be given top priority.
3) 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.
4) One of the member highlighted that coverage of water supply in the city should be increased and water treatment plant should also be establish in the city.
5) One of the CSTF member Bhagwan Das expressed his view on depletion of ground water and said to take necessary action regarding this. He wants more emphasis on sanitation and also expressed their feeling on quality of water supplied, related health problems and the availability of ground water is not too good for drinking purposes.
6) One of member highlighted the unsystematic disposal of solid waste and waste water from households in empty plots and low lying areas will lead to contamination of ground water and the same should be checked immediately.
7) One of the CSTF member Nitin Verma highlighted problems related to pollution, water supply and solid waste faced by their natives in their respective ward.

8) One of Participants Manager (Chris School) highlighted lack of awareness in public about cleanliness behaviour. He also suggests the awareness generation particularly for sanitation and for stop the people those put there solids waste in to drains.
9) At the end Commissioner of Firozabad (Ramautar Raman) 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.
10) The chairman thanked the stakeholders for their participation and expressed that problems raised by participants will be resolved.

Figure 47: News of 7 Nov,

Coverage of CSTF Workshop by Print Media (30.12.2015)

शहर में स्वच्छता प्लान तैयार कर रही कंपनी

फिरोजाबाद | हिन्दुस्तान संवाद

स्वच्छ भारत मिशन के तहत नगर निगम के अंतर्गत आने वाले क्षेत्रों में सैनिटेशन कार्यक्रम को लागू करने के लिए दिल्ली की एक कंपनी को जिम्मेदारी दी गई है। कंपनी के प्रतिनिधि नगर क्षेत्र को पेयजल, शौचालय, सॉलिड वेस्ट प्रबंधन आदि कार्य लागू करने को प्लान तैयार करके देंगे। प्लान बनाने के लिए कंपनी की टीम आंकड़े जुटा रही है।

शहर में स्वच्छता और मूलभूत असुविधाओं को लेकर नगर निगम प्लान तैयार कर रहा है। इसके लिए दिल्ली की जेटी अरजा कंपनी को कार्ययोजना बनाने की जिम्मेदारी दी है। कंपनी के प्रतिनिधियों ने कार्य भी शुरू कर दिया है। शुक्रवार को प्रतिनिधि डाटा एकत्रित करने को विभिन्न सरकारी विभागों में जाते दिखे। कंपनी की अर्बन प्लानर नीलम खालसा और मदीहा

तैयारी

- दिल्ली की कंपनी को शहरी स्वच्छता का प्लान तैयार करने की जिम्मेदारी दी
- प्लान बनाने के लिए कंपनी की टीम आंकड़े जुटा रही

खान ने बताया कि कंपनी के प्रतिनिधि नगर क्षेत्र के हर हिस्से में घूमकर पेयजल, तरल एवं ठोस द्रव्य प्रबंधन, ड्रेनेज सिस्टम आदि की समस्या दूर करने को कार्ययोजना तैयार करेंगे। कंपनी पहले सर्वे कर आंकड़े जुटाती है, फिर कार्यक्रम तैयार होता है। उसको लागू कराने का कार्य नगर निगम का होता है। उदाहरण को जिस स्थान पर पेयजल की समस्या है, वहां टंकी या पाइपलाइन, जहां शौचालय नहीं हैं वहां शौचालय आदि के कार्य कराए जाते हैं।

नगर को स्वच्छ बनाने को सहयोग की जरूरत

फिरोजाबाद | हिन्दुस्तान संवाद

बैठक

- सिटी सेनीटेशन प्रोग्राम के तहत संबंधित संस्था जीटी ऊर्जा काम कर चुकी पूरा
- बैठक में शहर के लोगों से सुझाव लिए गए

निकाय और निगमों के लिए अनिवार्य सिटी सेनीटेशन प्रोग्राम को लेकर पालीवाल ऑडीटोरियम में नगर आयुक्त की अध्यक्षता में बैठक हुई। जहां शहर के लोग उपस्थित हुए। लोगों से सुझाव लिए गए कि शहर की सफाई व्यवस्था और भी बेहतर कैसे की जा सकती है। इस बीच संबंधित संस्था जेटी ऊर्जा के पदाधिकारियों ने भी प्रोजेक्ट के संबंध में विस्तार से जानकारी दी। नगर आयुक्त ने कहा कि नगर को स्वच्छ बनाने को लोगों के सहयोग की जरूरत है।

नोएडा की संबंधित संस्था जेटी अरजा ने शहर के तमाम वार्डों में सर्वेक्षण कर अधिकतम फील्ड वर्क तो पूर्ण कर लिया है। अब लोगों से सुझाव लेने का सिलसिला शुरू कर दिया गया है। मंगलवार को पालीवाल ऑडीटोरियम में पहली बैठक हुई। जहां लोगों से सुझाव लिए गए कि किन किन संसाधनों के माध्यम से शहर की सफाई व्यवस्था और भी बेहतर की जा सकती है। नगर आयुक्त रामऔतार रमन ने कहा कि सिटी सेनीटेशन प्रोग्राम शहर के लिए जरूरी है।

मंलवार को पालीवाल ऑडीटोरियम में आयोजित बैठक में अफसरों ने सिटी सेनीटेशन प्रोग्राम के बारे में बताया। • हिन्दुस्तान

जिसके तहत यह आंकलन किया जा रहा है कि शहर में क्या क्या व्यवस्थाएं हैं और किन किन व्यवस्थाओं की जरूरत है। इसी आंकलन के अनुसार डीपीआर तैयार कराया जाएगा। उन्होंने कहा कि नगर को स्वच्छ बनाने को लेकर हर संभव प्रयास किए जा रहे हैं लेकिन इसमें लोगों के सहयोग की भी जरूरत है। अपर नगर आयुक्त प्रमोद कुमार ने कहा कि स्वीकृति के लिए डीपीआर बनाकर शासन को भेजा जाएगा। स्वीकृति मिलने के बाद धन आवंटित होगा और फिर संसाधन उपलब्ध कराए जाएंगे। जैसे किस क्षेत्र में कितने वाहन की जरूरत है, कितने सफाई कर्मचारियों की जरूरत है। जीटी ऊर्जा के डायरेक्टर जावेद अहमद ने सिटी सेनीटेशन के बारे में बताया। इस अवसर पर सिटी मजिस्ट्रेट रविन्द्र सिंह, महाप्रबंधक (जलकल विभाग) वीएन द्विवेदी, एक्सईएन राजकुमार, जेई जलकल संस्थान पीके सिंह आदि मौजूद थे।

लोगों से भरवाए गए फार्म

बैठक में लोगों से फार्म भरवाए गए। लोगों से जाना गया कि फिरोजाबाद के सिटी सेनीटेशन प्लान का मुख्य लक्ष्य क्या होना चाहिए।

फार्म में कई प्वाइंट दिए गए थे। शहर की सफाई व्यवस्था से संबंधित महत्वपूर्ण मुद्दे क्या हैं। शहर में स्वच्छता से संबंधित महत्वपूर्ण किन परियोजनाओं को लागू किया जाना चाहिए यह भी जाना गया।

एक एक प्वाइंट को लेकर बनी है रिपोर्ट

हर एक मोहल्ले को लेकर अलग अलग रिपोर्ट बनाई गई है। एक एक प्वाइंट को लेकर रिपोर्ट बनवाई गई है जैसे नाले नालियों की चौड़ाई क्या है, किस क्षेत्र में कौन कौन से वाहन सफाई व्यवस्था को लेकर जा सकते हैं, क्षेत्र में वाटर सप्लाई की क्या स्थिति है आदि।

सिटी सेनिटेशन प्लान को जानी राय

- जेपी ऊर्जा की टीम ने जुटाए आंकड़े कार्ययोजना की तैयार होगी डीपीआर
- स्वच्छ भारत मिशन के तहत सुहागनगरी में कराए जाएंगे कई जरूरी कार्य

जागरण संवाददाता, फीरोजाबाद : सिटी सेनिटेशन प्लान को अधिकृत कंपनी की टीम ने आंकड़े जुटा लिए है। इसको लेकर जनता की राय जानी जा रही है। इसी संबंध में मंगलवार को पालीवाल ऑडीटोरियम में टास्क फोर्स की कार्यशाला का आयोजन किया गया। यहां निवर्तमान सभासदों और नगर निगम अधिकारियों से भी जरूरी सुझाव मांगे गये।

स्वच्छ भारत मिशन के अंतर्गत हर एक शहर में सिटी सेनिटेशन प्लान तैयार होना है। इसी के तहत दिल्ली की जेपी ऊर्जा कंपनी द्वारा शहर में सर्वे कार्य कर संबंधित आंकड़े जुटाए है। इसके

सेनिटेशन की कार्यशाला में मंचासीन नगर आयुक्त रामऔतार रमन, सिटी मजिस्ट्रेट रवीन्द्र कुमार, अपर नगर आयुक्त प्रमोद कुमार, जलकल संस्थान के महाप्रबंधक वीएन द्विवेदी।

अंतर्गत आपूर्ति, जल निकासी, कूड़ा प्रबंधन, सीवरेज सिस्टम, खुले में शौच से मुक्ति को शौचालय निर्माण आदि कार्य कराए जाने है। इन समस्याओं के निदान को सेनिटेशन प्लान तैयार किया गया है, जिसके लिए उपस्थित प्रमुख लोगों से सुझाव भी मांगे। नगर आयुक्त राम औतार रमन ने बताया सिटी सेनिटेशन प्लान तैयार करते हुए डीपीआर केंद्र सरकार को भेजी जाएगी। धनराशि अवमुक्त होने के बाद महत्वपूर्ण कार्य शुरू कराए जाएंगे। कंपनी के निदेशक जावेद खान ने बताया सिटी सेनिटेशन के तहत दीर्घ व लघु योजनाएं बनाई जाएंगी। इसके अंतर्गत सफाई, सुंदरीकरण, पानी की निकासी, सीवरेज, कूड़ा प्रबंधन आदि कार्य कराए जाएंगे। दीर्घ योजनाएं धनाभाव में प्रभावित न हों इसलिए केंद्र ने राज्य सरकार के समन्वय से केंद्रीय शुल्क में .5 फीसद इजाफा किया गया है। उन्होंने यह भी बताया शहर में करीब 15 हजार ऐसे मकान है, जिनमें शौचालय नहीं है। यहां इनका निर्माण कराना होगा। दो अक्टूबर,2019 तक शहर को साफ और स्वच्छ बनाना है। कार्यशाला में मुख्य रूप से अपर नगर आयुक्त प्रमोद कुमार, जलकल महाप्रबंधक वीएन द्विवेदी, लेखाधिकारी अक्षय कुमार, जेपी ऊर्जा कंपनी के निदेशक जावेद अहमद, एक्सपर्ट अर्बन प्लानर मदिहा खान व नीलम आदि मौजूद रहे।

बैठक में मौजूद नगर निगम के कर्मचारी और निवर्तमान सभासद।

Executive Summary on Firozabad Visit

Visit date: 28, Oct., 2015, 2 Nov.2015, 6 Nov.2015, 18 Nov 2015 and 21Dec 2015

Site name: Firozabad, Dabrai

Visit purpose: Data collection and meeting with Nagar Nigam officers

Visitor: Neelam Khalsa (Urban Planner), Madiha Khan (Urban Planner), Dhirendra (Ass.Engineer)

FIRST METTING (28, Oct., 2015) Meeting to Commissioner (Mr. Ramautar Raman) and Secretary (Mr. Pramod Kumar) but both was not there. Then we meet executive engineer (Mr. Rajkumar) regarding M.C boundary and ward wise area details and other C.S.P data.

SECOND METTING (2 Nov.2015) meeting Commissioner (Mr. Ramautar Raman) and Secretary (Mr. Pramod kumar), executive engineer (Mr. Rajkumar) and Mr. V.N. Dwivedi (G.M. Jalkal) and there other technical staff also present there. Sir Commissioner) in evening we meet Secretary (Mr. Pramod kumar) for detail discussion about workshop date and remaining data and he finalize the 20 November 2015 for workshop. After that we return Noida at 8:30 P: M.

THIRD MEETING (18 Nov.2015) meeting with Commissioner (Mr. Ramautar Raman) and discuss about the data of all indicators and called Indu Bala (DUDA) for slum data which she said to mail us, Than we meet Ajay Kumar (Sanitary Inspector) who calculated all the data by himself, meet Ahsanul Haque (Jalkal) for the verification of water supply data, Executive Engineer (Mr. Rajkumar) with whom we discuss about the Drainage data and called Ajay Misra to give merged villages name. Mr Tarun Kumar (Education Officer) also provides school related data to us. Then we go for the field visit, took photographs from Kaushal Nagar and Mathura Nagar.

FOURTH METTING (21 Dec.2015) Meeting with D.M (Vijay Kiran Anand) regarding brief introduction about city sanitation plan of Firozabad

ANNEXURE-2: Survey Questionnaire

Personal information

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

Ward No.:_____ Employment Type: _____ Zone: ___ Income Category: _____

Q. No.	Questions	Responses	Count
I.	**Sanitation System**		
1.	Is there toilet facility available in house?	Yes	
		No	
		Total	
	Type of Toilet (Wet-Flush/dry- soak pit)		
2	If yes. a. How many members of household use it? b. Is the toilet shared by houses OR Individuals?		
3	If No, do you use a public/community toilet OR defecate openly?		
4.	Are there community toilets/ Urinals in your locality?	Yes	
		No	
		Total	
4a	**If Yes:**		
	What is the condition of the public toilet?		
	Who is responsible for maintenance of the public toilet?		
	Are there any user fee/charges for the usage of public toilet?		
	If yes, what are the charges?		
	How many people use the public toilet		

	(average daily number of visitors)		
	Any toilet for physically disabled persons in your community		
4b.	**If Not**, are you willing to contribute to such facilities?	Yes	
		No	
		Total	
6.	Will you also contribute to O&M of such facilities?	Yes	
		No	
		Total	
7.	What type of toilet do you use and where the waste is disposed?	Open drains	
		Manual Scavenging	
		Septic Tank (if yes, go to section …)	
		Connected to sewerage system (if yes, go to section II)	
II.	**Sewerage System**		
1.	Do you have sewer connection?	Yes	
		No	
2.	If yes, what is the cost of the connection you paid?		
	Any monthly fee?		
3.	If no, are you willing to pay for sewerage connection and how much?	Yes	
		No	
4.	Do you face any problem with your sewer connection?	Chocking	
		Frequent leakage/rupture	
		Foul smell	
		Overflowing in rainy season	

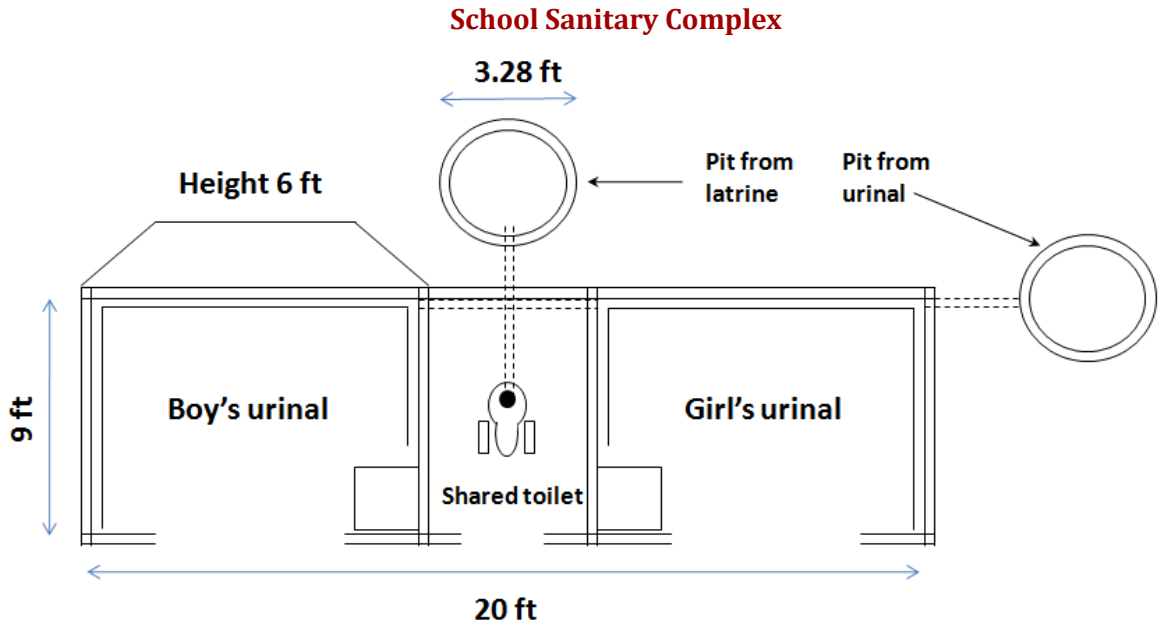
5.	Who is responsible for cleaning the sewerage system of your locality?	Pvt./ Municipality/any other agency	
6.	How often the corporation people visit you for health/sewerage purpose	Quarterly Half yearly Annually Need base When complaint is made	
	Where does the sewage go from your place	STP/open drains/storm drain/river/any other	
III.	**Septic Tanks**		
1.	Are you connected to individual septic tank or community septic tank?		
2.	Who manages the septic tanks?	Municipal corporations Community initiatives Individuals No One	
3.	How often do you get the septic tank cleaned?	Once in a year Once in two years Once in three years Not yet done	
4.	How much do you pay for septic tank cleaning to MC or community initiatives?		
5.	Where is septic tank waste disposed of?	STP Open drain/ open space	

		Don't know	
IV.	**Water Supply**		
1	What is the source of water supply?	Nagar Nigam	
		Bore –well	
		Private tankers	
		others	
2	What is the frequency of water supply?	< 2 hours	
		2-4 hours	
		4-8 hours	
		>8 hours	
3	What is the quality of water supplied?	Always poor	
		Occasionally poor	
		Good	
4	Do you have your own house water connection?	Yes	
		No	
5	What is the adequacy of water supply?	Sufficient	
		Not sufficient	
	V. **Solid Waste Management**		
1	Where do you dispose your household solid waste?	In drain	
		In open	
		To nominated agency/ scheduled collection	
		Waste containers/ community bins	
2	How far is the place, where Solid waste is dumped?	< 100 mts	
		100-200 mts	
		200-500 mts	
		>500 mts	

3	How often the garbage is collected by ULBs?	Once in a day	
		Once in two days	
		Once in three days	
		Never picked up	
4	Do you have domestic animals?	Yes	
		No	
5	Where do you dispose the animal waste?	In open	
		Use at home	
		Dispose with other waste	
		Outside the city	

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.

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

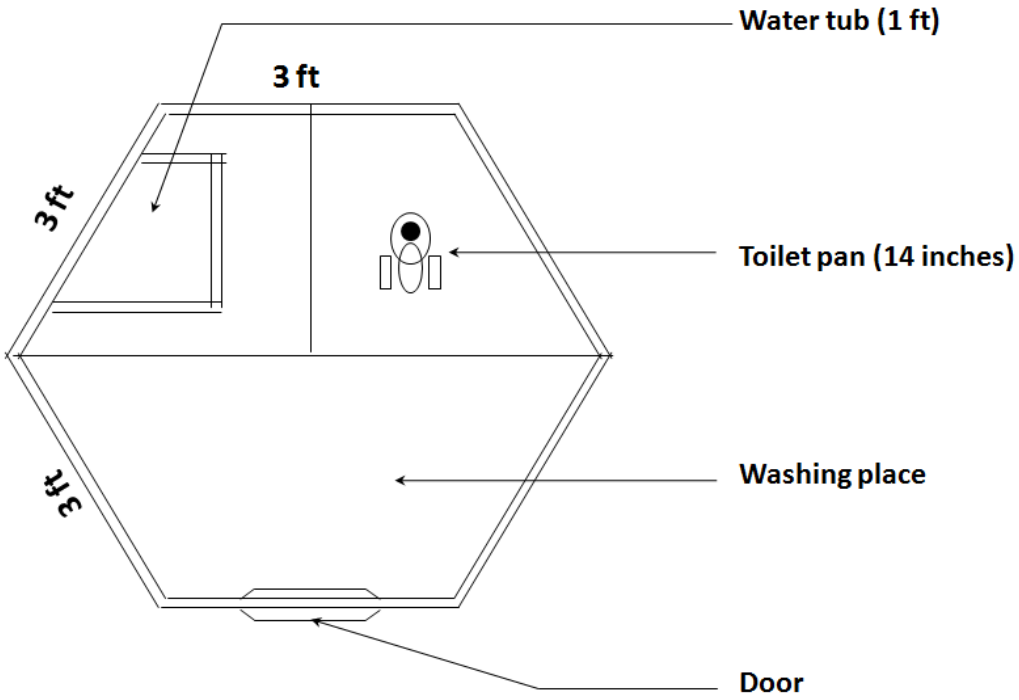
8. Incinerator should be installed in girls toilet for menstrual hygiene management

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

Anganwadi Toilet



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
10.	Transport charges	…..	….	500.00
	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

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;

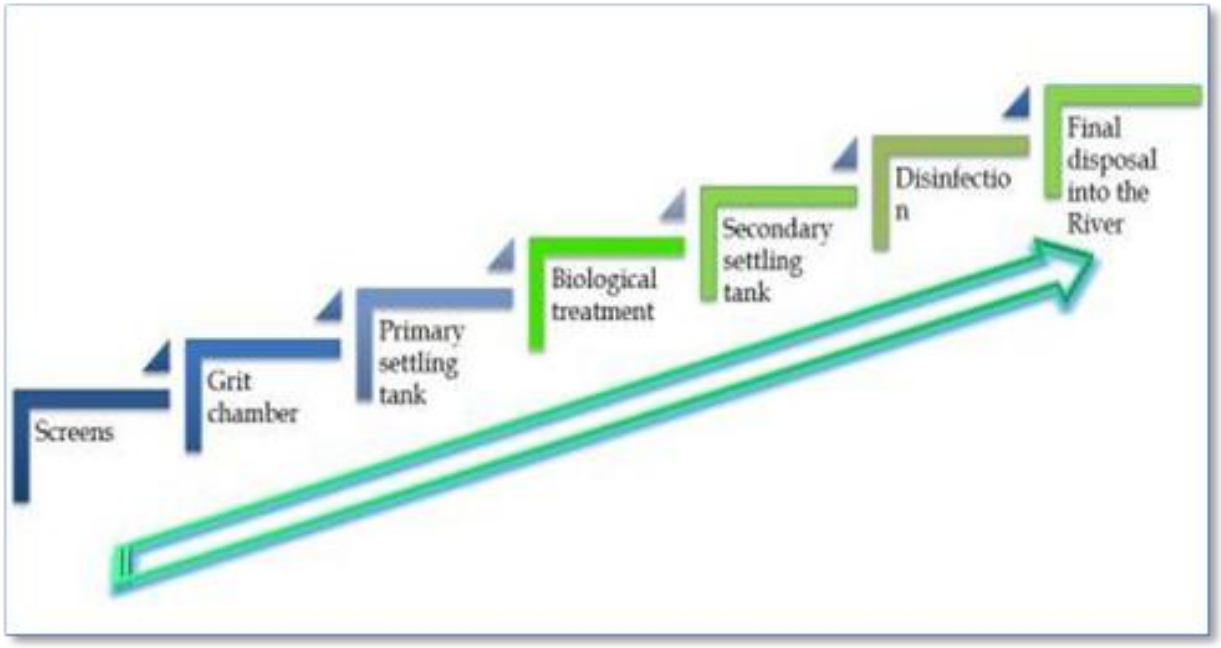
b. Secondary treatment system mainly consists of biological treatment systems.

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 to10 days, and slowly cool off back to ambient temperatures as the biological decomposition is completed. Systematic turning of the material, which mixes the different components and aerates the mixture, generally accelerates the process of breaking down the organic fraction, and a proper carbon/nitrogen balance (carbon to nitrogen or C/N ratio of 20:1) in the feedstock insures complete and rapid composting. The composting process takes from 17 to 180 days. For composting process, the moisture content of the MSW should be ideally > 45%. There are two fundamental types of composting techniques: open or windrow composting, which is done out of doors with simple equipment and is a slower process, and enclosed system composting, where the composting is performed in some enclosure (e.g., a tank, a box, a container or a vessel).

ANAEROBIC DIGESTION

In anaerobic digestion (AD), biodegradable material is converted by a series of bacteria groups into methane and 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 in organics, 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.