CRISIL INFRASTRUCTURE ADVISORY

CRISIL Risk and Infrastructure Solutions Limited

Japan International Cooperation Agency

Final City Sanitation Plan for Lucknow

July 2011

Abbreviation

Acronym	Term
ARV	Annual Rental Value
BMC	Bhubaneswar Municipal Corporation
BOT	Build Operate and Transfer
CAGR	Compounded Annual Growth Rate
CAPEX	Capital Expenditure
CDP	City Development Plan
CDRI	Central Drug Research Institute
CDS	City Development Plan
CIMAP	Central Institute of Medical and Aromatic Plants
CPHEEO	Central Public Health and Environmental Engineering Organisation
CRIS	CRISIL Risk & Infrastructure Solutions
CSP	City Sanitation Plan
CSTF	City Sanitation Task Force
CWD	Community Waste Depots
DPR	Detailed Project Report
DUDA	District Urban Development Authority
ETP	Effluent Treatment Plant
EWS	Economically weaker Section
FAB	Fluidised Aerobic Bio-Reactor
FOP	Financial Operating Plan
GDP	Gross Domestic Product
GIS	Geographical Information System
GOAP	Gomti Action Plan
GOI	Government of India
HIG	High Income Group
HUDCO	Housing and Urban Development Corporation
IEC	Information Education Communication
IIT	Indian Institute of Technology
ILCS	Integrated Low Cost Sanitation

Acronym	Term
ITRC	Industrial Toxicology Research Centre
JICA	Japan International Corporation Agency
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
LDA	Lucknow Development Authority
LIG	Low Income Group
LJS	Lucknow Jal Sansthan
LNN	Lucknow Nagar Nigam
LUA	Lucknow Urban Agglomeration
MIG	Middle-Income Group
MIS	Management Information System
MLD	Million Litres per day
MOA	Memorandum of Agreement
MSW	Municipal Solid Waste
MTV	Mobile Toilet Van
NBRI	National Botanical Research Institute
NEDA	Non-Conventional Energy Development Agency
NEERI	National Environmental Engineering Research Institute
NGO	Non Government Organisation
NHDC	National Handloom Development Corporation
NUSP	National Urban Sanitation Policy
OPEX	Operating Expenditure
PPE	Personal Protection Equipment
PPP	Public Private Partnership
PWD	Public Works Department
RAY	Rajiv Awas Yojana
RCC	Reinforced Cement Concrete
RCUES	Regional Centre of Urban and Environmental Studies
SAR	Situational Analysis Report
SJSRY	Swarna Jayanti Shahari Rozgar Yojana
SPGIMS	Sanjay Gandhi Post Graduate Institute of Medical Sciences
SPS	Sewerage Pumping Station
STP	Sewerage Treatment Plant

Acronym	Term
SUDA	State Urban Development Authority
SWM	Solid Waste Management
TCS	Tata Consultancy Services
TPD	Tons per day
UGD	Under Ground Drainage
ULB	Urban Local Body
UPAVP	Uttar Pradesh Awas Vikas Parishad
UPJN	Uttar Pradesh Jal Nigam
UPPCB	Uttar Pradesh Pollution Control Board
USAID	United States Agency for International Development
WHO	World Health Organization

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1. Executive summary

1.1 City Sanitation Plan

1.1.1 Interventions required to improve Sanitation Situation in India immediately

In India, four million (7.87%) urban households do not have access to latrines and defecate in the open. 12.47 million (18.5%) households are not connected to a drainage network, and 26.83 million (39.8%) households are connected to open drains. The condition of the urban poor is even worse. The percentage of notified and non-notified slums without latrines is 17% and 51%, respectively. More than 37% of the total human excreta generated in urban India is not disposed off in a safe manner. This scenario leads to significant public health and environmental costs for urban areas that contribute to more than 60% of the country's GDP. The impact of poor sanitation is especially significant for the urban poor (22% of the total urban population), women, children, and the elderly.

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 enable 100% access by 2025. This implies extending coverage to households without adequate sanitation and providing proper sanitation facilities in public places to make cities open defecation-free. This task is expected to get more challenging due to the increasing urbanization of India. According to Census 2001, 27.8% Indians, i.e., 286 million people or 55 million households live in urban areas; projections indicate that the urban population grew to 331 million people by 2007 and will grow to 368 million by 2012.

The Ministry of Urban Development, Government of India (GOI), recognizes the extent of this challenge and has launched the National Urban Sanitation Policy (NUSP), which aims to transform urban India into community-driven Nirmal Shahars, or totally sanitized, healthy, and liveable cities and towns. A key input for this is the preparation of a city sanitation plan (CSP) that identifies institutional and infrastructural gaps and recommends an overarching strategy for safe management of human excreta and solid waste and safe disposal of industrial and other specified hazardous wastes.

In the light of the above facts, Japan International Cooperation Agency (JICA), an independent international agency, which is acting as a development partner to the Ministry of Urban Development in this endeavour, has appointed CRISIL Risk & Infrastructure Solutions Limited (CRIS), to prepare the CSP for the city of Lucknow.

1.1.2 JICA Assistance

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1.1.3 Lucknow: Profile of a rapidly growing city

The city of Lucknow is spread over a total area of 333.5 sq.km. and has a population close to 28.55 lakhs. The densely populated areas of the city are situated on the southern bank of the Gomti River, while on the northern bank, planned colonies, viz., Indira Nagar, Maha Nagar, Vikas Nagar, Aliganj Housing Scheme, and Nirala Nagar, have been developed. According to the Census, 22% of the migrants from rural areas and 27% from urban areas cited 'employment' as the reason for migrating to Lucknow. The rapid increase in population has resulted in stress on the existing infrastructure and urban services, causing constrained living conditions, especially in the older parts of the city. Based on discussions with Lucknow Nagar Nigam (LNN), it is estimated that the population of LNN in 2009 is approximately 28.50 lakhs which is close to 2011 Census' provisional figures. The city's population is expected to grow at a 3.5% to 4.3% aided by migration and plans of the state government to make Lucknow an investment centre. Growth in the city's population is expected to increase the stress on Lucknow's urban infrastructure.

1.1.4 Data and Consultation intensive methodology Adopted

The methodology for preparing the CSP entailed preparing a Situation Analysis Report (SAR), which was a diagnostic study aimed at identifying the key issues that affect development of sanitation infrastructure and provision of sanitation services in Lucknow.

A consultative and data-intensive approach was adopted for preparing SAR. The first step involved briefing the key officials of the Lucknow Nagar Nigam (LNN), and Jal Kal Vibhag, LNN (earlier Lucknow Jal Sansthan), and other parastatals about CSP, its contents, its approach to preparation, and outcomes. This was followed with a round of meetings with senior officials to obtain their views on the sanitation infrastructure of the city and the challenges facing the same.

Simultaneously, the following activities were also undertaken:

- Review of the detailed project reports (DPRs) of upcoming projects in the water and sanitation infrastructure sectors
- Analysis of the financials of LNN and Jal Kal Vibhag
- Preparation for the launch of the primary survey

The primary survey assisted in obtaining a first-hand understanding of the status of sanitation infrastructure in Lucknow. It should be noted that the questionnaire used in the primary study was tested through a pilot study, and LNN's concurrence on both the questionnaire and the locations where the study would be conducted was obtained. The primary survey consisted of a reconnaissance survey in all the zones of Lucknow and a field survey involving structured interviews

with 1,780 respondents. The respondents comprised households, slum households, commercial establishments, industries, hospitals, and public and educational institutions. Based on the above, a set of key issues associated with sanitation infrastructure were identified and documented for preparing SAR.

A number of consultations were held after the submission of SAR. The consultations initiated with a meeting with the State Urban Development Ministry, chaired by the Principal Secretary. The meeting discussed at length the issues that were identified in SAR and the process for preparing the CSP. This meeting was followed by discussions with the City Sanitation Task Force (CSTF), citizen groups and NGOs active in Lucknow. The discussions assisted in finalizing the 'vision and objectives' for CSP and the key sanitation issues that needed to be resolved in the CSP.

After completing the above round of consultations prepared the interventions, i.e., technological and non-technological solutions for resolving sanitation issues. The guiding philosophy was to develop interventions that will assist in achieving the CSP vision/objectives. At this stage, CRIS also had discussions with experts at IIT Kanpur to obtain suggestions on sanitation technologies that can be deployed in Lucknow. Subsequently consultations on the proposed interventions were held with select officials from CSTF and NGOs and a Draft CSP was prepared. Post preparation of Draft CSP wider round of consultations were held with the CSTF, LNN, Jal Kal Vibhag and NGOs. Based on the comments received the CSP was finalized.

1.2 Road Map for CSP

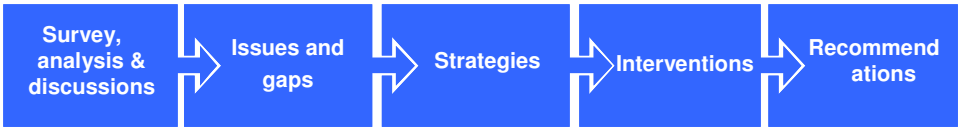
1.2.1 Vision & Objectives of Lucknow CSP

After a series of discussions with various stakeholders, CSTF, and the citizens of Lucknow, the vision and objectives of the Lucknow CSP were outlined. The vision of the city as articulated by its stakeholders was: "Lucknow aspires to be among the best cities in India to live in by providing universal access to sanitation facilities, especially to the under-privileged; increasing the awareness of citizens about linkages between sanitation and public health; and ensuring sustainability and coordination amongst institutions providing these facilities." To achieve this vision, a set of objectives was formulated along four broad aspects, namely infrastructure, institutional, financial, and social.

The chief objectives were to ensure that Lucknow became 100% open-defecation free by 2015 and there was 100% collection and scientific disposal of solid and liquid wastes generated in the city of Lucknow by 2015. Also, the objectives included instituting processes that allowed for expansion of sanitation services along with the growth of the city; augmenting the recovery of costs involved in the provision of sanitation services; developing a mechanism for resource/cost recovery, through recycling and reuse of solid and liquid wastes; and increasing awareness amongst citizens on hygiene and health concerns in the city of Lucknow.

1.2.2 City-Wide Sanitation

The issue of safe sanitation has been approached as an interconnected system, i.e., from **"Awareness to Disposal".** The following approach and methodology has been adopted to arrive at the interventions and recommendations to improve the sanitation situation in the city.



In case of generation and collection, it has been observed that approximately 10% to 11% of the total households do not have access to individual toilets. Moreover, in the case of public toilets, the city has 2,656 toilet seats leading to 125 users per seat; again, Zones 3, 4 and 5 have extremely high number of users per seat and only 15% to 20% of the households have public toilets within walking distance of 100-200 meters. Insufficient number and poor condition of public toilets were major factors contributing to open defecation. Of the total population, around 7% to 10% resort to open defecation (OD) with Zones 3 and 5 reporting the maximum open defecation. In the case of collection, it was identified that around 40% to 50% of the total households are connected to sewer networks, while 45% to 55% are connected to septic tanks.

In the case of treatment and disposal, the data revealed that the city generates approximately 510 MLD of waste water per day of which approximately 40% to 45% is getting disposed off in the River Gomti without any treatment. At present, the city has been operating two Sewerage Treatment Plants of 56 MLD and 345 MLD capacities at Daulataganj and Bharwara respectively, treating approximately 280 to 300 MLD of waste water. However, there is no provision for re-use of treated waste water.

Though work under the JNNURM scheme to augment the capacity of the existing infrastructure and centralize the existing sewer network has already started, there are infrastructure gaps that are yet to be addressed. At present, the projects are in progress in Districts I and III with the work likely to be completed by March 2012; the projects in Districts II and IV are yet to be approved by the Government of India.

The strategies and interventions adopted to address the infrastructure gap and various issues are as follows:

- Individual Toilets – To bridge the gap of individual toilets, it has been suggested to promote household individual toilets wherever space is available through the development of two-pit toilets which require less space, are cost-efficient, and have many other advantages over the other form of toilets. Moreover, the individuals can claim benefit under the ILCS Scheme of the Government of India which provides a solution to offset the investment required for the construction of such toilets.
- Public Toilets – To provide adequate number of public toilets at lesser cost and space, it has been suggested that LNN should promote the development of two-storey toilets. Moreover, for places such as fairs, functions, rallies and temporary markets, LNN can opt for Mobile

Toilet Vans (MTV). In addition to this, in the case of development of public toilets, LNN can opt for the development of zero discharged toilets based on the concept of isolating water bodies from human and animal excreta. This alternative practice is based on minimum or total absence of water for conveyance of waste, to avoid entry of faecal matter into the water bodies, and is referred to as dry sanitation or ecological sanitation (EcoSan).

- To ensure that public toilets are cleaned regularly and are kept in good condition, it has been suggested that the operation and maintenance of public toilets should preferably be outsourced on a PPP basis or through the involvement of Community-Based Organizations (CBO). The concept has already been adopted by the Municipal Corporation for Greater Mumbai (MCGM) and is yielding satisfactory results. The same has been discussed in detail in the relevant chapter.
- To overcome the challenge of safe disposal of human sludge, especially from narrow streets, it has been suggested that LNN can opt for Vacutug, a mechanized human sludge collecting, discharging and emptying machine.
- To ensure that septic tanks and the sewer network are cleaned regularly, it has been suggested that operation and maintenance of septic tanks and sewer network should preferably be outsourced on a contract basis in a longer period. Though in the short to medium term, LNN can opt for the purchase of various sewer cleaning machines such as sewer jetting-cum-suction machines, gully pit emptiers, and sewer rodding machines, and undertake O&M on its own.
- Studies need to be initiated on the preferred way for treating sludge and effluents that come out of STPs and also for ascertaining their use for industrial and other purposes. Moreover, it has also bee suggested that LNN can look for another landfill site for better management, disposal and treatment of sludge, which would certainly set off the load at the STP.
- Though the city is going to have a centralized sewer in the near future, it has been suggested that LNN should encourage the use of de-centralized treatment systems and the re-use of treated waste water for non-potable purposes. LNN should also provide incentives to malls, institutions, residential colonies and complexes who are implementing the same.

Furthermore, it is suggested that the above-mentioned interventions be implemented in a phased-out manner to achieve maximum results. For instance, LNN can initiate pilot projects through the purchase of Vacutug machines in a smaller number in the immediate term (six months to two years). Also, henceforth, based on the response from the pilot projects, LNN can undertake necessary studies to implement the project on a larger scale. In addition to this, LNN should also explore tie-ups with IIT Kanpur, IIT Varanasi and other such technical institutes thus utilizing their knowledge to develop on-going low cost technology interventions to solve the city's sanitation challenges.

1.2.3 Solid Waste Management: Addressing uncovered gaps

Lucknow Nagar Nigam (LNN) has adopted an integrated approach for solid waste management for the city. From the primary collection of the waste to its ultimate disposal of waste is covered under the project approved under JNNURM for Solid Waste Management (SWM) for Lucknow. LNN has signed a concession agreement with a private player for the implementation of the integrated Sold Waste Management project in the city. The total cost of the project is Rs.42 crores. It includes

complete door-to-door collection, setting up of a 250 MT compost plant, and the development of a sanitary landfill site. Apart from this, the private player is expected to invest Rs. 33 crores to set up an RdF unit. The private player has started collecting door-to-door waste from 63 wards out of 110 wards and the construction of the landfill site and the compost plant has been initiated. Currently, the average quantity of MSW is estimated to be around 1,400 MT/day (2011) and this is projected to increase to about 2000 MT/day in 2021.

In addition to the SWM project, a series of other measures would need to be implemented by LNN to achieve the CSP vision. LNN would be required to deploy separate vehicles to collect waste from commercial pockets and industrial pockets. Waste from hotels, restaurants, marriage halls, community halls, etc. would need to be lifted daily by deploying a set of separate motorised primary collection vehicles in commercial areas. All sources characterised by bulk generation of putrefying waste like vegetable, fruit and flower markets; meat and fish markets; and temples and gurudwaras would need to be provided with containers at convenient locations and with adequate capacity. Further, LNN should work with the concerned authorities in the Cantonment area to integrate their solid waste management system with the city's system.

LNN should evaluate the option of providing an adequate number of transfer stations at suitable locations which will help economise the cost of long haul and improve efficiency of operations. It is understood that LNN is proposing to construct four transfer stations. However, they should ensure that the stations proposed have space for future expansions also. LNN can explore the option of creating recycling centres in different municipal zones for separate collection of potentially reusable and recyclable waste, e.g., paper, plastic, rubber, and demolition waste. These centres shall also collect stock and safely dispose off hazardous waste generated in households, shops and establishments, institutions, etc.

LNN must take up a review of its existing bylaws, as applicable to MSW management, and identify areas for improvement in line with emerging challenges. LNN must introduce a system of monitoring and inspection by officials from other departments on a rotation basis in different wards of the city. Once the entire MSW management system is in place, LNN must commission a specialist agency for the preparation of a customized manual/guide book for its officials and for continuation of the agreed service levels/practices/operations in the event of transfers of officials, etc.

LNN must allocate adequate resources to ensure appropriate interventions for the management of personnel and their health and safety. These interventions will comprise short-term training courses round the year on a regular basis for all grades of MSW workers; regular medical check-ups of all MSW/sanitation workers; and provision of uniforms, caps with LNN logos, and personal protective equipment on a regular basis to impart a sense of identity to them. There is a strong felt need for LNN to take up orientation programmes for the benefit of municipal councilors as well as officials from all departments. The Government of Uttar Pradesh has created the post of an Environment Engineer for all urban local bodies as part of the JNNURM reform agenda. LNN should leverage this decision and ensure that the Environment Engineer is in charge of the Solid Waste Department. The Municipal Health Department may be given the responsibility for monitoring the effectiveness of the MSW management operations.

Further, to ensure the sustained success of the initiatives planned under CSP, it is necessary for LNN to take up mass public awareness campaigns as well as regular citizens' consultations. The awareness campaigns will not only attempt to motivate residents to take up source segregation, but will also attempt to develop the culture amongst the citizens of the Lucknow to dispose municipal solid waste in an appropriate manner and promote initiatives such as home composting and segregation of waste.

LNN must adopt a system of organizing regular consultations with stakeholders on the issues of CSP, management of solid waste, environmental sanitation, public health and hygiene, quality of life, and urban governance/development in general. These are expected to foster transparency and thereby participation in LNN's initiative. The feedback received from these consultations will help in optimizing resources and improving service levels regularly.

LNN should simultaneously implement all the measures at the city and community levels for minimising waste loads destined to the sanitary landfill site. By adopting this strategy, LNN will comply with the MSW Rules, 2000 and achieve the CSP vision over time.

1.2.4 Institutional Interventions: Creating a platform for improving coordination between multiple agencies

The institutional landscape in Lucknow includes a number of institutions, besides LNN, that are responsible for the governance of the city and for providing urban infrastructure and services to its citizens. Apart from the local institutions, various departments and agencies of the state government play important roles in the provisioning of sanitation infrastructure. Multiple agencies are involved in the creation and maintenance of sanitation assets. There needs to be a convergence between the planning and delivery of urban infrastructure development and management functions. This ensures effective linkages between asset creation and asset management so that the infrastructural services created in the cities are not only maintained efficiently but also become self-sustaining over time. Hence, as a short-to-medium-term solution, an option could be explored to formalize the City Sanitation Task Force (CSTF) into a body that will drive the sanitation agenda for Lucknow and overcome the institutional fragmentation of roles.

CSTF is expected to be a forum where plans and investments are reviewed on an ongoing basis to ensure their relevance with ground realities such as water availability, emerging socio-economic profile of the zone, and available technological options. Accordingly, CSTF will enable coordination between different agencies as all investments presently being undertaken/planned for the future and their linking with the city's existing infrastructure.

There has been an increased focus on the development of sanitation technologies on account of the linkage between sanitation and economic development. This has led to a number of innovations. CSTF is expected to channelize these innovations for resolving Lucknow's sanitation challenges through collaborations with bodies such as the Indian Institutes of Technology and the Regional Centre for Urban and Environmental Science (RCUES).

Besides engaging and building the capacity of the agencies involved in sanitation, CSTF will also be required to raise the awareness levels of citizens about their roles in achieving Lucknow's sanitation

vision. CSTF is expected to monitor the progress of the IEC campaign, and to work with agencies such as the Resident Welfare Associations and NGOs to improve the effectiveness of the campaign and take corrective measures whenever required.

Plans require to be monitored to succeed. Indicators have been suggested in the Sanitation and MSW sections of the CSP. These track the progress of Lucknow in achieving the CSP vision. CSTF can revise and expand the list of indicators. CSTF is expected to set annual targets for achieving the indicators, review progress and deliberate on the measures required for achieving the targets.

Lastly, CSTF will house a database on geo-technical, socio-economic, and other aspects of Lucknow. The lack of this data is a key gap in developing effective interventions in the sanitation sector.

CSTF shall be assisted by a City Sanitation Cell and a Code of Conduct Manual for implementing the above agenda. The City Sanitation Cell is envisaged to play the role of a 'secretariat' which will support the following operations of CSTF. The Code of Conduct Manual would document guidelines for location and prioritization of investments, sharing of plans, resolution of disputes, etc. to aid the day-to-day functioning of the CSTF.

1.2.5 Awareness Campaigns: Involving citizens in implementing the CSP

The need for an IEC strategy for CSP, Lucknow, emerges from the analysis of data on sanitation and hygiene awareness at the household level as well as the study of the existing waste disposal practices of households and industrial, commercial, and institutional establishments, and also hospitals. Snapshots of the undesirable practices that are prevalent in Lucknow are presented below:

- Households with access to toilets with septic tanks revealed the practice of manual cleaning of septic tank sludge (i.e., by hiring manual labour) and unsafe dumping of sludge by all such households. Further, 40% of general households and 72% of slum households reported dumping solid waste in open spaces; this is partly attributable to the lack of access to door-to-door collection service and/or access to community bins.
  - Almost all industries surveyed mixed industrial waste with municipal waste and around 82% of them were disposing it in open spaces.
  - Among hospitals, the survey finding reveals that close to ~25% of the hospitals surveyed are mixing hospital waste with municipal waste and around 8% of them are disposing the same in open spaces.

Successful implementation of the CSP is possible only if there is awareness among the citizens. Thus, creating awareness becomes the first and most crucial step in the strategy to draft the City Sanitation Plan. As a key first step to formulate an awareness generation strategy for Lucknow CSP, different types of consumers in the city were identified; these have been categorized below.

Category	Sub-Category
Households	Households residing in: ▪ Notified and non-notified slums

Category	Sub-Category
	▪ Illegal housing colonies ▪ Urban villages located within the city and on the outskirts ▪ Core areas (old parts of the city) ▪ General areas ▪ Areas with floating population
Commercial units	▪ Bulk generators of waste (e.g., hotels, malls, etc.) ▪ Smaller, unorganised shops and establishments
Industries	▪ Large Industries ▪ Medium Industries ▪ Small Industries
Slaughter houses	▪ Organized LNN slaughter houses ▪ Small butcher operated shops/units

Within each category, priority sub-category groups were identified whose activities had a significant negative impact on the environment. For instance, among hospitals, the target group was smaller hospitals/dispensaries/nursing homes that tended to practice unsafe disposal of medical waste; among industries, those discharging industrial effluents were to be targeted in the IEC campaign. The following table provides indicative sanitation challenges in each category, interventions to overcome them, and aspects targeted in the IEC campaign.

Category	Priority	Interventions	Aspects Targeted in Campaigns
Households *	1] Open Defecation 2] MSW disposal in open spaces 3] Segregation of waste 4] Unsafe disposal of waste water	1] Mohalla campaigns, street plays, 2] Campaigns in government schools/schools located close to slums 3] Campaigns in hospitals/clinics near slums 4] Engaging with local religious leaders, trade associations/communities	1] Health and Hygiene Practices 2] Behaviour Change 3] Solid waste management practices 4] Provision of information services by LNN 5] Construction of toilets for servants by housing societies, cost and benefits associated with the same
Commercial	1] Dumping of solid waste in the open. Solid waste is not	1] Engaging with trade associations 2] Publishing the name of	1] MSW Practices, e.g., waste segregation, disposal and treatment at source

Category	Priority	Interventions	Aspects Targeted in Campaigns
	segregated. 2] Lesser than required number of public toilets 3] Septic tank maintenance	serial defaulters in newspapers 3] Giving fiscal benefits for composting, recycle, and reuse	2] Septic maintenance – ill-effects of not maintaining septic tanks 3] In situ treatment of waste by bulk generators such as malls/hotels
Industrial	1] Treatment of effluents prior to their discharge	1] Engaging with Industries association 2] Giving fiscal incentives for treating and reusing waste 3] Using community pressure -- publishing names of serial defaulters	1] Awareness about 'polluter pays principle' 2] Awareness of penalties and incentives for treating/not treating waste 4] Impact on environment caused by not treating waste
Hospitals	Preventing contamination of MSW and bio medical waste	1] Engaging with local medical associations 2] Displaying waste management process in prominent locations in hospitals/clinics 2] Community pressure -- Publishing names of serial defaulters	1] Hazards of mixing bio-medical waste and MSW 2] Information on private contractors handling bio-medical waste
Slaughter-house	Preventing disposal of slaughter-house waste with MSW	Increasing awareness on waste management through community/religious leaders	Hazards of present system of waste disposal

LNN/CSTF shall oversee the IEC campaign while the responsibility for coordinating the implementation of the CSP IEC Campaign shall rest with the umbrella NGO, which will co-ordinate campaign implementation by local NGOs/CBOs and community groups.

The design of the campaign shall have two components: (1) Design of capacity-building programmes for IEC implementation (training of trainers programmes), and (2) Design/conceptualization of the campaign itself, i.e., logo/slogans, and advertisements. The campaign shall be designed as an intensive campaign for the first five years and will be reviewed in the fourth year of implementation to determine future areas of focus. The campaign's focus may need to be redefined continuously over the period of the CSP implementation, reducing the intensity (and resource requirements) after

the initial phase. The IEC Campaign will also include an 'Awards' component with categories such as the cleanest ward, the cleanest school, the best sanitation worker and may also be given to best Parishad. There can also be an exchange program within the wards, wherein the Parishad would take over the on-going works in the other wards that shall also enable the wards to learn and adopt different things. These awards will seek to reinforce desired behavior by providing rewards such as reduction in municipal taxes and recognition of councillors/municipal staff among others, and thus facilitate greater citizen participation in the CSP process.

1.2.6 Financial Analysis: Urgent need to drive revenues

Further, a detailed financial model has been developed to depict the financial position of LNN. The model can be used to calculate future surpluses under various scenarios involving combinations of internal revenue improvement, state support, and financing terms. The Financial Operating Plan provides the direction on future revenue and expenditure streams based on the existing revenue and capital streams and also based on the ongoing and future (priority) projects of the ULB. It also provides a direction on the ability of the ULB to undertake further investments. The Financial Operating Plan projects that LNN has a high revenue deficit which has to be balanced by augmenting its revenue streams by optimizing its regular capital expenditure, raising user charges in the sewerage sector, and commissioning more projects on PPP (preferably PPP) to others to bridge the investment deficit. LNN would need to undertake a detailed study to determine the levers it can utilize to boost revenues and cut costs.

1.3 Way Forward

This document presents an in depth analysis of Lucknow's sanitation infrastructure and outlines the Broad strategies and Interventions to be adopted to achieve the desired Vision for the city of 'Lucknow'.

The ethos around which a City Sanitation Plan is put together is the notion of participatory planning. The planning process has to be a consultative one, with stakeholders representing a wide spectrum of interests taking part in the discussions and dialogue leading to the formulation of a vision and development objectives, identification of priorities etc.

Keeping this in mind, this Final City Sanitation Plan should be seen as 'work-in-progress plan' which is reviewed and improvised by the City Sanitation Task force and other key stakeholders based on the experience gained in implementing it, to ensure that the city achieves its vision.

2. INTRODUCTION

2.1 Background

It is widely recognized that a significant number of people in urban India do not have access to hygienic sanitation facilities. Four million (7.87%) urban households do not have access to latrines and defecate in the open. 12.47 million (18.5%) households are not connected to a drainage network, and 26.83 million (39.8%) households are connected to open drains. The condition of the urban poor is even worse. The percentage of notified and non-notified slums without latrines is 17% and 51%, respectively. More than 37% of the total human excreta generated in urban India are not disposed of in a safe manner. This scenario leads to significant public health and environmental costs on urban areas that contribute to more than 60% of the country's GDP. Impacts of poor sanitation are especially significant for the urban poor (22% of the total urban population), women, children, and the elderly. The loss due to diseases caused by poor sanitation for children under 14 years alone in urban areas amounts to Rs. 500 crores at 2001 prices (Planning Commission, United Nations Children's Fund, UNICEF, 2006). The discharge of untreated domestic/municipal wastewater has resulted in the contamination of 75% of surface water across India.

Despite the enactment of the 74th constitutional amendment, which sought to make urban local bodies (ULBs) responsible for sanitation, improvements in urban sanitation have been marginal. A key reason behind this is that sanitation has always been accorded low priority and there is poor awareness about its inherent linkage with public health.

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. This implies extending coverage to households without adequate sanitation and providing proper sanitation facilities in public places to make cities open-defecation free.

This task is expected to get more challenging due to the increasing urbanization of India. According to Census 2001, 27.8% Indians, i.e., 286 million people or 55 million households, live in urban areas; projections indicate that the urban population grew to 331 million people by 2007 and will grow to 368 million by 2012.

The Ministry of Urban Development, Government of India (GOI), recognizes the extent of this challenge and has launched the National Urban Sanitation Policy (NUSP), which aims to transform urban India into community-driven Nirmal Shahars, or totally sanitized, healthy, and liveable cities and towns. A key input for this is the preparation of a city sanitation plan (CSP) that identifies institutional and infrastructural gaps and recommends an overarching strategy for safe management of human excreta and solid waste and safe disposal of industrial and other specified hazardous wastes.

In the light of above facts, Japan International Cooperation Agency (JICA), an independent international agency, as a development partner to Ministry of Urban Development in this endeavour

has appointed CRISIL Risk & Infrastructure Solutions Limited (CRIS), to prepare the CSP for the city of Lucknow.

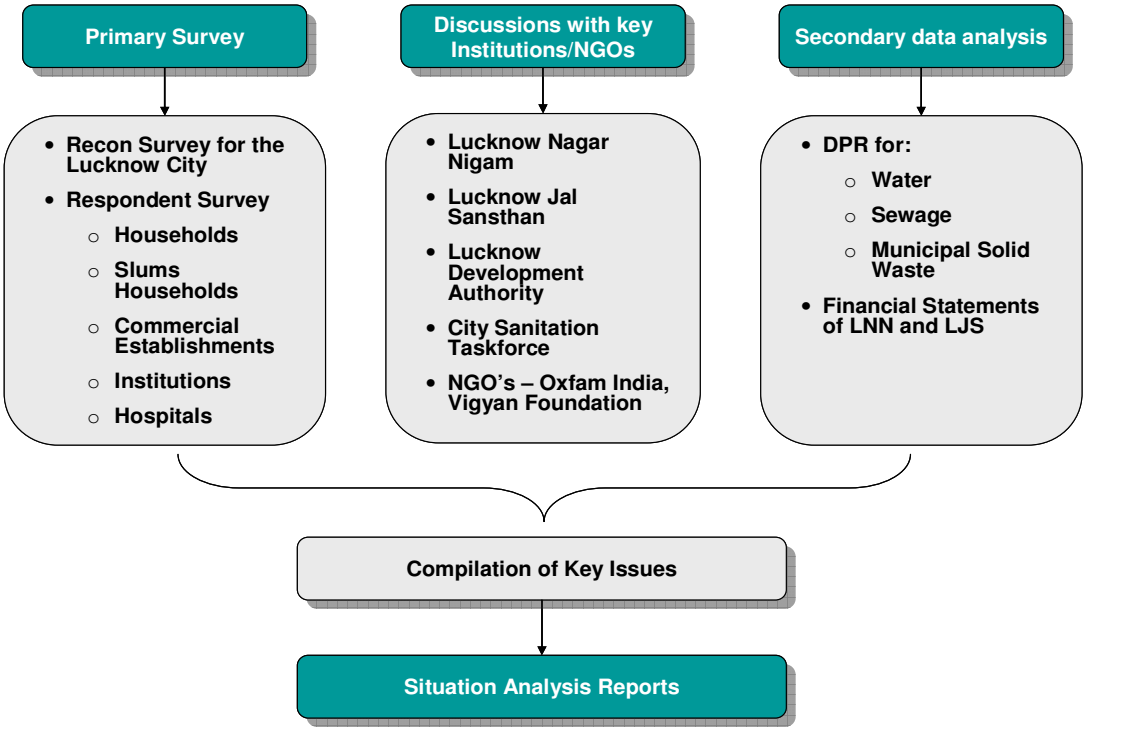
2.2 Methodology for Preparation of City Sanitation Plan

The methodology for preparing CSP comprised of two key milestones. The first milestone was preparing the situation analysis report (SAR), which was a diagnostic study that identified the key issues that affect development of sanitation infrastructure and provision of sanitation services in Lucknow. The second milestone was preparing the draft CSP, which articulates the vision and objectives for the city's sanitation and suggests interventions to achieve the vision and objectives. In the following section, the process for achieving the two milestones has been detailed.

2.2.1 Preparing SAR

The methodology for preparing SAR is presented in the following box chart and elaborated subsequently.

Figure 1: Methodology for preparing SAR



A consultative and data-intensive approach was adopted for preparing SAR. The first step involved briefing the key officials in Lucknow Nagar Nigam (LNN), Jal Kal Vibhag, LNN, and other parastatals about CSP, its contents, approach for preparation, and outcomes. This was followed with a round of meetings with senior officials to obtain their views on the sanitation infrastructure of the city and the challenges facing the same.

In parallel, the following activities were also undertaken:

- Review of the detailed project reports (DPRs) of upcoming projects in the water and sanitation infrastructure sectors
- Analysis of the financials of LNN and Jal Kal Vibhag
- Preparation for the launch of the primary survey

The review of DPRs assisted in understanding the projects that were being implemented and their impact. The analysis of the financials of LNN and Jal Kal Vibhag provided an insight into the trends in the growth of revenue and capital income and expenditure of the two institutions.

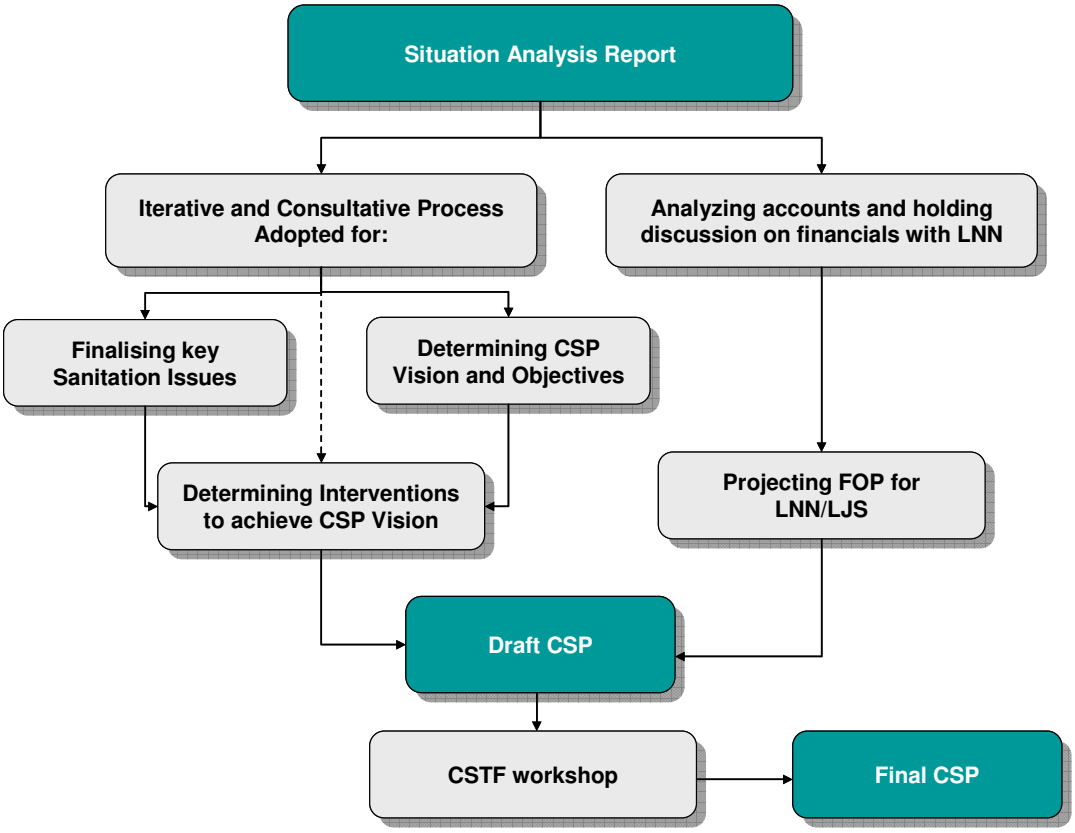
The primary survey assisted in obtaining a first-hand understanding of the status of sanitation infrastructure in Lucknow. It should be noted that the questionnaire used in the primary study was tested through a pilot study, and LNN's concurrence was obtained both on the questionnaire and the locations where the study would be conducted. The primary survey consisted of a reconnaissance survey in all zones of Lucknow and a field survey involving structured interviews with 1,780 respondents. The respondents comprised households, slum households, commercial establishments, industries, hospitals, and public and educational institutions.

Based on the above, a set of key issues associated with sanitation infrastructure were identified and documented for preparing SAR.

2.2.2 Preparing Final CSP

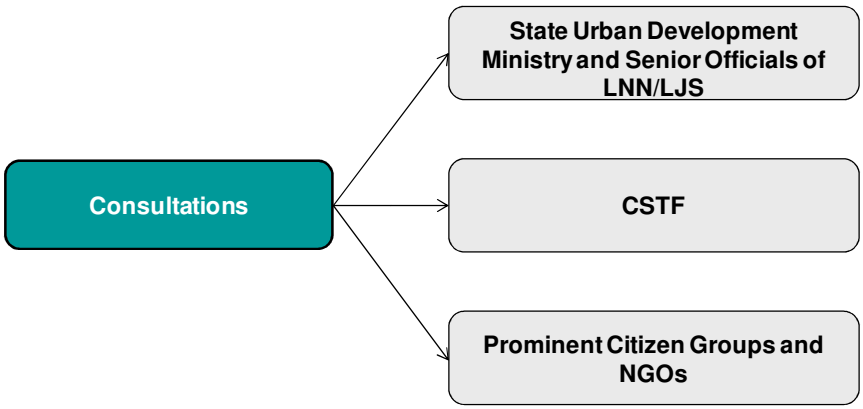
A consultative and iterative process was followed for preparing the draft CSP. The process is represented in the following figure and detailed subsequently.

Figure 2: Methodology for preparing CSP



A number of consultations were held after the submission of SAR. The purpose of the consultations was to arrive at a consensus on the issues identified in SAR and the approach to deal with them.

Figure 3: Consultations for preparing final CSP



The consultations initiated with a meeting with the State Urban Development Ministry, chaired by the Principal Secretary. The meeting discussed at length the issues that were identified in SAR and the process for preparing CSP. This meeting was followed by discussions with the City Sanitation Task Force (CSTF).

The CSTF meeting was chaired by the Mayor of Lucknow and comprised prominent citizen groups. The meeting assisted in finalizing the 'vision and objectives' for CSP and the key sanitation issues that need to be resolved in the draft CSP. Subsequently, the presentation made to CSTF was made to all the NGOs active in Lucknow. Subsequently, inputs were also sought from NGOs for designing the 'awareness campaign' aspect of CSP.

After completing the above round of consultations, CRISIL Risk & Infrastructure Advisory Solutions Ltd. (CRIS) and its associates prepared the interventions, i.e., technological and non-technological solutions for resolving sanitation issues. The guiding philosophy was to develop interventions that will assist in achieving the CSP vision/objectives. At this stage, CRIS also had discussions with experts at IIT Kanpur to obtain suggestions on sanitation technologies that can be deployed in Lucknow. Subsequently, a final round of consultation on the proposed interventions was held with a select group of officials from CSTF and NGOs.

It should also be noted that in parallel to the above discussions, CRIS also had a series of discussions with LNN and Jal Kal Vibhag on their financials. The purpose of these discussions was to finalize the assumptions with regard to projections of their respective revenue and capital incomes and expenditure for the period of CSP.

Based on the above, a CSP that articulates the vision and objectives for the sanitation sector, interventions to achieve the vision, and lastly identifies the finances for funding the plan was drafted. LNN has undertaken a complete GIS survey of the city and the GIS maps are under preparation. In the absence of a complete GIS map, CRIS team has worked extensively on the maps provided by the Nagar Nigam which have been annexed to the document for reference.

2.3 CSP Vision

The key elements for developing CSP are as follows:

- Vision - Desired or intended future state of the city
- Objectives - Time bound statements of intended future results, which in turn assist in achieving the vision
- Interventions – Short-, medium-, and long-term steps taken to achieve a set of desired outcomes

After a series of discussion with various stakeholders, CSTF, citizens of Lucknow, the vision and objectives for Lucknow CSP were outlined.

Lucknow CSP Vision

Lucknow aspires to be amongst the best cities in India to live in by

- Providing universal access to sanitation facilities especially to the under privileged,
- Increasing awareness and participation of citizens about the linkages between sanitation and public health, and
- Ensuring sustainability and coordination amongst the institutions providing these facilities.

To achieve the vision, a set of objectives have been formulated broadly along four aspects.

Objectives of CSP

I. Infrastructure

- Ensuring that Lucknow is 100% open-defecation free by 2020.
- Ensuring 100% collection and scientific disposal of solid and liquid wastes generated in the city of Lucknow by 2020.

II. Institutional

- Clearly demarcating the roles and responsibilities of various institutions involved in construction and operation of sanitation assets
- Instituting processes to that allow for expansion of sanitation services along with the growth of the city

III. Financial

- Augmenting the recovery of costs involved in provision of sanitation services
- Developing mechanism for resource/cost recovery, through recycling and reuse of solid and liquid wastes

IV. Social

- Increasing awareness amongst citizens on hygiene and health concerns in the city of Lucknow

The interventions to achieve the vision and objectives are given in the following sections.

2.4 Content of Final CSP Report

The contents of the draft CSP report are as follows:

- Section 1 – Executive Summary
- Section 2 - Introduction: Provides background and the methodology adopted for executing the assignment
- Section 3 - City Profile: Provides information on the background of the city, demography, socio-economic aspects, location, climate, population, etc.
- Sections 4 & 5 - City Wide Sanitation and Solid Waste Management: Provides an assessment of the current situation of infrastructure facilities and gaps in the sanitation and solid waste management (SWM) sectors and defines the strategies and interventions that need to be adopted to achieve the CSP vision/objectives
- Section 6 - Institutional Interventions: Provides an overview of the governance structure in Lucknow, challenges faced, and interventions required for the effective delivery of sanitation services
- Section 7 - Capacity Building and Information, Education, and Communication Campaign: Presents a strategy for developing and implementing an information, education, and

communication (IEC) campaign to achieve the CSP vision/objectives, in the context of the existing awareness levels and behavioural issues among stakeholders

- Section 8 - Financial Assessment: Projects the Financial Operating Plan for LNN and assess the funds available with the Nagar Nigam for implementing CSP
- Section 9 – Way Forward: Provides the process that will be adopted to ensure CSP is renewed constantly

3. City Profile

Uttar Pradesh (UP) is a state in the northern part of India. It shares borders with Nepal and the Indian states of Bihar, Jharkhand, Chhattisgarh, Madhya Pradesh, Rajasthan, Haryana, Uttarakhand, and National Capital Territory of Delhi. The Himalayas lie to the north of the state and the Deccan Plateau is at the south. The rivers Ganga, Yamuna, and Ghaghara flow eastwards. UP is divided into 70 districts under 18 divisions. Lucknow is the capital of UP.

3.1 Lucknow City Profile

Lucknow is situated in the centre of UP. The city has a humid subtropical climate with a cool dry winter from December to February and a hot summer from April to June. The temperature extremes vary from about 45 °C in the summer to 3 °C in the winter. The city receives about 100 cm of annual rainfall mostly from the southwest monsoons between July and September. The city lies at an average altitude of 110 m above the mean sea level and slopes to the east. It lies between 26°55' north latitude and 80°59' east longitude.

The densely populated areas of the city are situated on the southern bank of the Gomti River, while on the northern bank, planned colonies, viz., Indira Nagar, Maha Nagar, Vikas Nagar, Aliganj Housing Scheme, and Nirala Nagar, have been developed. Important Institutions are situated in Lucknow; prominent amongst them are the University of Lucknow, Sanjay Gandhi Post Graduate Institute of Medical Sciences (SPGIMS), King George Medical University, Institute of Engineering & Technology, Indian Institute of Management, and several privately owned engineering and medical/dental colleges.

Table 1: Lucknow city profile

Parameter	Unit	Year 2001	Year 2009
Total Urban Area	Sq. km.	333.5	333.5
Total Population	No.	21,85,927	28,55,370
Total Slum Population	No.	6,77,126	7,84,300
Total Floating Population	No.	1,16,000	1,68,000
Total Road Length	Km.	2,148.24	3,006.89
Total Number of Households	No.	3,32,706	4,77,860

Parameter	Unit	Year 2001	Year 2009
Total Number of Slum Households	No.	96,732	NA
Number of Wards	No.	110	110
Number of Slum Settlements	No.	658	793

Source: LNN

3.2 Topography

The city in general slopes towards the east. Lateral slopes are towards the Gomti River, which flows from north-west to south-east through the heart of the city dividing it into the trans-Gomti and cis-Gomti regions. The general profile of the city is slightly undulating. Most of the areas on the cis-Gomti side are comparatively lower than the areas on the trans-Gomti side. Since the low-lying areas of the city are liable to flooding with the rise in the level of the Gomti River, bunds have been constructed on both sides of the river. The average altitude of the city is 110.00 m above the mean sea level.

3.3 Demographic Profile

Census 2001 estimated the population of the Lucknow Urban Agglomeration (LUA) at 22.46 lakhs. This included an estimate of about 60,000 as the population of Lucknow Cantonment and 21.85 lakhs population of Lucknow city. Lucknow's population is expected to grow to 44–45 lakhs by 2021. This growth rate is higher than the average growth rate of cities of similar size in the country and the state. The drivers of the growth are migration and the state government initiatives that are aimed at attracting investments to the city. Migration accounted for a 36% increase in population over the last decade. Of the 5.76 lakhs people added to LUA during 1991–2001, about 2 lakhs were migrants. In comparison, the natural growth was 3.68 lakhs. Lucknow is bordered by smaller towns like Hardoi and Sitapur in the northwest; Bara Banki in the northeast; Rae Bareli in the southeast; and Unnao in the southwest. Migrants come in search of better employment opportunities and higher-order services like education and health. According to the census, 22% of the migrants from rural areas and 27% from urban areas cited 'employment' as the reason for migrating to Lucknow.

Table 2: Lucknow: Projected population in 2021

Year	Lucknow urban Agglomeration			Lucknow Nagar Nigam		
	Population	Decadal Growth	Growth Rate (%)	Population	Decadal Growth	Growth Rate (%)
1981	1007604	193622	23.79	947990	173346	22.38
1991	1669204	661600	65.66	1619116	671125	70.79
2001	2245509	576305	34.53	2185927	566811	35
2011*	3226000	980491	43.66	3166000	980073	44.84

Year	Lucknow urban Agglomeration			Lucknow Nagar Nigam		
2021*	4500000	1274000	39.49	4440000	1274000	40.24

*Source: Master Plan 2021; *Projected Population*

The rapid increase in population has resulted in stress on existing infrastructure and urban services causing constrained living conditions, especially in the older parts of the city.

Based on discussions with LNN it is estimated that the population of LNN in 2011 is approximately 28.50 lakhs, which has been considered as a base for this report. Moreover, census 2011 has also provisioned for 28.50 lacs as the total population for the city of Lucknow.

3.3.1 Gender Ratio

In LNN, there has been a steady increase in the number of women per 1000 men – from 829 in 1971 to 849 in 1981, 862 in 1991 to 893 in 2001. While this rise is attributable partly to natural growth, discussions with the Lucknow Development Authority (LDA) suggest that it could be rural families are migrating in search of employment instead of the general practice of only men migrating.

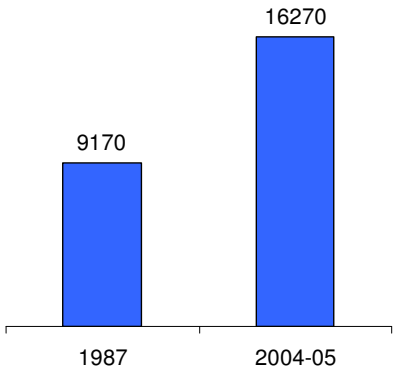
3.3.2 Literacy

The literacy in the LNN area was 67.46% in 2001. This is relatively low when compared to cities of similar size and given the economic prosperity and better infrastructure and education facilities enjoyed by the city. However, within UP, Lucknow city has a relatively high level of literacy.

3.4 Land Use Pattern

The Master Plan 2021 estimated that Lucknow covered an area of 16,270 hectares in 2004–05 as compared to 9,170 hectares in 1987 – an increase of 77.4%.

Figure 4: Growth in size of Lucknow



Source: Master Plan 2021 (figures in hectares)

The trends in land use are interesting. There has been a dramatic growth in residential land use; there has also been a notable growth in commercial, industrial, and public service land use.

Table 3: Existing land use pattern – Lucknow city area (in hectares) as per Master Plan-2021

PARAMETER	1987		2004–05	
Land Use	**Area**	**%**	**Area**	**%**
Residential	4,485.98	48.92	8,945.00	54.98
Commercial	223.77	2.44	360.00	2.21
Offices	474.69	5.18	560.00	3.44
Industrial	596.22	6.50	990.00	6.08
Parks/Playgrounds	346.48	3.78	435.00	2.67
Public Services	902.02	9.84	1,410.00	8.67
Traffic	952.00	10.38	1,240.00	7.62
River/Water Bodies	193.66	2.11	310.00	1.91
Open Land	996.14	10.86	2,020.00	12.42
Total	**9,170.96**	**100.00**	**16,270.00**	**100**

Source: Master Plan 2021

3.5 Economic Profile

The major industries in LUA include aeronautics, machine tools, distillery chemicals, furniture, and chikan embroidery. Lucknow has traditionally been associated with chikan embroidery on readymade garments, sarees, etc., with most units being small scale and household based and located in the old city area.

Lucknow is also a major centre for research and development (R&D) and an educational centre. Prominent R&D centres located in the city include the National Milk Grid of the National Dairy Development Board, Central Drug Research Institute (CDRI), Central Institute of Medical and Aromatic Plants (CIMAP), Industrial Toxicology Research Centre (ITRC), National Botanical Research Institute (NBRI), National Handloom Development Corporation (NHDC) Ltd., Pradeshik Cooperative Dairy Federation Ltd. (PCDF), Research Designs and Standards Organisation (RDSO), and UP Export Corporation.

The principal educational institutions in the city include the University of Lucknow, King George Medical College, Indian Institute of Management, Birbal Sahni Institute of Palaeobotany, Board of Technical Education, Institute of Engineering and Technology, Institute of Judicial Training and Research, SPGIMS, Bathkhande University of Indian Music, Central Veterinary Research Laboratory, Building and Road Research Station, and Indian Institute of Sugarcane Research.

3.6 Key Observations

- The city population is expected to grow at a rapid clip (3.5%–4.3%) aided by migration and plans of the state government to make Lucknow an investment centre.
- Growth in the city's population is expected to increase the stress on the Lucknow urban infrastructure.
- Residential land use is the predominant use of land in Lucknow.

4. City-Wide Sanitation

Sanitation is the means for collecting and disposing of excreta and community liquid wastes in a hygienic way so as not to endanger the health of individuals and community (WHO, 1987). According to Elledge (2002), sanitation refers to 'facilities and hygienic principles and practices related to the safe collection, removal, or disposal of human excreta'.

Sanitation needs to be approached as an interconnected system. Effective solutions should be designed for the entire process, i.e., from **'creating awareness to disposal'**.

The following chapter deals with the sanitation's existing status of infrastructure, key issues, infrastructure gaps, interventions, and recommendations for **'generation to disposal'**, while the parameters for **'awareness'** are elaborated in Chapter 6.

4.1 Status of Existing Infrastructure and its Coverage

Institutional Generation and Collection

4.1.1 Toilets

Household Individual Toilets

Based on the 2001 census and the data collected from LNN, the total population residing in the city of Lucknow in 2010–11 is 28,55,371. Approximately 72% of the population (20,80,825) resides in non-slum areas, whereas the remaining 28% (7,74,546) resides in slum areas, thus representing 4,16,165 pucca households (average of 5 people per household) in non-slum areas and 1,29,091 slum households (average of 6 people per household).

The survey results and the secondary information collected revealed that around 90% of the pucca households (3,74,548) and 80% of the slum households (1,03,272) has access to individual toilets, which have septic tanks, pits, or temporary disposal arrangements, or directly discharge into roadside drains. The following table presents information on the number of households with and without access to individual toilets.

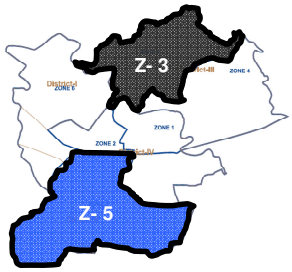
Table 4: Information on individual toilets

PARAMETERS	NON-SLUM AREAS	SLUM AREAS
Total population	20,80,825	7,74,546
Number of households	4,16,165	1,29,091

PARAMETERS	NON-SLUM AREAS	SLUM AREAS
Approximate percentage of households having access to individual toilets	90%	80%
Number of households having access to individual toilets	3,74,548	1,03,273
Number of households not having access to individual toilets	41,617	25,818
Source: Primary Survey and Secondary Information		

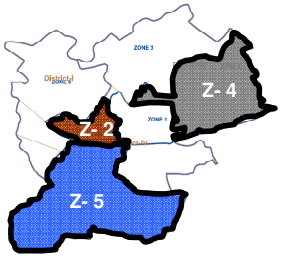
The survey also identified that out of the six zones, pucca households in Zones 3 and 5 and slum households in Zones 4, 2, and 5 have the maximum number of households without access to individual toilets. The same information is represented graphically as below.

Figure 5: Population without access to individual toilets in Zones 3 and 5



	Zone 3	Zone 5
Population (NS)	3,94,730	2,65,296
HH (Non Slum)	78,946	53,059
% of HH not having access	14%	14%
HH not having access	11,052	7,428

Figure 6: Population without access to individual toilets in Zones 4, 2, and 5



	Zone 4	Zone 2	Zone 5
Population (S)	78,966	1,04,572	1,90,253
HH (S)	13,161	17,429	31,709
% of HH not having access	46%	33%	26%
HH not having access	6,054	5,752	8,244

Public Toilets

At present, the public toilets in the city are being operated and maintained by Sulabh International, Non-Conventional Energy Development Agency (NEDA), District Urban Development Agency (DUDA), and LNN. The city has approximately 207 toilets having 2,656 seats (Source: Sulabh, DUDA, NEDA,

and LNN) located across the zones. 72% of the toilets (155 toilets) are operated and maintained by Sulabh International.

The primary survey revealed that the condition and maintenance of majority of the toilets are often poor, especially in the case of toilets that are not being maintained by Sulabh International. The poor condition of the toilet leads to a large number of people opting for open defecation.

Figure 7: Sulabh toilet

Though the public toilets are spread across the city, they are not evenly distributed across the zones. From the primary survey, it was found that approximately 11% of the households do not have access to individual toilets; this covers a population of approximately 3,20,197 people across the six zones. Considering the present number of seats available in the city, the average number of people per seat stands at 115 to 125, which is too high when compared with the standard of 45 users per seat. It was also observed that only 50% to 55% of the population without access to individual toilets uses public toilets.

The reasons quoted by the remaining population for not using public toilets were as follows: (a) the public toilets not within the accepted range of 100 to 200 meters from their houses; (b) poor operation and maintenance of public toilets; and (c) there were people who did not want to spend Re.1/- to use the toilet and therefore they prefer to defecate in the open. In fact to overcome problem (c) it was suggested that the organization operating and running the toilets could think of issuing family membership cards with monthly charges which can be vary nominal.

Figure 8: Public toilet

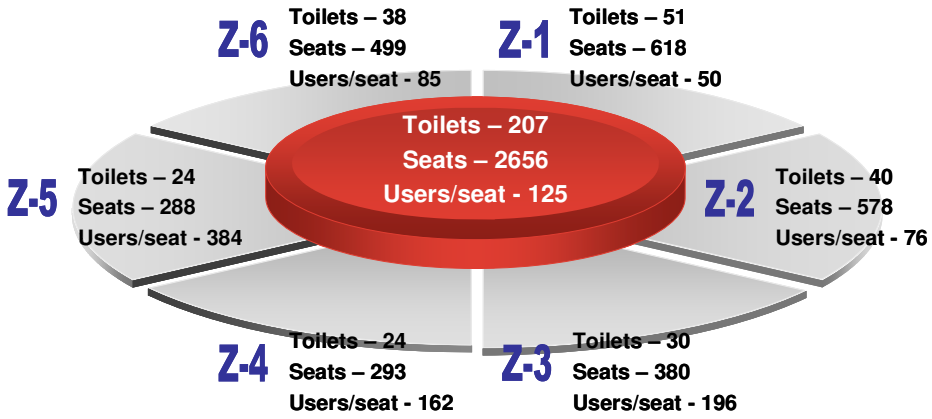
The following table presents the total number of toilets and seats across the city.

Table 5: Information on public toilets

AGENCIES	TOILETS	SEATS	AVERAGE SEAT PER TOILET
Sulabh International	148	1,828	12
NEDA	52	758	15
Others (DUDA, LNN)	7	70	10
Total	207	2,656	13

Source: Sulabh International, NEDA, DUDA, and LNN

The following picture presents the total number of toilets and the number of users per seat across the zones.



The number of users per seat is high in each zone, especially in Zones 3, 4, and 5, where the number is exceptionally high. It was analyzed that the city requires approximately 350 toilets across the zones, of which the maximum requirement is in Zones 3, 4, and 5.

Open Defecation

The survey revealed that about 7% to 10% of the population resorts to open defecation. The incidence is reported to be the highest in Zone 3 (8% to 10%) and Zone 5 (13% to 15%). In case of pucca households, the incidence of open defecation is around 5% to 7%, whereas in case of slum households, it ranges from 12% to 15%. Open defecation is predominant in Zone 4 (35%–39% of slum households) and Zone 5 (12%–15% of pucca households).

It was observed that factors such as absence of a public toilet, poor maintenance of public toilets, lack of seats, large distance of public toilets from home, and existing habits and attitude of the residents were largely responsible for open defecation.

4.1.2 Sewer Network and Septic Tanks

The survey revealed that around 40% to 45% of the total households in the city are connected to the sewer network. Zones 3 and 4 have approximately 40% to 50% coverage. Based on the primary

survey and interaction with the key stakeholders, it was found that a significant proportion of sewage enters the surface drainage system either directly or through spillage from damaged or blocked sewers, after which it is discharged without treatment into the Gomti River.

The project being funded by JNNURM seeks to augment the capacity of the existing sewer network to handle the projected wastewater flow until 2041. This project has already been proposed; however, projects in Districts II and IV covering Zones 1, 2, and 5 are yet to be approved. The total length of the proposed sewer is as follows: District I – 337 km, District II & IV - 850 km, and District III – 854 km.

Figure 9: Sewer network

Toilets in approximately 45% to 55% of the households are connected to septic tanks. The survey revealed that the septic tanks were not cleaned on a regular basis, and approximately 35% to 40% of the households get the septic tanks cleaned only when they overflow. Moreover, majority of the septic tanks were cleaned through private contractors, and only 20% of the septic tanks were cleaned by LNN janitors.

Treatment and Disposal

4.1.3 Wastewater Treatment

The survey revealed that approximately 40% to 45% (approximately 230 MLD) of the total wastewater generated in the city is disposed in the Gomti River without any treatment, which is a serious concern. The disposal of wastewater without any treatment is posing considerable health risks to the citizens.

The city generates approximately 510 MLD of wastewater per day. The city has a sewage treatment plant (STP) at Daulatganj in the Gaughat area of District I (near Zone 6). The plant has a capacity of 42 MLD, which is proposed to be increased by 14 MLD under the JNNURM project, thus taking the combined capacity to 56 MLD. Based on our interaction, it was revealed that the plant is having 100% capacity utilization. Under the Gomti Action Plan (GOAP), another STP having a capacity of 345 MLD (Upflow anaerobic sludge blanket (UASB) plant at Bharwara) in District III has been constructed and put to operation. At present, the plant's capacity utilization is approximately 70% to 75%.

Moreover, under various sewerage projects, the capacity of the STPs in the city is likely to be increased as follows: District II - 108 MLD and District IV - 270 MLD. Our interaction with the authorities revealed that the projects in Districts II and IV are yet to be approved, whereas in District III, the work is in progress and is likely to be completed by March 2012.

The total capacity of the STPs meets Lucknow's requirements. However, there is no provision for reuse of treated wastewater. It was revealed that the treated wastewater is not getting any users because of reasons such as poor treatment, dark colour, foul smell, and presence of glass pieces in treated water, and behavioural issues of the users.

4.2 Ongoing Sewerage Projects

4.2.1 GOAP

In 1993, GOI approved Rs. 61.01 crores to control the pollution in the Gomti River. An action plan named GOAP was framed by the Ministry of Environment and Forests, GOI, for which UP Jal Nigam is the implementing agency in UP.

Of the total 26 drains, 20 drains have already been diverted and have been linked with Bharwara and Daulatganj STP, whereas 6 drains would be shortly in operation. There are 2 intermediate pumping station located at Kukrail and Hyder Canal, whereas 1 main pumping station is located at Gwari. A total of 136.41 MLD of wastewater is being diverted. Out of the diverted liquid waste, 42 MLD is discharged into the river after treating it at the Daulatganj STP, and the remaining 94.41 MLD is tapped via a trunk sewer using the pumping station on the Cis-Gomti side. The first phase of GOAP is almost 97% complete.

It has been proposed to divert the remaining nallahs under GOAP-II which would partly be funded by GOAP and (the balance after netting the funding received from GOAP) under JNNURM.

4.2.2 JNNURM

The project being funded under JNNURM seeks to augment the capacity of the existing infrastructure to handle projected wastewater flow until 2041. Under the project, the city has been divided into four separate sewerage districts, each with its own treatment plant:

a. District I: Chowk, Hardoi Road, Cambell Road, Dubagga, etc., conveying sewage to the existing Daulatganj STP

b. District II: Amausi and Sarojini Nagar areas conveying sewage to the proposed Khwajapur STP

c. District III: Trans-Gomti side including Indira Nagar, Gomti Nagar, and Sitapur Road areas conveying sewage to Kakraha STP

d. District IV: Cis-Gomti side conveying sewage to the proposed Mastemau STP

The details of the projects under JNNURM are provided in the following table.

Table 6: Projects under JNNURM

District	Cost	Work proposed	Work done	Expenditure incurred till 31 March 2011
District I	Rs. 236.23 crores	Branch sewer – 283 km Trunk sewer – 54 km SPS – 1 No. STP – 1 No. P. P. – 1 Job Generator – 1 No. Substation – 1 No. Power connector – 1 Job	Branch sewer – 283 km Trunk sewer – 52 km SPS – 1 No. STP – 1 No. P. P. – 1 Job Generator – 1 No. Substation – 1 No. Power Connector – 1 Job	Rs. 173.04 crores
District III (Part I)	Rs. 262.16 crores	Trunk sewer – 54 km Lateral sewer – 56 km Branch sewer – 394 km SPS – 1 No. R. M.– 3000 m P. P. – 1 Job Generator – 1 No. Substation – 1 No. Power connector – 1 Job Road reinstatement – 1 Job	Trunk sewer – 4.8 km Lateral sewer – 4.2 km Branch sewer – 92 km	Rs. 64.80 crores
District III (Part II)	Rs. 214.42 crores	Trunk sewer – 20 km Lateral sewer – 21 km Branch sewer – 309 km SPS – 3 No. R. M. – 3375 m P. P. – 1 Job Generator – 1 No. Substation – 1 No. Power connector – 1 Job Road reinstatement – 1 Job	Trunk sewer – 1 km Lateral sewer – 13 km Branch sewer – 53 km SPS No. 1 – 20%	Rs. 53.50 crores
Districts II and IV	-	DPR has already been prepared and submitted for approval to the GOI. The project has been passed by the state authorities, but is yet to be approved by GOI. Based on our discussion held with the authorities, it was suggested that if in case the project is not being taken up under JNNURM then it shall be taken up as a long term plan under the CSP.		
Source: JNNURM Cell, Lucknow				

4.3 Infrastructure Gap Assessment

Work has already been started to centralize the existing sewer network; however, considering the existing situation and the work that has been proposed in these projects, it is observed that there are gaps that are yet to be addressed. The following section assesses the infrastructure gap considering the existing situation and the ongoing sewerage projects.

4.3.1 Individual Toilets

The survey results and the information collected from secondary sources revealed that approximately 10% to 11% of the households do not have access to individual toilets. This translates into a requirement of approximately 70,000 individual toilets across the city. The following table presents the total number of toilets required across the slum and non-slum areas.

Table 7: Requirement for individual toilets

PARAMETERS	NON-SLUM AREAS	SLUM AREAS
Total number of households	4,16,165	1,29,091
Approximate percentage of households having access to individual toilets	90%	80%
Number of households having access to individual toilets	3,74,548	1,03,273
Number of new individual toilets required	41,617	25,818
Source: Primary Survey and Secondary Information		

4.3.2 Public Toilets

The survey results revealed that about 8% to 10% of the population resort to open defecation; the incidence was highest in Zones 3 and 5. Moreover, open defecation is commonly seen in slum regions because of reasons such as inability to construct toilets due to cost/space constraints, unavailability of public toilets, public toilets located at far distance, poor maintenance of the public toilets, and behavioural issues of the users. It may perhaps be prudent to make some alternative provision for such households. Although the emphasis should be to promote household toilets in all areas, including slums, some slum households may not be able to afford private toilets or may not have the space to construct one. In addition, toilets would be required in market places, public places, courts, bus stands, railway stations, and fairs.

Lucknow, being the administrative and commercial capital of the state, attracts a large number of visitors and floating population. Discussions with officials revealed that the total floating population is approximately 8% to 10% of the existing population. The number of seats has been estimated at an average of 100 users per seat, assuming that in some of these establishments (industry, units, commercial complexes), toilets are already available for the floating population.

Therefore, our estimation of the gap in the number of public toilets required and available is based on the needs of (a) the existing population specifically living in slum areas, which cannot afford individual toilets, or does not have the space to construct toilets; (b) market and public places; and

(c) the floating population of Lucknow. However, efforts to create awareness and motivation should be pursued simultaneously to achieve full coverage of slum households with individual toilets.

The requirement of toilets has been estimated at 50 people per seat for the existing population and 80 people per seat for the floating population.

The following table presents the estimated number of seats/toilets required for the city of Lucknow.

Table 8: Requirement of public toilets

S. NO.	Parameters	Subtotal	Total
1	Existing number of seats		2,656
A	Existing population dependent on public toilets	3,20,197	
B	Floating population that requires public toilets	2,85,537	
2	Total population that requires public toilets		6,05,734
3	Additional seats required, based on 50 users per seat for existing population		3,748
4	Additional seats required, based on 100 users per seat for floating population		2,855
5	Total additional seats required		6,603
6	Additional toilets required in the city considering an average of 20 seats per toilet		330
Source: Primary Survey and Secondary Information			

4.3.3 Sludge Collection Vehicle

Discussions with officials revealed that one of the major concerns has been the empting, transfer, and end disposal of sludge due to the lack of options in densely populated areas, particularly in slum areas, most of which are located far away from sewer lines. It was found that the city requires a vehicle that can enter narrow streets where conventional vehicles such as tractors or trolleys cannot enter. At present, approximately 40% to 45% of the households in the city are connected to septic tanks (majority of the households in Districts II and IV are connected to septic tanks), and hence, it becomes more important to look for an interim measure prior to the completion of projects underway/proposed for laying underground sewers across the entire city to organize the collection and disposal of sludge.

Though the long-term solution would certainly be to connect the whole city to a centralized sewer network, these projects would take time to complete and the difficulty in collecting sludge from narrow lanes remains. Hence, it would be advisable to look for a measure for the collection of the sludge from narrow lanes. However, in areas where there is sufficient space for the movement of conventional vehicles, LNN should stick to such vehicles for removing sludge.

The following table presents the estimated number of vehicles required to remove sludge from narrow lanes for the city of Lucknow.

Table 9: Requirement for collection vehicle

S. NO.	Parameters	Subtotal	Total
1.	Existing number of pucca households	4,16,165	
2.	Existing number of slum households	1,29,091	
3.	Pucca households connected to septic tanks	40%	
4.	Pucca households connected to septic tanks	34%	
5.	Percentage of pucca households having narrow lanes and requiring small vehicles for collection of sludge	20%	
6.	Percentage of slum households having narrow lanes and requiring small vehicles for collection of sludge	100%	
7.	Total number of households that require the vehicles		77,184
8.	Number of households that the vehicle operates in a year		600
9.	Total number of vehicles required (approximately)		129
Source: Primary Survey and Secondary Information			

4.3.4 Sewer Network

At present, approximately 35% to 40% of the total households in the city are connected to the sewer network. This document does not account for the construction of any sewer network as the same has been covered under the JNNURM projects. The total length of the sewer network that has been proposed under the JNNURM projects is around 1,191 kms, which includes branch and trunk sewers.

A total of 688 km of sewer lines is already in operation, of which 192 kms has been laid by LNN (Zone I and II), 340 km by LDA (Zone I, II, III and IV), and 156 km by UPAVP (Zone I, II, and IV).

4.3.5 STP

The city, at present, is operating two STPs, one at Daulatganj in the Gaughat area of District I (near Zone 6) with a capacity of 42 MLD, which has been increased to 56 MLD, and the second at Bharwara in District III having a capacity of 345 MLD. This document does not account for the construction of any STP as the same has been covered under the JNNURM projects. The total capacity of the STP plants proposed under the JNNURM projects comes to around 779 MLD, which is expected to meet Lucknow's requirement until the year 2041.

4.4 Roadmap for an Improved Sewerage System

The following section deals with the key issues that exist across the zones and the strategies and interventions to tackle those issues.

4.4.1 Key Issues, Strategies, and Interventions

ISSUES	STRATEGIES	INTERVENTIONS
Approximately 11% of the households do not have access to individual toilets.	Promoting household individual toilets in all areas, including slums, wherever space is available and providing a solution to offset the investment required from the individuals for the construction of the individual toilets	In case of households where there is space available, individuals can opt for two-pit toilets of the linear rectangular model, which require a minimum space of approximately 2 sq m. On an average, a two-pit toilet costs between Rs. 13,000 and Rs. 15,000. The individuals can benefit under the Integrated Low Cost Sanitation (ILCS) Scheme of the Government of India for the construction of two-pit toilets.
Insufficient number and poor condition of public toilets are leading to open defecation.	Providing adequate number of public toilets and ensuring 100% upkeep of public toilets in slums and market places, thereby leading to removal of open defecation Ensuring that public toilets are cleaned on a regular basis and are kept in good condition	Provisions for public toilets through construction of two-storey toilets or mobile toilet vans (MTVs), fitted on a wheel where there is very little space available to construct toilets or zero discharge toilets. Operation and maintenance of public toilet should preferably be outsourced on PPP basis or through the involvement of community-based organizations (CBOs).
Removal of sludge from narrow streets has been challenging	Providing a system where sludge can be removed mechanically from narrow streets	Vacutug, a mechanized human sludge collecting, discharging, and empting machine, should be used to overcome the crisis of safe disposal of human sludge, especially from narrow streets. On an average, the cost of a Vacutug is approximately Rs. 3,50,000 to 4,00,000 (Source: LNN). The machine requires two operators to pull the vehicle to a site where sludge could be disposed.
Septic tanks are cleaned only when they overflow, leading to bad management, disposal, and treatment of sludge.	Ensuring that septic tanks are cleaned on a regular basis and the sludge is transported in an organized manner Ensuring better treatment and reuse of treated sludge	Operation and maintenance of septic tanks should preferably be outsourced. Look for another landfill site for better management, disposal, and treatment of sludge. This would also set off the load at the STP.
Sewers get blocked on a frequent basis as they are	Ensuring that sewers are regularly cleaned and the	Operation and maintenance of sewer networks could be

ISSUES	STRATEGIES	INTERVENTIONS
not cleaned on a regular basis.	blockage of sewers is not reported.	outsourced. Sewer jetting-cum-suction machines, gulley pit emptiers, sewer rodding machines, and bucket cleaning machines to be used for sewer cleaning.

In addition to the above, it has also been observed that wastewater is discharged into the Gomti River without proper treatment. The situation is more critical in Districts II and IV (Zones 1, 2, and 5) where the projects have been proposed but are yet to be approved. The districts lack an underground sewer network and an STP plant for wastewater treatment. Though the long-term solution to treat the wastewater would definitely be an STP, it is suggested that LNN can opt for a decentralized system for the peripheral areas specifically in Districts II and IV where the projects are yet to be approved and would take time for completion.

In addition, decentralized systems for wastewater management can also be built up in malls, large institutions, small-scale industries, and new housing colonies from where the treated water could then be utilized for non-potable purposes such as car washing, gardening, and cleaning. Use of treated water for such purposes would certainly reduce the pressure on the sewer network and the stress on water demand. It is suggested that LNN should motivate new housing complexes, malls, and colonies to have their own decentralized wastewater treatment system and provide incentive for the same in the form of deduction in taxes. These decentralized systems would depend on the space and wastewater generated in a particular area.

The features of these interventions have been explained in detailed in the section 4.5.

In addition to above, the corporation should also promote Rain Water Harvesting within the city.

Rainwater harvesting is the accumulating and storing, of rainwater for reuse, before it reaches the aquifer. It has been used to provide drinking water, water for livestock, water for irrigation, as well as other typical uses given to water. Rainwater collected from the roofs of houses, tents and local institutions can make an important contribution to the availability of drinking water. The same shall be promoted in housing complexes, malls, societies, colonies, parks, and industrial units.

The system produces beneficial externalities by reducing peak storm water runoff and processing costs. In municipalities with combined sewer systems, reducing storm runoff is especially important, because excess runoff during heavy storms leads to the discharge of raw sewage from outfalls when treatment plant capacity cannot handle the combined flow. The system is simple to install and operate and moreover, the running costs are negligible, and they provide water at the point of consumption.

Key messages:

- Rainwater harvesting can serve as an opportunity to enhance ecosystem productivity thereby improving livelihoods, human well beings and economies.

- Rainwater harvesting has been shown to create synergies between landscape management and human well being. These synergies are particularly obvious when rainwater harvesting improves rainfed agriculture, is applied in watershed management, and when rainwater harvesting interventions addresses household water supplies.
- Improved water supply enhanced agricultural production and sustainable ecosystem services can be attained through adoption of rainwater harvesting with relatively low investments over fairly short time spans.
- Awareness and knowledge of ecosystem services must be increased among practitioners and policy makers alike, to realize the potentials of rainwater harvesting and ecosystem benefits for human well being.

4.5 Interventions

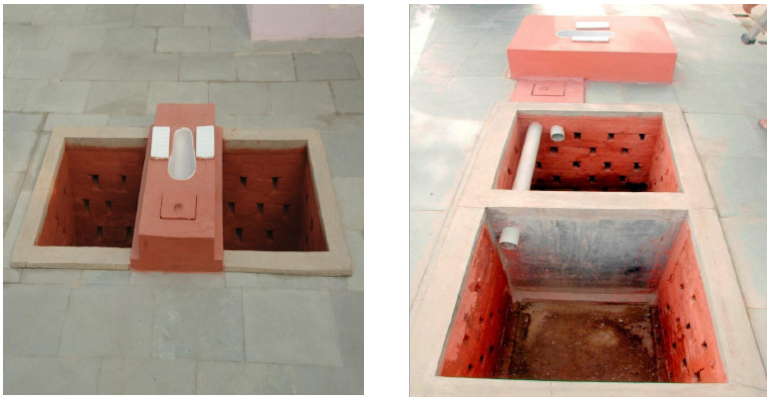
4.5.1 Option for Individual Household Toilets

In the case of households that can afford individual toilets, it is suggested that two-pit, pour-flush, compost toilets be constructed. In a two-pit toilet, there are two pits where one pit is used at a time and the other is kept as a standby. When the first pit fills up, the excreta are switched over to the other pit. Both the pits are used on an alternate basis. In the first pit, human excreta get converted into manure after a period of two years.

Two-pit toilets can be constructed either inside or near the house, even where there is very minimum space, in the courtyard or on the upper floor of a house. The minimum space required for the construction of a two-pit toilet is 2 sq m.

The following diagram shows a representation of a two-pit toilet.

Figure 10: Two-pit toilet



Advantages

a. The two-pit toilet is free from all health hazards and does not pollute ground water or drinking water sources like hand pumps, wells, etc., provided proper precautions are taken during its construction.

b. It meets all the standards of a hygienic sanitary toilet as laid out by the World Health Organization. It is scientifically and technically appropriate as well as eco-friendly. There is no odour as the pits and drains are covered and sealed. The water trap underneath the toilet pan prevents any gases from the pits exiting into the atmosphere.

c. The human excreta get decomposed into manure, which is pathogen free. The manure[1] can be removed from the pit by the beneficiaries without involving scavengers, as it is odourless, pathogen free, and semi-solid.

d. The design and specifications can be modified to suit the householder's needs and affordability.

e. It needs only 1 to 1.5 L of water for flushing, whereas conventional flush toilet needs 12 to 14 litres of water.

f. It can be easily connected to sewers when introduced in the area.

g. It requires less space than a septic-tank toilet system and is affordable and easy to construct with locally available materials.

Cost

On an average, a two-pit toilet costs up to Rs. 13,000, depending upon the number of family members, size of the pits to be constructed, design of the superstructure, and affordability.

Based on the primary survey and secondary information collected, the city requires approximately 67,435 individual household toilets. The following table presents the approximate capital cost of construction of individual household toilets.

Table 10: Cost for the construction of individual household toilets

S. No.	Component	Unit	Quantity	Average cost (Rs.)	Amount (Rs. Crores)
1	Individual toilets	No.	67,435	13,000	87.67
Source: Primary Survey and Secondary Information					

However, it is suggested that LNN should conduct a detailed study and prepare a list for households that require individual toilets and are ready to have their own individual toilets.

For economically weak sections (EWSs) of the society, LNN can take the benefit of the Integrated Low Cost Sanitation (ILCS) Scheme of the Government of India. The scheme is explained in brief below.

ILCS Scheme

LNN can get two-pit pour-flush toilets constructed under the ILCS Scheme. The main objective of the scheme is to convert the existing dry latrines into low-cost pour-flush latrines and to construct new

[1] *Manure is a fertilizer and soil conditioner that improves the productivity of the field and fruits and flowers, when used for agriculture/horticulture.*

ones where none exist. The broad principles of the scheme are highlighted below, whereas the salient features of the scheme are covered in detail in Annexure **10.13**.

Broad principles of ILCS Scheme

The objective of the scheme is to convert/construct low-cost sanitation units to suit local conditions (area-specific latrines) and construct new latrines where EWS households have no latrines and follow the uncivilised practice of defecating in the open in urban areas. The scheme is based on 'all town' coverage basis.

The scheme is funded in the following manner: Central Subsidy - 75%, State Subsidy - 15%, and beneficiary share - 10%. However, the upper ceiling cost of Rs. 10,000 may be fixed for the complete unit of a two-pit pour-flush individual latrine with superstructure.

The scheme will be implemented by the Ministry of Housing and Urban Poverty Alleviation directly. There would be two committees, the Central Coordination Committee and the State Coordination Committee, which would look after the implementation of the scheme.

4.5.2 Options for Public Toilets

Our survey and discussions with LNN officials revealed that the city requires approximately 187 public toilets for the population already residing in the city with the maximum requirement of the toilets in Zones 3, 4, and 5. Considering an average of 20 seats per toilet, an addition of 3,748 seats across the city would be required. In addition to this, the city also requires approximately 143 toilets for the floating population, adding approximately 2,855 seats. Thus, the city requires another 6,603 public toilet seats.

Choice of Public Toilet

The city definitely requires a significant addition in seats/toilets across the city; however, one of the major concerns has been the availability of space to construct these public toilets. It is always desirable to choose an alternative, which is affordable, sustainable, and likely to be most preferred, used, and well preserved. It is suggested that LNN should promote the construction of multi-storey toilets as these toilets can hold a minimum of 20 seats, which is twice the number of seats in a single-storey toilet. Moreover, the operation and maintenance cost of multi-storey toilets is almost similar to that of single-storey toilets. In case, there is little or no space available for construction, LNN can opt for mobile toilet vans (MTVs). The following table presents the relative features of multi-storey toilets and MTVs.

Table 11: Comparison of public toilets

S. NO.	PARAMETERS	MULTI-STOREY TOILET	MOBILE TOILET VAN
1	Feasibility of construction	Depends on the availability of public plot	Requires very little space and hence is suitable where space is a constraint. Can be parked on roadside for instance, thus overcoming space constraint issues.

S. NO.	PARAMETERS	MULTI-STOREY TOILET	MOBILE TOILET VAN
2	Cost	Average cost of per seat: Rs. 60,000 to 1,00,000	Average cost of per seat: Rs. 50,000 to 55,000
3	Suitability	Suitable for market places, railway stations, courts, bus stands	Suitable for slum areas, fairs, functions, rallies, temporary markets, construction sites

Source: Primary Research

Multi-Storey Public Toilets

Multi-storey public toilets are suitable for areas where suitable land is scarce, which is the case in Lucknow. In a multi-storey toilet, the ground floor is meant for females and elderly people, whereas the first floor is for males.

Figure 11: Three-storey Sulabh public toilet (120 WCs, baths, and urinals)

The cost of a multi-storey public toilet ranges between Rs. 60,000 and Rs. 1,00,000 per seat, depending on the specifications and disposal system, i.e., a septic tank or a sewerage system. The operation and maintenance cost of a 20-seater multi-storey public toilet is approximately Rs. 2,25,000 per annum.

India does have multi-storey public toilets with the largest one in India at Shirdi, Maharashtra, built by Sulabh International, Delhi.

The concept of multi-storey toilets would also provide LNN an opportunity to first convert the existing single-storey toilets into multi-storey toilets, which most probably would require lesser capital and space vis-à-vis the new structures. The city, at present, has 207 toilets. Even if 40% to 50% of the single-storey toilets are converted into multi-storey toilets, there would be an addition of approximately 828 to 1035 seats, which will not require any additional land and put lesser burden on the municipal financial pockets. The following table provides an estimation of the increase in the number of seats if the single-storey toilets are converted into multi-storey toilets.

Table 12: Addition in seats on conversion of single-storey toilets into multi-storey toilets

PERCENTAGE OF CONVERSION	40%	50%	60%	70%	80%	90%	100%
No. of toilets	83	104	124	145	166	186	207
Average no. of seats	10	10	10	10	10	10	10
Addition in seats	830	1,040	1,240	1,450	1,660	1,860	2,070

Source: CRIS Analysis

Thus, increasing the number of seats through the conversion of all the existing single-storey toilets to multi-storey toilets can add 2,070 seats to the existing number. In turn, the construction of new public toilets would then be reduced accordingly and help in reducing the total cost. Considering an average of Rs. 60,000 per seat as the capital cost, the following table presents the estimated total capital cost.

Table 13: Capital cost for conversion of single-storey toilets into multi-storey toilets

PERCENTAGE OF CONVERSION	40%	50%	60%	70%	80%	90%	100%
Addition in seats	830	1,040	1,240	1,450	1,660	1,860	2,070
Capital Cost (Rs. Crores)	5.0	6.2	7.4	8.6	10.0	11.0	12.4
Source: CRIS Analysis							

In case of development of public toilets, LNN can opt for zero discharge toilets[2] based on the concept of isolating water bodies from human and animal excreta. This alternative practice is based on the minimum or no use of water for conveyance of waste to avoid entry of faecal matter into water bodies and is referred as dry sanitation or ecological sanitation (EcoSan).

Ecological sanitation is based on a systematic material-flow-oriented recycling process of nutrients and water as a hygienically safe, circular, and holistic alternative to conventional solutions. It recognizes the rational utilization of non-hazardous treated human excreta as a useful resource, so as to protect the health of human beings and achieve ecological balance.

The technology is aimed at the principle of zero discharge. The toilets are identical to those in conventional water-borne systems where the solid and liquid matters are separated underneath the toilet seat itself by using a solid-liquid separator. The separator allows the formation of a thin water film that adheres to the surface of the separator and flows outward, while most of the solids gravitate into the central retention compartment of the retention-cum-polishing (RCP) tank. The solids gradually disintegrate to form slurry, which is then evacuated from the tank under gravity. The liquid is passed through a micro-filter and recycled for flushing toilets, thus avoiding excessive use of fresh water for flushing, while no compromise is made on using water for completely flushing the toilet pan. Specially developed microbial cultures are used to eliminate any foul odour.

The faecal slurry is converted into quality organic manure using activated aerobic composting and vermin composting for rapid and effective utilization of valuable organics and nutrients. The excess flush water is evaporated using solar energy to obtain valuable nutrients present in human urine.

The advantages of the proposed technology vis-à-vis traditional technology are:

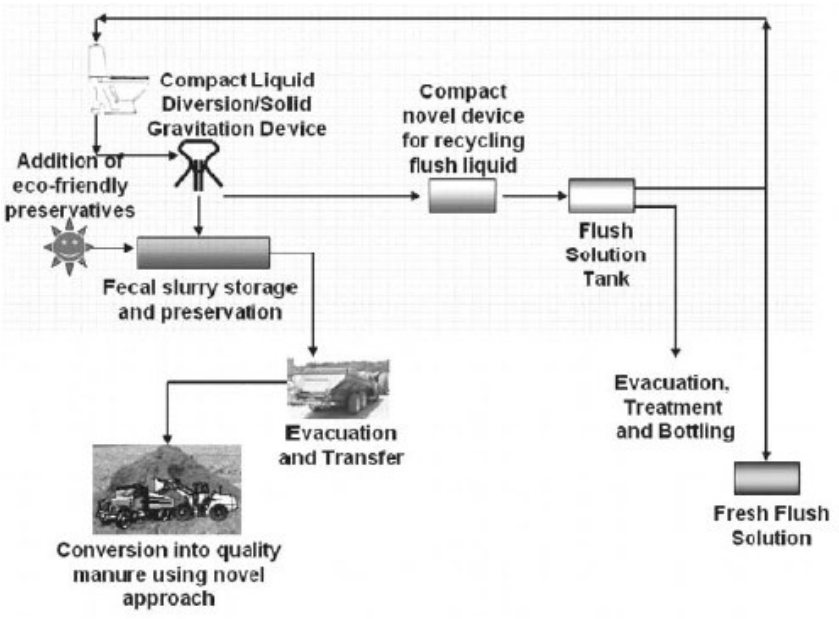
- It saves fresh water. The water requirement is approximately 1/10th of the water which is required in other forms of toilets.

[2] *The zero discharge toilet system is a toilet that has been developed by Professor Vinod Tare, Professor, Environmental Engineering and Management, Department of Civil Engineering, IIT Kanpur.*

- Valuable by-products obtained in the form of organic manure and inorganic fertilizer in the powder or concentrated liquid form
- It can be easily installed in congested localities with no sewerage system.
- It requires less electricity.
- User comfort and hygienic conditions maintained at the same level as in conventional water-borne systems
- It can easily be operated and maintained by the community and can generate employment to local people

The entire process is systematically represented in following figure.

Figure 12: Schematic representation of Zero discharge toilets system



Field Trial

1. A single zero discharge toilet system is operational on the campus of the Indian Institute of Technology at Kanpur since June 2005. The toilet is being used by 25–30 persons daily.
2. A set of four zero discharge toilets have been commissioned in a congested locality at Delhi Gate (behind Police Station) in Aligarh, UP, India. Each toilet has been designed for 25 users per day. This toilet block can be used effectively by approximately 100 people on a daily basis. The toilets are in the middle of a very busy market place adjoining a residential locality where most of the households do not have toilet facility or the toilets discharge into open drains. As there is no sanitation facility available in the area, people have been defecating in open resulting in filthy and unhygienic conditions. Setting up of zero discharge toilets appears to be an ideal sanitation solution. It has also provided employment to the local people wherein the identified manual scavengers are employed to keep the toilet clean. During the pilot testing phase of six months, no user fee was charged from the user, but later on, the facility would be handed over to the community (CBOs) who will employ trained workers (trained during the pilot phase) and will decide on the user fee. The user fee will be used for the operation and maintenance of the

Field Trial
facilities.
Source: Zero Discharge Toilets, paper by IIT Kanpur Professor Dr. Tare

Moreover, LNN can also opt for a mobile version of the zero discharge toilet system. The same has recently been installed at the shopping complex in the campus of the Indian Institute of Technology Kanpur. The system features and operational aspects are similar to that described in the above section for the pilot studies at Aligarh. The system has provision of a toilet and two urinals.

Figure 13: Portable zero discharged toilet system, IIT Kanpur campus

LNN should initiate a pilot project through the development of 5 to 10 zero discharge toilets. For training purposes, LNN can arrange for a meeting between its engineers and officials with IIT, Kanpur, to understand the mechanism of working of these toilets. Based on the response of the pilot project, LNN can further undertake a study to assess the exact requirement for zero discharge toilets for the overall city.

The detailed system details and components of the toilet system are explained in Annexure 10.9.

Mobile Toilet Vans

MTVs can be considered as a suitable option for slum areas where people do not have space to construct their own individual household toilets or there is no space for LNN to construct public toilets. The option is also suitable for gatherings for small duration like fair, functions, rallies, construction sites, temporary markets, etc. MTVs are fitted on wheels having normally 10 seats, 5 each for males and females. A washbasin with the mirror is normally provided in the system.

MTVs are fitted with a water storage device and a sludge storage tank at the bottom. After the sludge tank is filled, MTVs are carried away by a tractor to the disposal site for the sludge. However, there could be multiple options for removing sludge from the tank. Normally, the sludge is disposed of in a sewer.

MTVs can be operated on pay-and-use basis by private operators. Sometimes, municipality pays monthly operation cost to the party and MTV facilities are provided free of charge to the users.

Figure 14: Mobile Toilet Van

The cost of an MTV varies from Rs. 5 lakhs to Rs. 7 lakhs, depending on the specifications. The running cost of a 10-seater MTV ranges from approximately Rs. 1,50,000 per annum to Rs. 2,00,000 per annum.

LNN should initiate a pilot project through the purchase of 20 to 30 MTVs and place them is slum areas, fairs, and temporary market areas. Since these vans would also require tractors and trucks as forward linkages for transportation of sludge to the disposal site, therefore, based on the pilot study findings, LNN can further undertake a study to assess the exact requirement for MTVs for the overall city. A list of the names of the manufacturers/suppliers of the MTVs has been provided in Annexure 10.10.

The following table presents the approximate total capital cost for the construction of 330 public toilets, translating into 6,603 seats.

Table 14: Total capital cost for the construction of public toilets

S. No.	Component	Quantity (Seats)	Cost per Seat (Rs.)	Amount (Rs. Crores)
1	Number of new public toilet	5,568	75,000	41.76
2	Conversion of 50% of single-storey toilets into multi-storey toilets	1,035	60,000	6.21

Source: Primary Survey and Secondary Information

4.5.3 Option for Operation and Maintenance of Public Toilets

It is suggested that the operation and maintenance of public or community toilets should be considered as an outsourcing activity (public private partnership) on a pay-and-use basis.

Slum Sanitation Program for Municipal Corporation of Greater Mumbai (MCGM)
The World Bank financed Slum Sanitation Program (SSP) was primarily targeted at improving the health and environmental conditions in Greater Mumbai including [those of] slum dwellers. A key feature was the involvement of slum communities in project implementation right from the planning stage. The mobilization process facilitated collaborations between non-governmental organizations (NGOs), contractors, and CBOs.

Slum Sanitation Program for Municipal Corporation of Greater Mumbai (MCGM)

Key features:

- Demand-responsive participatory approach for provision of community toilet blocks
- Incentives for private contractors, NGOs, and CBOs to work together to jointly deliver community toilet blocks in a flexible framework
- Contracting innovations such as simple contract milestones and 100% contract variation
- High technical standards of construction and high-quality service levels, including 24-hour water and electricity, and other amenities including toilets for disabled persons, urinals, children's toilets, and a room for the caretaker and his family
- Initial community mobilization, CBO registration, and household contribution for membership
- Entire O&M responsibility handed over to CBOs, and CBOs signed MoU with MCGM, which spelled out the roles and responsibilities of the CBOs and MCGM
- O&M management - CBOs collect monthly charges (from members) and per use charges (from other visitors)
- Per seat (contract) capital costs under SSP varied between Rs. 50,000 and Rs. 65,000. The monthly pass for unlimited use by all family members was far lower than single pay users – in the range of Rs. 20 to Rs. 50 per month; average being Rs. 31.

Launched in 1997, SSP development led to the concept of an integrated 'compact' contract, either led by an NGO or a contractor. **The roles were as follows:**

a) MCGM was to create an enabling environment that would bring NGOs and the private sector to facilitate participation of slum households and provide the capital investment to construct toilet blocks.

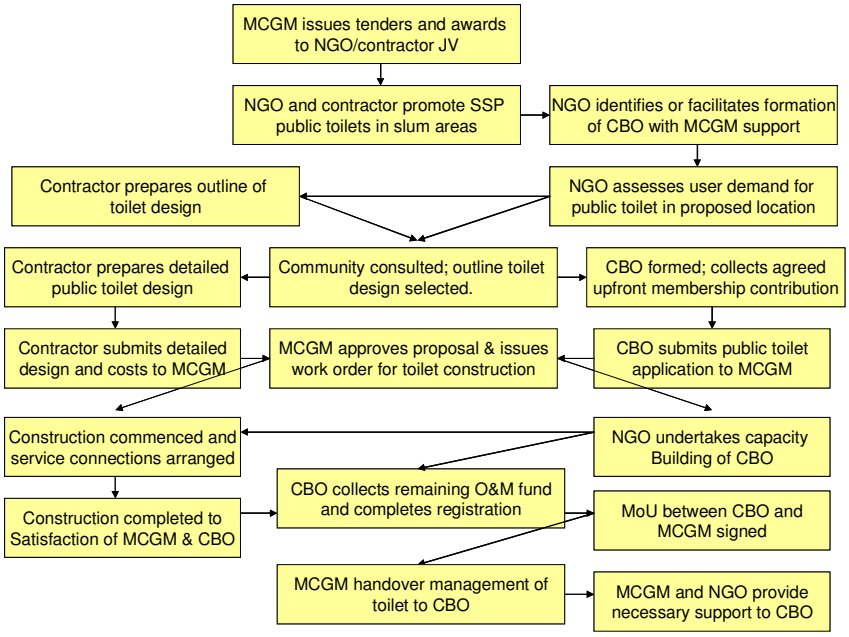
b) NGOs would mobilize slum communities, facilitate formation of CBOs, provide hygiene education and training on O&M and CBO functioning, and serve as the main catalyst to encourage a partnership between the community groups, CBOs, and MCGM.

c) Private construction companies were asked to carry out toilet construction, in partnership with NGOs. Alternatively, in the NGO-led consortium, they were responsible for community mobilization and CBO formation as well as construction. All work was subject to competitive bidding procedures, consistent with government and World Bank guidelines.

d) CBOs were to help enable local community processes, supervise construction, and take full charge of O&M of local sanitation services and assets.

The following figure describes the process for SSP at MCGM.

Slum Sanitation Program for Municipal Corporation of Greater Mumbai (MCGM)



The main management arrangements of the program could be highlighted as follows:

- CBO members operate and manage toilet blocks on their own.
- CBOs employ staff (for example, caretakers) to operate and manage toilet blocks.
- CBOs contract a caretaker (an individual or a family) to manage and operate toilet blocks on CBOs' behalf.
- CBOs contract a professional operator to manage toilet blocks.

Achievements of SSP

- Winning political support from municipal councillors and other political leaders including local slum leaders for the program and convincing them that the SSP approach could potentially deliver good results for communities if the arrangements were devolved to them.
- It demonstrated the successful impact of a participatory, demand-responsive approach whereby community members were willing to contribute to upfront membership fees, pay fully for and carry out routine O&M, with major repairs and replacements being done by MCGM.
- Superior technical quality and service levels attracted people even if this meant higher capital (borne by MCGM) and O&M costs (borne by registered CBOs made up of slum households).
- It showcased the successful partnering of contractors, NGOs, and CBOs, selected competitively, in delivering good quality sanitation infrastructure facilities, with MCGM playing the role of a facilitator.

Slum Sanitation Program for Municipal Corporation of Greater Mumbai (MCGM)
▪ A review commissioned by WSP/the World Bank in 2005 showed that SSP toilets have demonstrated significant improvement in levels of maintenance and cleanliness compared to the existing MHADA and older MCGM toilets. ▪ SSP successfully tested a range of technical options and contracting innovations, which are available for a potential scale-up of the program or for use in urban sanitation initiatives elsewhere. ▪ It emphasizes that key constraints to effective delivery of sustainable sanitation systems for poor people are rooted in government slum, housing, and land policies. Reforming these laws and policies is essential for long-term success. ▪ It shows that it is important to understand what communities want and forge partnerships. ▪ Encouraging entrepreneurship through emergence of private entrepreneurs willing to provide toilet O&M services to CBOs. ▪ Policy development needs proof of concept and buy-in from stakeholders - MCGM and GoM have decided that in Mumbai and Maharashtra, respectively, as a matter of policy, community toilets will not be permitted to be built in urban areas if they are not in compliance with the SSP approach.
Source: Primary Research, Google

4.5.4 Options for Sewage Collection

Vacutug is considered as an option to overcome the problem of collecting sludge from septic tanks located on narrow streets. It is a device with a vacuum pump discharging into a 500-L tank fitted onto a wheelbase with a small engine for driving it around. A modified system (known as Vacutug Mark II) has also been developed in Dhaka, Bangladesh, which has a larger capacity tank on a trailer that is pulled by a vehicle.

The machine can be used in high-density informal settlements with narrow lanes where conventional vacuum trucks are unavailable or vehicular access is difficult. The machine creates a vacuum within the tank and, through a plastic hose, sucks the human waste sludge from the pit or septic tank. The tank is then wheeled to an end disposal site, a pressure created within the tank, and the waste pushed out of the tank into the end disposal site. It is used for the cartage of sludge over a shorter distance from the point of collection to a treatment facility, a municipal sewer, or an intermediate collection point, from where waste can be collected using larger conventional sludge trucks.

Figure 15: Vacutug

The sludge collection machine should be manufactured locally using readily available components, be affordable, easily serviceable, able to operate in narrow passageways where other conventional exhauster vehicles cannot pass, and capable of sucking out dense waste sludge for transportation to a larger tanker vehicle. At the same time, it was imperative that excrement be removed as safely as possible without posing further health hazards in slums.

Vacutug, a safe and sustainable option, is an essential device for empting pits and septic tanks both for urban and small town as well as for rural areas. Though the system is labour intensive, it is quite effective for small communities and slum areas. Small-scale implementation of this system has proved successful in slums of Nairobi, Kenya, funded under the United Nations Commission on Human Settlements (UNCHS).

Field Trial - Vacutug – Phase I (First trials in Kibera 1995–2000)
The trials of UN-HABITAT Mark I Vacutug began in 1995 in partnership with the Kenya Water and Health Organisation (KWAHO) in Kenya and Manus Coffey and Associates. In 1997, Mark I Vacutug was given on loan to KWAHO to be tested in Soweto Village in Kibera, Nairobi. Kibera is the largest slum in East Africa with a population in excess of 7,00,000 covering an area of 210 ha. The main sanitation facility used by the residents in Kibera is either a simple pit latrine or VIP latrine. The population without access to any facility use the 'flying toilet' method, whereby excreta is collected in a plastic bag and thrown out of the dwelling. The machine was deliberately put into a situation where there was very little technical assistance in order to see how sustainable a mechanised pit latrine technology would be in a low-income urban settlement. **The machine was operated on a commercial basis and, during the trial period, earned a total profit 36% on its overheads.** KWAHO estimates that over 4,00,000 people benefited directly from the use of Vacutug in Kibera (one-pit latrine can serve between 80–100 people) and, in the absence of the Vacutug, residents would have no other option but to use wachusi (manual exhausters) to manually empty their latrines. Five people were employed and paid by the revenues of the project; a supervisor, two operators, a mechanic, and a watchman.
Source: Google

Figure 16: Vacutug in operation

Two trained operators can operate a single Vacutug machine and can be considered responsible for cleaning and maintaining the machine, emptying the pits, driving the machine to the disposal point, and carrying out minor repairs. The operators should be warned about the hazardous nature of latrine wastes and should be provided with rubber boots, rubber gloves, overalls, and disinfectant soaps. The machine has been designed to be operated and maintained with minimum servicing and spare parts, but some preventive servicing will ensure its optimum life and operational performance. Maintenance requires one part-time mechanic for a weekly check up and when it breaks down. The cost of a Vacutug machine varies from Rs. 3.5 lakhs to Rs. 4 lakhs. The running cost of a Vacutug machine ranges between Rs. 1,25,000 and Rs. 1,75,000 per annum.

The following table presents the approximate total capital cost for 129 Vacutug machines required for the city.

Table 15: Total capital cost for Vacutug

S. NO.	COMPONENT	QUANTITY (NO.)	COST PER VEHICLE (RS.)	AMOUNT (RS. IN CRORES)
1	Vacutug	129	4,00,000	5.15
Source: LNN, Lucknow Jal Nigam, and JNNURM Team Based out of Lucknow				

It is hereby suggested that LNN should initiate a pilot project in a particular ward through the purchase of 10 to 20 Vacutug machines. Based on the outcome of the pilot project, LNN can undertake necessary study to assess its expansion to overall city.

4.5.5 Options for Sewerage Maintenance

The construction of such a huge sewer network in Districts I and III would certainly require different kinds of sewer cleaning machines in order to operate and maintain the network. It is understood that sewer cleaning machines are frequently required to avoid blocking of the cross sections, prevent odour problems, remove damages at the channel and remove inorganic deposits that reduce the sewage treatment efficiency.

Various kinds of sewer cleaning machines such as sewer jetting-cum-suction machine, gully pit emptier, and sewer rodding machines are being used for operating and maintaining the sewer network. A brief on few of the machines have been explained as follows:

Sewer jetting cum section machine: The high pressure sewer drain jetting pumps are rugged in construction, have medium speed and provide satisfactorily results in cleaning of sewers. There is special pressure washers designed specifically for this purpose, called sewer jetters. They can clean the pipes leading from sinks and bathtubs leading to the tanks, even those at long distances, which is especially helpful in the case of industrial piping. The sewer drain jetters work at a high pressure,

between 150-300 bar and 12-400 lpm which can be adjusted throughout the job as required. These machines use a special nozzle that gets down into the drains to loosen and cuts the clogged materials that are obstructing the pathways. This essentially scours the pipes clean and then washes the debris back up to be removed, usually through a vacuum pump. Following are the various accessories for sewer cleaning and drain jetting system: different types of specially designed drain cleaning nozzles, high pressure sewer jetting hose, hose reel, hydraulic hose reel and camera.

Gully pit emptier: It is an advanced technology for emptying cesspit, cesspool and manhole chambers as well as it is used for cleaning underground drainage and sewer lines. It has a simple suction operation and is capable of creating very high degree of air pressure which breaks the sedimentation that gets accumulated at the bottom of the cesspool and manhole chambers. It is also equipped with heavy duty vacuum pump, auto shut off valve, siphon filter, safety pressure release valves and other important safety features. The machine is meant to clean without anyone having to enter the poisonous and gaseous sewer, manholes, etc.

Sewer Rodding: It is ideal for opening blockages in sewer & pipe lines. The machine is easy to operate, and can be operated both manually as well as with Diesel Driven Reversible power drive. In case of the equipment being driven by Power, the Ratchet Tuming Handles are replaced by the power drive. The operation is same as with hand rodding equipment with one man controlling the rods with a pull-out tool at the manhole, while the power drive operator applies the safety lever. A compact carry all trailer is available to carry the complete equipment from place to place.

Sewer Cleaning Machine (Power Bucket Type): It is available with a set of two mobile power driven machine for cleaning and desilting of underground sewers of diameter 150 mm and above with different size of buckets, tools and devices. The machine is operated by means of wire rope winches which is suitable for operation in tropical conditions of up to 46 degrees centigrade.

The data given in the following table for different kinds of existing sewer cleaning machines has been provided to CRIS by LNN. The table presents the total requirement for the city for Districts I and III, which is based on our discussion with LNN and LJN officials and the JNNURM team based out of Lucknow.

Table 16: Sewer cleaning machine

S. NO.	MACHINE	EXISTING NO.	REQUIRED NO.	COST PER MACHINE (RS. IN LAKHS)
1	Sewer jetting-cum-suction machine	2	8	17.00
2	Gully pit emptier	0	12	8.00
3	Sewer rodding machine	2	18	0.70
4	Bucket cleaning machine	2	18	5.00
Source: LNN, Lucknow Jal Nigam, and JNNURM Team Based out of Lucknow				

The following table presents the total capital cost based on the requirement of machines for the operation and maintenance of the sewer network. The figures with regards to cost of the machine

and its total requirement in District I and III have been shared by LNN, Lucknow Jal Nigam, and JNNURM Team Based out of Lucknow.

Table 17: Capital costs for sewer cleaning machines

S. NO.	MACHINE	REQUIRED NO.	CAPACITY	TOTAL COST (RS. IN CRORES)
1	Sewer jetting-cum-suction machine	8	10,000 L	1.36
2	Gully pit emptier	12	5,000 L	0.96
3	Sewer rodding machine	18	-	0.13
4	Bucket cleaning machine	18	-	0.90
TOTAL				3.35

Source: LNN, Lucknow Jal Nigam, and JNNURM Team Based out of Lucknow

It is hereby suggested that LNN, in short to medium term, can opt for purchase of such machines and undertake O&M of the sewer network on its own. However, in the long term, LNN can opt for O&M of the sewer network on a contract basis. Consequently, LNN can undertake necessary study to assess the overall demand of machines for the whole city (The above table provides the requirement of machines only for Districts I and III. Once the sewer network is ready in Districts II and IV, LNN would have to add a fleet of machines to its existing machines.) and also understand and develop a contract for O&M of the sewer network.

4.5.6 Options for Sewage Treatment

The city is witnessing a drastic change due to the ongoing JNNURM projects wherein the whole city would have centralized sewer network. However, it is suggested that LNN can opt for decentralized systems, which are feasible and desirable in areas that are un-sewered/do not have STPs and have space to accommodate small multiple wastewater treatment plants and disposal systems. Since these systems are localized small systems, they will be economical and simpler for operation and maintenance. It may be also possible to form local committees or co-operative societies, which may take up the O&M of these plants. If this is not feasible and achievable, the alternative is to outsource the O&M to a private party or LNN may have to take over this responsibility.

The choice between decentralized and centralized systems mainly depends on feasibility in terms of availability of land for decentralized systems, their acceptability to the people and cost (both capital and O&M). However, LNN should promote the idea of a decentralized system for peripheral areas that have space and institutions such as malls, large official complexes, and commercial complex and small industries.

A decentralized system has following advantages:

a. It reduces the pressure on the sewer network and the stress on water demand.

b. It has low operational and maintenance costs.

c. Semi-skilled persons can operate the whole system.

d. Energy consumption is nil or very low, depending upon the technology applied.

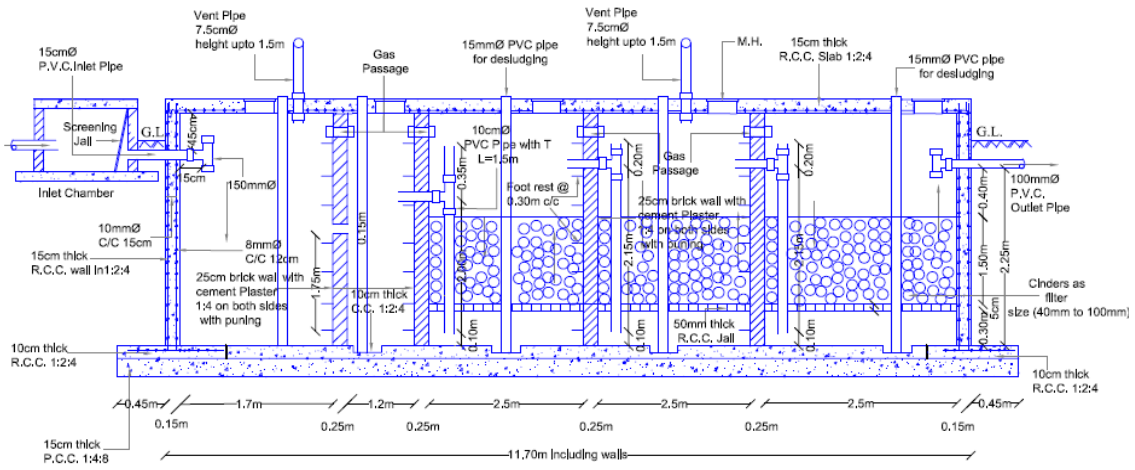
e. It can be designed as per the site condition and requirement – reuse or disposal of effluent and safe reuse of sludge.

f. It is suitable for all the site conditions including undulating topography where conventional sewage treatment cannot be implemented.

There are several technologies under the decentralized wastewater treatment system, with slightly different working principles. Though it is advisable to opt for anaerobic chambers with baffled walls and growth media in treatment chambers in series, LNN can opt for any other method based on the assessment of various other factors. In this system, wastewater is first allowed to settle in the settling chamber, from where it flows into 3–4 treatment chambers, which are connected in series. From each chamber, effluent flows to another chamber from 3 or 4 points that checks in any turbulence in flow of water, causing solid parts of the wastewater to settle. In all the treatment chambers, bacterial growth media are used. For growth media, cinders, as they are light and porous, or any rough and used plastic materials may be used. Loosely woven coir ropes have also been used for this purpose. This method gives a much better result as it provides a huge surface area for the growth of bacteria. After the treatment, the effluent is discharged or reused for agriculture purposes. The total retention time under the system is only for 3–4 days in case of mixed black and grey water, depending on the initial biochemical oxygen demand level. The cleaning of first settling chamber is carried out after 3 to 4 years. Such cleaning can be carried out by sludge pumps, and the sludge can be put to use in agriculture land.

For a 25 m^3 system, a part-time semi-skilled operator is required to check any blockage in the drains. To operate the system, no additional manpower is required. One person can be engaged to look after 2 to 3 nearby plants.

The following diagram represents a layout of a 25 m^3 wastewater (black and grey water) decentralized treatment plant.



Section Elevation

The cost of a decentralized system depends on the method applied. An anaerobic baffled treatment plant with a capacity of 25 m^3 costs approximately Rs. 4,50,000 to Rs. 5,00,000. Moreover, the recurring expenditure comes to about Rs. 1,50,000, which is quite low.

In India, the decentralized treatment system has been implemented at a number of places such as Kerala, Tamil Nadu, and Karnataka. Though there is no report of operating the system on PPP basis, which could be due to the fact that there is no direct income from the system. However, the income can be generated by selling treated water for agricultural purpose. Moreover, in case of malls, large institutions, small industries, and commercial complexes, the treated water could be put to use for non-potable purposes.

4.5.7 Options for Sludge Reprocessing and Tertiary Treatment of Effluent

Based on our discussion held with the officials, it was revealed that in the case of sludge recovered from STPs (approximately 40 t from Bharwara STP and 4 t from Daulatgang STP), LNN can explore sludge reprocessing and enrichment for its conversion to organic manure or scientific disposal through the landfill site. LNN can undertake necessary study to identify the preferred way of disposing of sludge.

Moreover, it is also suggested that the effluent coming out of STPs should further be treated to bring down the suspended solids, reduce BOD/COD, and improve DO levels to make it available for use in non-potable purposes.

Tertiary treatment supports in removing stubborn contaminants that secondary treatment is unable to clean up. The wastewater effluent becomes even cleaner in this treatment process through the use of stronger and more advanced treatment systems. However, tertiary treatment should be adopted only when there is requirement of treated waste water for different useful and economic purposes as tertiary treatment is expensive option. For tertiary treatment LNN can opt for a technology from a range of technologies such as Moving Bed Bioreactor Technology (MBBR),

Activated carbon, and Sequential Batch Reactor (SBR), suiting LNN's requirement. A brief on these technologies have been explained as below:

MBBR technology: It is an advanced high rate waste water treatment process providing high treatment efficiency. The set up requires less space and is also low on capital, O&M and replacement costs. The water treated using this technology can even be used for washing and gardening.

Activated Carbon: Activated carbons and filtration systems support in removing organic and inorganic contaminants from groundwater, surface and process water, wastewater and air/vapor streams with permanent or removable absorber equipment options and carbons backed by an industry-leading quality assurance program. The system has high O&M costs and therefore has not been tried in India. However, the technology has been used in treating industrial waste water at Common Effluent Treatment (CET) plant at some places.

SBR technology: SBR is an activated sludge process designed to operate under sequences for various phases of biological treatment where aeration and sludge settlement both occurs in same tank. It is a fill and draw type activated sludge process where individual reactors are filled one by one in five discrete periods i.e., Anoxic fill, React, Settle, Decant and Idle/ Waste sludge. It can be designed for large volume of influent and consists of fine bubble air diffusers. In this process, the compressed air is sheared into small bubbles creating large specific surface area for higher mass transfer efficiency between air and waste water. An appropriately designed SBR process is a unique combination of equipment and software providing highest level of effluent quality on all parameters including BOD and nutrient removal. Automated control minimizes the manual intervention and thus there is minimal possibility of operational errors. The final effluent quality not only fulfils the Indian effluent discharge standards, but it also fulfils the US EPA standards for non-potable reuse.

In India, SBR technology has been used at some places and is being operated successfully. The largest plant in India has been implemented in Navi Mumbai in 2008. An 80 MLD plant of project cost Rs 59.78 crores was executed by M/s Ramky Infrastructure in Ahmedabad, Gujarat. Recently, a plant has been installed in Noida, Uttar Pradesh that is reported to be working well.

A list of the names of the manufacturers/suppliers of the SBR technology have been provided in Annexure 10.10.

Re use of treated water

Treated waste water can be put to re use based on the degree of treatment of waste water and final characteristics of effluent quality.

Treated effluent of a secondary treatment plant can best be used for agriculture purpose. Though the permissible level of BOD for agriculture use is 100 mg /l, however, it has been observed that effluent having such BOD level when regularly used for agriculture land creates layer of solid on soil. Henceforth, in the long term it has some inhibitory effect on soil texture and its productivity. During secondary treatment the BOD level normally is around 30 mg/l, making it more suitable for agriculture purpose.

The treated wastewater can also be used for aquaculture purpose i.e., fish production. However, for fish production one should assure the DO (Dissolve Oxygen) level in the effluent. Fish species like surface feeders require more oxygen and can't survive in deficient oxygen environment. Such fish can't grow in 100% effluent. An existing fish pond may be used and required quantity of effluent can be put in pond to maintain the water level in the pond. Treated effluent has its own advantage due to the fact that it supports in growth of phytoplankton and zooplankton in the pond that are consumed by the fish.

As suggested by authorities, the secondary treated effluent can also be utilized for horticultural purposes in the parks, gardens, wayside green patches. The discharge of oxidation/sludge ponds should then be pumped to zonal reservoir through pumping station and then into garden/park reservoir through sprinklers/pumps for watering purposes. Based on the existing data for secondary treated effluent, the authorities have suggested the following infrastructure for the same: i) Main pumping station (MPS) at STP; ii) 3 zonal reservoirs and pumping station in zone 3,4,and 5 in LDA/UPAVP colony zonal parks; and iii) 110 reservoir and pumping station at the local Parks in the distribution lines. The approximate estimated cost as shared by the authorities for the same shall be as follows: i) MPS (Rs. 2 crore); ii) Main lines (Rs. 2.5 crores); iii) Zonal reservoirs plus pumping station (Rs. 7 crore); iv) Distribution Lines (Rs. 4 crores); v) Pumping station plus branch lines (Rs. 2.5 crore) equalling Rs. 18.00 crore. Though an approximate cost has been provided, it is suggested that the corporation shall get a detailed technical study done to arrive at the exact requirement and costs for such kind of a project.

In case of tertiary treatment of effluent where BOD level of effluent is normally less than 10mg/l, treated effluent can also be put to use for economical purposes like boiler, cooling tower, washing cloths, and gardening etc.

Another option for the reuse of treated water could be meeting the demand of water in industrial units. However, it would be important for LNN to check whether the treated water meets the characteristic of water that is being required by industrial units, feasibility to provide water to these industrial units, and their willingness to purchase such treated water.

Hence, it is suggested that LNN should undertake a study to assess the kind of technology and other factors for the development of such a plant and ascertain its use for industrial and other purposes.

Restoring existing Water Bodies

There are more than 500 water bodies in the LNN area. These are generally lying abandoned and have almost degenerated to foul condition as waste water and solid waste have also got dumped into them.

Most of the time it becomes challenging to restore existing water body in a city. In most of the cases it is neglected giving least attention to maintain its ecosystem and purity. In some cases where such water bodies are linked with supply of drinking water for the town they are given some attention. To restore water body the most important aspect is to maintain its quality. For that purpose no untreated water should be allowed to enter into such water body. Only the tertiary treated water should be allowed to flow into the pond.

Moreover, it has been observed that adjoining areas of such water bodies are abandoned and it becomes too difficult to approach such water body. In most of the cases the bank of the water body has sufficient space which can be utilized as a site for walking and arrangement can also be made to make such sites as picnic sites making aesthetically appealing to local residents through plantations along the banks. In addition to this, boating arrangement can also be worked out which provides benefit in terms of revenues and moreover boating provides some oxygen to water that results in natural treatment of water.

It is suggested that these water bodies shall be revived with provisions such as pucca bunds, steps, cleaning, and aeration. The corporation should engage the services of a technical consultant and prepare a comprehensive plan to revive these water bodies.

4.6 Project Components and Cost

Based on the above discussions, an indicative list of sanitation components and their broad investment costs are presented below.

Table 18: Capital cost for sanitation components

S. NO.	Component	Unit	Quantity	Amount (Rs. Crores)	LNN Share	Lnn Investment (Rs. Crores)
1	Individual toilets	No.	67,435	87.67	0%	-
2	Multi-storey public toilets	Seats	6,603	46.94	100%	46.94
3	Vacutug	No.	129	5.15	100%	5.15
	Total					52.09

Source: CRIS Analysis

Note: Costing for MTVs, decentralized systems, zero discharge toilets, and sewer cleaning machines has not been calculated as the same would depend on a number of factors as described in their respective individual sections. However, the capital and the running cost of the respective components have been covered in their respective individual section.

An indicative list of sanitation components and their broad running costs are presented below.

Table 19: Running cost for sanitation components

S. No.	Component	Unit	Quantity	Amount (Rs. crores)	LNN share	LNN investment (Rs. crores)
1	Multi-storey public toilets	Seats	6,603	7.43	0%	NIL
2	Vacutug	No.	129	1.93	0%	NIL
	Total					NIL

S. No.	Component	Unit	Quantity	Amount (Rs. crores)	LNN share	LNN investment (Rs. crores)
Source: CRIS Analysis						

Note: It is suggested that the operation and maintenance of public toilets and Vacutug should be considered as an outsourcing activity. Then, there would not be any O&M expenditure for LNN.

4.7 Recommendation

4.7.1 Immediate Term (6 months to 2 years)

a. Individual toilets - Sensitizing people through IEC (Information, Education and Communication) campaigns to construct their own individual toilets. Conducting a study and preparing a list of households that require individual toilets and are ready to have their own individual toilets under the ILCS Scheme.

b. Public toilets - Conversion of 50% of single-storey toilets to multi-storey toilets and construction of approximately 40% to 50% of new public toilets.

c. Initiating pilot projects -

   i. Purchasing 20 MTVs and placing them in slum areas, fairs, and temporary market areas.

   ii. Purchasing 20 Vacutug machines for sludge collection in narrow streets, especially in slum areas.

   iii. Initiating a training programme for LNN officials from MCGM to understand the mechanics of operation and maintenance of community-based toilets and implementing it in few wards.

   iv. Initiating a training programme for the engineers and officials from IIT Kanpur to understand the mechanics of zero discharge toilets and initiating a pilot project through the development of 5 to 10 such toilets and mobile toilets across the city.

d. Sewer cleaning

   i. Initiating the purchase of sewer cleaning machines for Districts I and III and also assessing the requirement for Districts II and IV based on the development of the sewer network in Districts II and IV.

e. Sludge reprocessing and tertiary treatment of effluent from STP

   i. Initiating necessary study to assess the preferred way for treating sludge and effluent that is coming out of STPs and also ascertaining treated effluent's use for industrial and other purposes.

f. LNN should explore for tie ups with IIT Kanpur and IIT Varanasi, thus utilizing their knowledge to develop low-cost technology interventions to solve city's sanitation challenges.

g. Promote rain harvesting system across malls, institutions, housing societies, colonies, industrial units, and parks.

4.7.2 Short to Medium Term (2 to 5 years)

a. Individual toilets – Refining the IEC campaign based on the experience of the previous campaign and continues to stress on public toilets wherever possible.

b. Public toilets - Completing the construction of remaining new public toilets

c. Expansion of pilot projects

   i. Undertaking a study for the purchase of additional MTVs and expanding it to various parts of the city.

   ii. Undertaking a study for purchasing additional Vacutug machines for sludge collection in narrow streets.

   iii. Undertaking development and O&M of public toilets through CBOs, NGOs, and other related agencies – expansion of such scheme across the city.

   iv. Undertaking a study for the development of zero discharge toilets across the city

d. Sewer cleaning

   i. Assessing the operation and maintenance of the sewer network on contract basis.

e. Sludge reprocessing and tertiary treatment of effluent from STPs.

   i. Based on the study, developing plants for sludge reprocessing and treatment of effluent coming out of STPs and using the treated effluent for non-potable purposes.

4.7.3 Medium to Long Term (5 to 20 years)

a. Constructing a centralized sewer network across the city and connecting the entire city with the sewer network, which is already being laid under the existing JNNURM project?

b. Encouraging the use of decentralized treatment systems and reuse of treated wastewater for non-potable purposes and providing incentives to malls, institutions, residential colonies, and complexes that are implementing the same.

4.8 Key Indicators

Based on our discussion with various stakeholders and analysis of the existing situation, following are the key indicators that have been put in place to assess the performance of LNN against improving the sanitation situation through the implementation of various projects as discussed in this report.

Table 20: Key indicators for sanitation

S. NO.	Indicators	Benchmark	Service level – 2011	Service level targeted – 2015	Service level targeted - 2020
1	Toilet Coverage	100%	89%	95%	100%
2	Sewerage network coverage	100%	40%	65%	90%
3	Wastewater treatment adequacy	100%	60%	75%	90%
4	Open defecation	0%	11%	Less than 5%	0%

Source: CRIS Analysis

5. City wide solid waste arrangement

5.1 Background

SWM is defined as an organized process of storage, collection, transportation, processing, and disposal of solid refuse residuals in a sanitary landfill. The process followed in Lucknow for SWM collection and disposal is presented below.

Figure 17: Solid Waste: Collection and Disposal

Door to door collection is done on PPP model by employees from the private partner in most of the parts of the city. They collect solid waste from establishments (residential/non-residential) and dispose it in nearby open areas. The open areas can be open plots not in use/open drains (i.e., open dumping sites). In the case of slum households, this role is played by a family member.

Municipal solid waste (MSW) is collected from unofficial dumping sites and transported to secondary collection points in a rickshaw trolley. The waste from the secondary collection points is manually lifted and placed in tractor trolleys. The waste is transported to dumping sites at Ghaila/Dubbaga/Hardoi-Kanpur Ring Road, Rarndaskheda village, and Kursi Road. However, from January 2011, LNN appointed a private sector agency for the collection, transportation, and scientific disposal of solid waste.

The following section presents an overview of the SWM system under LNN, issues associated with SWM, the PPP project undertaken by LNN for outsourcing SWM, and the strategies/interventions required for achieving Lucknow CSP's vision and objectives.

5.2 Waste Generation

Similar to any other Indian city, solid waste is generated by residents, commercial establishments, industrial establishments, hospitals and nursing homes, hotels and restaurants, slaughter houses in Lucknow.

5.2.1 Residential Areas

Waste generated in residential establishments is mainly dumped into open dumps/on the streets, dhalaos, and in some cases, in dustbins or in the drains running in front of houses. The solid waste is

collected by safai karamcharis from dumping sites. As of now, no charges are levied on households for the collection of MSW by LNN.

In the some middle income group (MIG)/high income group (HIG) areas and newly developed areas in Lucknow, viz., Gomti Nagar, Indira Nagar, etc., waste is handled by private operators either individually or through NGOs (Muskan Jyoti Samiti, etc.). Private operators provide daily door-to-door waste collection service at a monthly charge of Rs. 15, 20, 25, and 30 to slum dwellers, economically weaker sections (EWSs), MIGs, and HIGs, respectively. This waste is transported to secondary waste collection centres by rickshaw trolleys. A population of more than 100,000 is served by these operators through NGOs in Lucknow city.

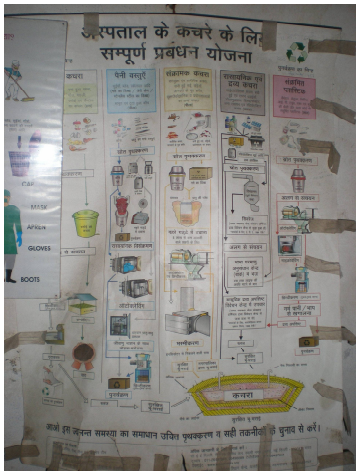
5.2.2 Commercial Areas

The commercial areas identified in Lucknow city are located throughout the city and include Aminabad, Charbag, Alambag, Rajaji Puram, Gomati Nagar (Vibhuti Khand, Vivek Khand), Hajarat Ganj, Ali Ganj, Bhutnath, Lekhraj market, Indira Nagar, Sanjay Gandhi Puram, Faizabad Road, etc. These areas are mixed zones comprising commercial (shops and markets) and residential areas as well as hotels and restaurants. The waste from shops starts accumulating in nearby open dumps in the morning hours (8:00 AM–2:00 PM), when they are cleaned. Safai karamcharis clean market places and throw the waste in nearby open dumps. Commercial establishments are currently not charged for market sweeping and waste collection and disposal at nearby secondary collection points.

5.2.3 Hospitals and Healthcare Establishments

Approximately 200 hospitals, 200 nursing homes, 344 medical clinics, 33 pathologies, 93 dental clinics, and 1,762 private doctors' clinics are registered with LNN, but the actual numbers of medical institutions are even higher. The large medical establishments have in-house facilities for treating biomedical waste. Approximately 1,500 kg of commingled waste is collected daily by the Nagar Nigam, and nearly 500 kg of biomedical waste is incinerated after segregation. The remaining solid waste generated from these medical institutions is dumped in open land and is taken care of by LNN.

Figure 18: Bio Medical Waste Management at Vivekanand Hospital, Lucknow

5.2.4 Hotels and Banquet Halls

Lucknow has more than 1,000 establishments comprising eating joints, hotels, restaurants, banquet halls, etc. The waste from these establishments mostly includes leftover food and disposable crockery. Workers of these establishments dump the waste at nearby containers/open dumps/dhalaos from where the same is transported to designated dumpsites by Nagar Nigam workers.

5.2.5 Drain Silt

Drain silt typically comprises dust, household waste, sweepings, construction waste, etc. The major portion of drain silt is generated by the disposal of household sweepings/street sweepings in open drains. The drains are cleared of the accumulated solid waste twice or thrice a week/even fortnightly in a few parts of the city. At other parts, the waste is left unattended for months and cleared only before the rainy season, upon receiving complaints from the local residents. Drain silt constitutes about 6% percent of the MSW generated in Lucknow.

5.2.6 Construction and Demolition Sites

Construction and demolition waste comprises ~16% of the waste generated in the city (Source: MSW DPR). However, the quantum varies from time to time depending on the construction or demolition activities in Lucknow city. There are no standard practices followed for the disposal of construction waste in Lucknow city. A major portion of this waste is generally used in reconstruction activities or for filling up low-lying areas or constructing temporary (kachha) roads. The entities generating construction waste generally engage private vehicles to collect construction waste and dispose it at nearby dumping sites.

5.2.7 Street Sweeping

LNN employees as well as private people are involved in this function. They collect the waste dumped on roadsides and transport it to nearby open dumps/dustbins by rickshaw trolleys or to the outskirts of the city directly by tractor trolleys. Street sweeping starts at 7:30 AM and continues up to 2:00 PM.

During sweeping, one sweeper covers an area of 10,000–20,000 sq yards depending on the width of drains and roads. According to the DPR of SWM, street sweeping constitutes about 3% of the MSW generated in Lucknow.

5.2.8 Per Capita Waste Generation and Waste Characteristics

Details of per capita generation of MSW for various residential categories are provided in the following table.

Table 21: Per capita generation of waste

Categories	Sample size (No. Of families)	Average per capita Waste generation (gm/day)
Residential		
EWS	24	258.89
LIG	423	268.08
MIG	339	278.75
HIG	142	295.04
SOURCE	**CATEGORY**	**QUANTITY OF WASTE**
Hospitals	Hospitals, Clinics, and other Medical Centres	5.08 MT/day (MSW along with biomedical waste)
		1.85 MT/day (biomedical waste)
Others	Restaurants	7.75 MT/day
	Hotels	4.22 MT/day
	Banquet Halls	1.27 MT/day
	Slaughter Houses	12.5 MT/day
Source: DPR on SWM		

MSW primarily comprises 30–35% of organic fraction, 3–6% of recyclables (paper and plastic), 40–45% of inert materials, and less than 1% glass and metals (National Environmental Engineering Research Institute [NEERI]). In the case of Lucknow, the general characteristics of waste generated are given below:

Table 22: MSW characteristics

Waste characteristics	Percentage
Organic Waste	47.35%
Recyclable Waste	17%
Drain Silt and Street Sweeping	8.95%
Construction Waste	15.98%
Others(Mixed Waste)	10.27%
Source: DPR on SWM	

5.3 Waste Collection

Details of the quantum of waste generated and the vehicles deployed for transporting it are provided in the following table.

Table 23: Waste Generated and Vehicles Used

SOLID WASTE	QUANTITY
Waste generated per day in Lucknow	1,320 Ton
Waste collected per day	1,236 Ton
Vehicles used for collection of waste	
Lorry	3
Dumper	23
Tractor	6
Tipper Truck	44
Three Wheeler Auto Tipper	39
Tata Ace	68
Others	3
Total	186
Source: DPR on SWM and LNN	

It is noted that almost all the vehicles have completed their economic life and are worn out. The containers used for secondary storage are also in poor condition due to the lack of maintenance, corrosion, etc.

5.4 Administrative Setup for MSW Management

The administrative control in LNN for SWM is under the Municipal Commissioner, who is assisted by health officers, chief sanitary and food inspectors, sanitary & food inspectors (14), and safai nayaks (53).The cleaning functions are performed by safai karamcharis (4,705).The city has been divided into 110 election wards and 6 zones for the purpose of MSW.

Table 24: Institutional Arrangement for MSW

Designation	Number
Municipal Commissioner	1
Health Officers	5
Chief Sanitary Inspectors	18
Safai Nayaks	53
Total Safai Karamcharis	4,705
Source: LNN	

5.5 Issues with SWM

The following section lists the challenges faced by LNN during SWM. It should be noted that a private sector operator has been appointed for SWM from January 2011. LNN expects the private operator to resolve a number of challenges listed below.

- **Lack of Sanitary landfill site**

Currently, there is no sanitary engineered landfill, and MSW is dumped in open land, which can lead to ground water and soil pollution, vector nuisance, etc. However a sanitary land fill site is under construction under the SWM project, which is being implemented on a PPP basis. The details of the site is placed at Annexure 10.11.

- **Inappropriate primary collection of solid waste**

Waste is discharged by establishments (residential and non-residential) into open plots, open drains, etc. These unorganized disposal methods have resulted in the accumulation of solid waste on roadsides, vacant plots, and storm water drains. This has resulted in a number of hygiene-related problems such as breeding of mosquitoes and presence of stray animals.

- **Transportation of solid waste in open vehicles**

Solid waste is transported primarily in open trucks, three wheelers, and trolleys. It is also observed that these vehicles are overloaded with waste, resulting in the littering of roads during transportation. The loading and unloading of waste are done manually, and safai karamcharis involved in this activity do not use any personal protective equipment (PPE) for their protection.

- **Inappropriate collection and disposal of construction waste**

The construction/demolition waste generated by local residents is transported in tractor trolleys and disposed at either secondary collection points or open/low-lying areas in the vicinity.

- **Mixing of slaughter house waste with MSW**

Waste from slaughter houses is disposed in open dumping sites, although there are provisions for separately disposing slaughter house waste in Lucknow city.

- **Lack of proper treatment for biomedical waste**

The arrangement for separate collection of infectious biomedical waste is non-existent, and there are no separate arrangement for the transportation of infectious waste from hospitals and nursing homes. As per the survey, 77% of the clinics and hospitals store biomedical waste along with MSW, there is only one incinerator owned by LNN, and very few private hospitals actually segregate biomedical waste.

- **Inadequate number of community dustbins**

40% of the household respondents and 55% of the respondents in slums dispose solid waste in open areas. One of the reasons for this is the lack of adequate number of community bins.

- **Multiple handling of waste**

Waste is handled multiple times leading to potential health hazards for the workers as all types of wastes including hospital waste, human waste, etc., are disposed at the same storage points. Sanitary workers are not given any protective clothing.

- **Lack of community involvement**

There are very few Resident Welfare Associations (RWAs) or NGOs involved in this activity and the community at large is not involved in effective SWM.

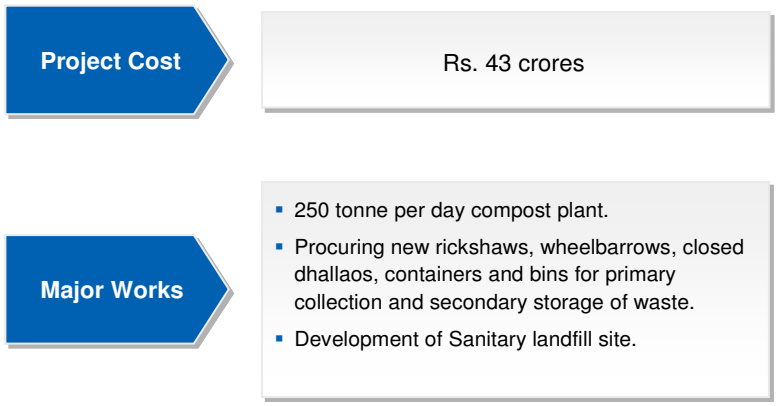
- **User charges for solid waste**

Currently, LNN spends around Rs. 36 crores annually on SWM, but there were no user charges till Mar 2011. It should be noted that a resolution has been passed to levy user charges for SWM for each household from Rs 25 to Rs 40 per month. The same has been implemented from May 2011 onwards by Jyoti Envirotech Private Limited. The copy of the government order is enclosed as a part of the Annexure 10.11.

5.6 Projects under JNNURM

LNN has privatised collection, transportation, and disposal of MSW. Under a project funded by the JNNURM scheme, a private partner named "***Jyoti Environ Tech Pvt. Ltd.***" has been appointed for the collection, transportation, and scientific disposal of waste.

Figure 19: Details of MSW project under JNNURM



Source: SWM DPR

In addition to the components approved under JnNURM, the private player is also putting an RDF plant which is around 30 Cr and hence the total project is around 70 Cr.

The project is proposed to ensure the following:

- Segregation of biodegradable and non-biodegradable wastes at households. An awareness campaign to explain the importance of this activity is a part of the project.
- 100% door-to-door waste collection for SWM in the city
- Separation of waste into biodegradable and non-biodegradable wastes at every secondary collection point and their storage in two separate covered containers
- Minimize the distance a sweeper is expected to travel to not more than 250 metres to dispose off the waste collected
- Transportation of biodegradable waste (green containers) from secondary collection points to a designated composting site on a day-to-day basis
- Transportation of non-biodegradable waste (black containers) from secondary collection points to a designated integrated waste processing facility at least once in two days

5.6.1 Scope of work of the concessionaire

The concessionaire is allowed a 30-year concession period and will be paid a tipping fee of Rs. 562 per ton and an increase of 4% ever year. Further, user charges will be also be levied on households. This will range from Rs. 20–50 per family/month. In turn, the concessionaire is expected to undertake the following:

- Door-to-door collection of MSW
- Primary storage of the collected MSW
- Secondary collection and transportation of MSW including street sweeping waste and drain silt
- Development, construction, and operation and maintenance of the MSW processing facility with composting as one of the main processes including segregation of waste
- Development, construction, and operation and maintenance of the landfill facility
- Carrying out post-closure activities at the landfill facility

- Collection, transportation, processing, and disposal of the MSW littered within the concession area
- Assisting ULBs in public education or organizing awareness campaigns related to MSW
- Collection of user charges on behalf of ULBs as determined by the ULBs from time to time
- Development and implementation of a complaint redressal system
- Development, financing, and operation and maintenance of the project
- Augmentation of equipment vehicles, capacity enhancement, and provision of ancillary facilities required for the implementation of the project during the concession period
- Deployment of adequate and qualified manpower for construction, and operation and maintenance management of the project
- Procure and/or provide any other required support services and facilities required for the project
- Performance and fulfilment of all the obligations of the concessionaire in accordance to the provisions of the concession agreement and matters incidental thereto or necessary for the performance of any or all of the obligations of the concessionaire under this agreement

During the concession period, the concessionaire shall ensure that all MSW generated within the concession area is collected, transported, segregated, processed, and disposed in accordance with the applicable laws and this agreement.

5.6.2 Progress Made

The private player has already started collecting waste from 63 wards and is likely to cover all the 110 wards by July 2011.

Table 25: Status of MSW Project

ZONE	TOTAL WARDS	WARDS COVERED FOR DOOR-TO-DOOR COLLECTION
Zone 1	16	10
Zone 2	18	12
Zone 3	21	10
Zone 4	17	05
Zone 5	18	14
Zone 6	20	12
Total	110	63

Source: LNN

Figure 20: Door-to-Door Collection Initiated in Ward 110

5.6.3 Areas of Concerns in the Project

The issues faced by the SWM project, identified from the evaluation of the DPR, and the challenges faced by similar projects during the implementation stage are as follows:

- The project proposes the community participation in the source segregation of domestic waste ('compulsory segregation of waste') as well as in the selective disposal of construction debris and demolition waste. However, LNN will have to undertake sustained efforts to achieve these objectives.
- Lucknow has a waste-to-energy plant built by Asia Bio Energy Ltd. in Barawan Kalan village at a cost of around Rs. 84 crores with government subsidy. The plant has a capacity of 300 TPD. The DPR assumes that in the future, the biogas plant will be revived, and therefore, a part of the waste will be treated there. This could be difficult to implement as this plant has been out of operation for last 6–7 years.
- The project proposes the adoption of conventional windrow composting technology, which has a very high potential to create odour nuisance.
- The project also needs to take into accounts the reject from the compost plant, which can be almost 50% of the plant intake.
- The project will have to make provisions for the replacement of equipment, implements, PPE, vehicles, etc., that typically varies from 3–5 years depending on the intensity of use of individual items.

5.7 The Overriding Paradigms

It is proposed that Lucknow Nagar Nigam (LNN) has initiated the process of integrated approach and shall ensure that the integrated approach for total solid waste management from primary collection to its ultimate disposal including all the intermediate steps. Protection of the environment and the public health is the overriding paradigm for formulation of the plan. In this respect LNN will strive to collect on a daily basis, among other fractions, the putrefying waste which endangers public heath and will evolve an appropriate strategy for other fractions of the MSW. LNN will develop an appropriate system for providing full and uniform coverage of the city population across all categories of settlements and income groups.

In order to achieve higher collection efficiency and thereby ensure improved aesthetics across the city, LNN will make all necessary and appropriate efforts to introduce a mix of door-to-door collection service in residential areas and install containers (create community waste storage depots) at convenient spacing in commercial, institutional and industrial areas. Over time and to the extent possible, LNN will aspire to gradually achieve 'bin-free' status for the city by introducing full motorised primary collection in its residential areas.

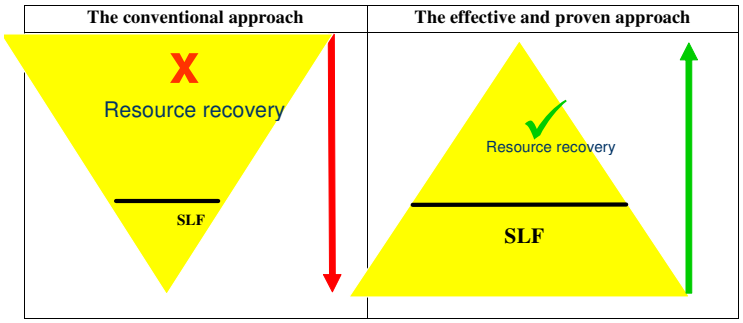
With regard to treatment of mixed MSW, LNN recognises the multitude of inherent and external challenges involved in any possible ways of potential value addition to it and would therefore not pursue such options which are technology and capital intensive. However, it will aspire to and work

towards the objective of reduction of volume of the waste that is otherwise destined for disposal into a sanitary landfill site.

While LNN takes cognisance of the importance of resource recovery, thereby minimising waste loads on the landfill and land requirements for the latter, it is recognised that these objectives need not be necessarily pursued at the cost of environment and public health. It is also recognised that a well designed sanitary landfill is the most robust, elastic and forgiving option for safe disposal of mixed MSW at all times and the management system to be developed for the LNN will have an SLF as the bedrock of all relevant infrastructure planning.

In this respect the figure below graphically illustrates the conventional approach (on the left hand side) that has been tried out in several cities across the country over last decade without any tangible results (closed biogas plant at Lucknow is an example of that) and the one which is proposed for adoption in the LNN area (on the right hand side) for effectively safeguarding the public health at all times. The former approach represents an inverted pyramid wherein resource recovery is given priority while SLF capacity is kept to a minimum. The latter approach represents an upright and stable pyramid wherein an SLF created at the outset offers a (a) strong base on which to build up, over time, the rest of the strategy and infrastructure for resource recovery, waste minimisation, etc. and (b) backstopping facility when the system is in full flow.

Figure 21: The Contrasting Conventional and Effective Approaches towards Integrated Solid Waste Management



In line with the above proposed approach, in due course of time LNN will strive to promote the practices of, among others storage and segregation of waste (e.g., hazardous domestic waste/chemicals, medicines, electronics, recyclables such as newspapers, glass and plastic bottles, etc.) at source through a sustained campaign for public awareness and community participation. By following this approach, LNN will aspire to achieve compliance with the MSW Rules, 2000 in a phased manner.

In this respect, LNN will promote the practice of **'Home Composting'** in residential areas and offer appropriate incentives for willing households. The device used to promote **'Home Composting'** is shown in figure 22 which comprises a perforated bin of about 100-150 litre capacity and requires a simple regimen to follow. A composting bin can receive mixed domestic waste and converts the bio-degradable fraction into compost in about three months. **'Home Composting'** is recognised to be the most effective element in the overall scheme of integrated MSW management for restricting entry

of potentially putrefying domestic waste in the mainstream of the mixed MSW. It enables, among others (a) resource recovery in least cost at the source of generation, (b) when scaled-up to a large number of households, reduction of costs in primary collection and subsequent stages of MSW management, and (c) reducing organic waste loads destined for SLF. This is especially suitable for plotted developments which are characterised by large horizontal spread, low vertical development and availability of front and/or back yards in houses, etc.

Figure 22: Home Composting – an Effective Way To Minimise Msw

On the same lines, as the system evolves LNN will facilitate creation and operation of recycling centres in different municipal zones through community participation where potentially utilisable material will be received, stocked, sorted and sent to prospective end users/buyers, etc.

5.7.1 Service Levels

In this broad context, the aim of the sanitation plan is to enable LNN to move toward providing 100% coverage under door-to-door collection service and achieve safe disposal. This ultimate level of service depends on among others, availability of manpower (trained, motivated and committed), fleet of collection and transport vehicles, secondary storage containers, the treatment and disposal facilities and the resources for sustained operation and maintenance. In this regard, a set of indicators for level of service under different categories are provided in Exhibit 3 wherein the primary stage refers to citywide service for waste collection from households, community bins and street sweeping.

Table 26: Solid Waste Management Service Levels In Lucknow

STAGES AND INDICATORS	LEVEL OF SERVICE	YEAR				REMARKS
A. PRIMARY STAGE		2010	2011	2012	2014	

STAGES AND INDICATORS	LEVEL OF SERVICE	YEAR				REMARKS
Area under DTDC service	90%	15%	70%	90%	-	Aim of full coverage. The integrated SWM Project is operational from 2011 onwards
Area served through motorized primary door-to-door collection.	80%	15%	50%	80%		Favoured mode with growing coverage.
Area served through containers (4.5 cum) at community waste depot.	10%	85%	30%	10%	-	Finally only bulk generation sources, markets and slums will be served by CWD.
Area served through manual DTDC service	10%	0	10%	10%	10%	Municipal workers operating hand carts for street sweepings do not provide DTDC service.
Nr. of cycle rickshaws in use for primary collection.	5 per 1000 hh	0	5 per 1000 hh			
Nr. of vehicles in use for motorized primary door-to-door collection service.	1 per 800 hh	0.15	1 per 800 hh			4 wheelers with raised body, also suitable for transport to the landfill.
Nr. of containers (4.5 cum capacity) at CWDs.	2.5 per 1000 hh	0.4	2.5 per 1000 hh			Metallic containers in low income settlements, commercial areas, bulk sources, etc.
Lifting of waste from CWDs.	1/d	0.14–1	0.5	0.75	1	Service varies over a wide range. Aim to lift at all CWDs at least once a day.
Area under daily road sweeping service	100%	50%	70%	100 %	100 %	All designated roads.
Nr. of hand carts in use for collection of street sweepings.	2-4/ km of road.	NA	2	3	4	LNN to evolve appropriate service levels in line with the MSW manual.
B. Secondary stage						
Covered containers	100%	0	75%	100 %	100 %	As per the requirements of MSW Rules, 2000.
Transporting vehicles which are covered	100%	0	50%	100 %	100 %	

STAGES AND INDICATORS	LEVEL OF SERVICE	YEAR				REMARKS
Combined waste transport capacity	125%	50%	70%	80%	100 %	Depending on distance to SLF, consider 2-3 trips/day.
C. Tertiary stage						
Daily waste load collection from all sources	100%	60%	70%	85%	100 %	
Waste receiving treatment	25%	0%	5%	15%	25%	Including home composting.
Safe disposal in SLF	100%	0	0	0	75%	SLF should be ready in 3 years.
Waste released into open environment	0%	100%	95%	85%	0	
D. Cost recovery						
Households paying user charges	70%	0%	20%	30%	50%	@ ` 10-50 pm.
E. Customer service						
Complaints per year	NA					LNN to document.
Complaint turnaround time	24hrs	48	24	12	12	LNN to document and monitor.
NOTES: NA: not available; SLF: sanitary landfill						

Secondary stage refers to transport of waste to the treatment and disposal site. Tertiary stage relates to treatment and disposal arrangements. Accordingly LNN is required to mobilise resources such that gradually the desired level of service is attained over a period of about 4-5 years. For the subsequent years LNN should develop service levels based on its own experience of the initial years and sustain them over the entire duration of the plan.

5.7.2 Projected waste quantities

In order to achieve and maintain the desired 'level of service', LNN will take into account expected growth in population, number of households, geographical area and the quantity of solid waste. From this point of view, projections are presented in Table below to offer guidance in planning for the infrastructure/assets and services (unit waste loads @ 0.45 kg/cap/d). As per these projections, the base year 2011, the average quantity of MSW is estimated to be around 1400 MT/day and which is projected to increase to about 2000 MT/day in 2021. However over and above this an additional 5-8% of the waste generated is also accounted by the floating population and for which the proposed system must have adequate buffer capacity to absorb the shocks.

Table 27: Projected Population and Waste Loads for the LNN Area

YEAR	POPULATION	NO. OF HOUSEHOLDS	MSW (MT/D)
2012	2885820	577164	1473.5
2013	2955285	591057	1524.0
2014	3025795	605159	1576.0
2015	3097368	619474	1629.4
2021	3550095	710019	1982.5
2026	3960000	792000	2324.2
2031	4402509	880502	2715.7
Source: DPR on SWM			

5.8 Interventions

LNN has taken up several steps for implementation of an integrated solid waste management system however it is necessary that LNN should ensure the following aspects in addition to those for an effective implementation of the integrated plan. The key steps that the CSP recommends to meet the challenges highlighted above and achieve the vision and objectives are as follows:

5.8.1 Strengthening Integrated Solid Waste Management Process

Table 28: Interventions for integrated Municipal Solid Waste Management

S.NO	ASPECTS	INTERVENTIONS
A	Enhancing Coverage	LNN should attempt to make the cantonment area also a part of this integrated solid waste management system.
B	Primary Collection	LNN shall take up a sustained public awareness campaign and thereby attempt to motivate residents to take up source segregation. In order to address the issue of organic food waste to a certain extent, LNN shall proactively promote the practice of 'Home Composting' among willing households.
B	Primary collection and secondary storage	Arrangements must be made for primary collection of waste from domestic, commercial, industrial and institutional sources, and its secondary storage (temporary storage) at community waste depots (CWD) across the city. All waste generators in commercial and industrial areas will be served through a combination of door-to-door collection service as well as conveniently placed closed containers.
C	Collection from non-domestic sources	Waste from hotels, restaurants, marriage halls, community halls, etc. should be lifted daily by deploying a set of separate

S.NO	ASPECTS	INTERVENTIONS
		motorised primary collection vehicles in commercial areas. In mixed land use areas, the same vehicles which serve households will cover commercial establishments. All sources characterised by bulk generation of putrefying waste like vegetable, fruit and flower markets; meat and fish markets; and temples and gurudwaras will be provided 4.5 cum containers at convenient locations. The number of containers will be determined for each such location; these should be adequate, correspond to the estimated peak waste volumes/loads, and have 100% standby capacity. The frequency of lifting these containers will be at least once a day, which may be increased depending on the quantity of waste generated at the respective nodes.
D	Replacements	Due to expected wear, tear and corrosion, timely replacement is a major feature of a good SWM system. LNN should ensure that all equipment and containers to be deployed for primary collection /secondary storage shall be replaced fully once every five years. All vehicles deployed for motorised primary collection shall be replaced once every seven years.
E	Street sweeping and drain sweeping	LNN needs to ensure that the municipal workers are motivated and inspired by the department head to give better service. The municipal workers need to be offered appropriate incentives in the form of uniforms, personal protective equipment, annual rewards and recognition, etc. Regular monitoring and supervision by inspectors and darogas is essential for higher performance. LNN should also consider community participation in monitoring this service and consulting for feedback from the community on a regular (weekly/monthly) basis.
F	Secondary collection and transport	Waste collected by the primary collection vehicles and should be disposed off in closed containers, which will be installed at the designated CWDs. The containers will be lifted at least once a day by a dumper placer vehicle and transported to one of the transfer stations. Waste from areas which are served through the motorized primary collection system will be transported to the transfer stations. Likewise, the containers which will be installed in areas covered by the motorized primary collection service will also be lifted and transported by the dumper placer vehicles to the transfer stations at least once a day. At all commercial and institutional areas and all bulk generation locations, the containers will be lifted by the dumper placer vehicles in line with the expected waste loads. Accordingly, the frequency of lifting in such areas will have to be kept more than once a day depending on the waste

S.NO	ASPECTS	INTERVENTIONS
		generated by them.
G	Transfer Stations	It is recommended that LNN evaluates the option of providing an adequate number of transfer stations at suitable locations which will help economize the cost of long haul and improve efficiency of operations. It is understood that LNN is proposing to construct four transfer stations. However, they should ensure that the stations proposed have space for future expansions also.
H	Recycling centre	LNN can explore the option of creating recycling centers in different municipal zones for separate collection of potentially reusable and recyclable waste, e.g., paper, plastic, rubber, and demolition waste. These centers shall also collect stock and safely dispose off hazardous waste generated in households, shops and establishments, institutions, etc.
I	Waste Disposal	LNN should simultaneously implement all other necessary measures at the city and community levels for minimizing waste loads destined to the sanitary landfill site. By adopting this strategy, LNN, over time, will aspire to comply with the MSW Rules, 2000.

Further details regarding the above-mentioned interventions have been placed in Annexure 10.11.

5.8.2 Personnel Management and Occupational Health

Municipal solid waste management operations essentially involve 3Ms, i.e., management of material, machinery, and manpower. In the overall scheme, manpower plays a critical role because a bulk of the municipal workers at the lower rung are characterized by low levels of education, awareness, commitment, and discipline; poor skills; wayward behavior and practices; resource diversion; absenteeism; alcoholism; drug addiction; etc.

Further, due to the very nature of their occupation, MSW 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 LNN allocate adequate resources to ensure appropriate interventions for management of personnel and their health and safety. These interventions will comprise:**

- A range of short-term training courses round the year on a regular basis for all grades of MSW workers on:
  - Motivation, yoga classes, de-addiction, etc.
  - Orientation on the significance and importance of their work to the city to enhance self-esteem
  - Occupational health and safety aspects, personal health protection, etc.

- Effective and safe working practices, new skills, use of right equipment and implements, etc.

- Regular medical check-up of all MSW/sanitation workers
  - Appropriate and commensurate support for curative treatment for those found to have chronic ailments.
- Provision of uniforms, caps with LNN logos, and personal protective equipment on a regular basis to impart a sense of identity

5.9 Institutional Strengthening and Capacity-Building

Institutional strengthening and capacity-building within LNN are sorely needed to strengthen the existing infrastructure and ensure service improvement, proper personnel management, etc. The interventions required are briefly described in the paragraphs that follow.

5.9.1 Aligning MSW management with the Engineering Department

MSW management is predominantly a material, machine and manpower operation involving logistics planning, fleet management, technical and technology considerations over the entire supply chain, etc. It also involves, among others, manpower management, resource control, and monitoring and evaluation on a continuous basis. An engineer by training is more suited to perform these functions compared to a health officer who has a background in clinical/medical or public health aspects or simply a sanitary inspector. The domain of solid waste management requires 'public health engineering' expertise as against the conventional approach of entrusting the responsibility to a 'public health' specialist. In this respect, **it is therefore recommended that LNN takes appropriate measures to transfer its MSW management function from the Sanitation/ Health Department to the Engineering/ Public Works Department**. In this regard, it is noteworthy that the Government of Uttar Pradesh has taken a policy decision to effect this key institutional change across the state. It is understood that LNN will implement this decision in the short term and depute a senior-level engineer to take care of its citywide SMW operations.

As a result of this realignment, it is recommended that the Municipal Health Department be given the responsibility for monitoring the effectiveness of the MSW management operations in terms of indicators for 'public health', hygiene, environment and aesthetics.

5.9.2 Capacity for public relations and community management

Successful MSW management requires significant inputs in the area of public relations and community management. It requires community organization (formation of CBOs, RWAs, etc.), mobilization (workshops, seminars, *melas*, conferences, etc.) and regular communication (newsletters, press briefings, etc.) to ensure constructive participation of different stakeholders. In this respect, LNN does not have adequate capacity, especially on its orientation towards MSW activities. **It is therefore recommended that LNN engage a group of qualified and experienced social workers (with Master's degree in social work) with good communication skills so as to be able to commence a sustained campaign on effective solid waste management all across the city.**

The service of the social worker can also be utilized for engaging with the community on a range of other municipal issues/services.

5.9.3 Local bylaws for MSW management

LNN must take up a review of its existing bylaws as applicable to MSW management and identify areas for improvement in line with emerging challenges. For instance, it must lay down new rules for waste generators to adhere to, in respect of, but not limited to storage at source; safe disposal of hazardous waste; limiting the use of packaging material by local traders; responsibilities of bulk generators of organic waste; prevention of littering by hawkers/venders and temporary market shops; indiscriminate burning of waste; regulation of disposal of construction debris; and incentives and disincentives for compliance, etc.

5.9.4 Training of councilors and officials

There is a strong felt need for LNN to take up orientation programs for the benefit of municipal councilors as well as officials from all departments on the subject of, but not limited to:

- Effective solid waste management and its various components
- Benefits of a good system and risks of mismanagement
- Responsibilities of various stakeholders, and
- Resources required and challenges involved for effective SMW.

In this respect, **LNN should also either organize study tours to those cities where good work has been carried out in the recent past, e.g., Surat, New Bombay, Suryapet, and Namakkal or invite concerned officials to Lucknow for sharing their experiences.**

5.9.5 Participatory monitoring

In order to complement the strengths of the implementing and monitoring departments, **LNN must introduce a system of monitoring and inspection by officials from other departments on a rotation basis in different wards of the city.** This will ensure higher visibility in the public, and higher transparency, accountability and familiarity with the essential services among the ULB officials at all levels. As a result of improved feedback generated through this initiative, LNN will be able to improve service levels across the city at the least cost.

It is recommended that LNN must also work with civil society/community in evolving a participatory monitoring system for waste management services, e.g., in market areas and residential colonies. Representatives of CBOs should be regularly invited for consultation and feedback.

Customized manual on MSW management

Once the entire MSW management system is in place, **LNN must commission a specialist agency for the preparation of a customized manual/guide book** for its officials and for continuation of agreed service levels/ practices/operations in the event of transfers of officials, etc. The manual must define the key issues, the challenges which LNN faces, and the system that it has evolved for providing the desired level of service at different stages, from primary collection to eventual safe disposal into an Sanitary Land fill site. The customized manual must also define different service delivery models that

LNN has adopted and all the efforts that it must make to ensure the availability of the required capacity in-house.

5.9.6 Customized MIS for MSW Management

Continuous improvement in service levels is possible only if the delivery system is monitored and evaluated at appropriate levels. Moreover, MSW management being a resource-intensive operation with most visibility, it is in the interest of LNN to create an appropriate management information system such that the Chief Engineer and the Commissioner have all the relevant information readily available to them as and when required. **Therefore, it is recommended that LNN install a customized computer-based MIS system, and make arrangements for data collection, and its regular updating.**

In order to improve transparency and community participation, it is recommended that LNN share its quarterly/half-yearly MIS reports with key stakeholders.

5.9.7 Quality policy

With respect to the solid waste management service – both from the point of view of customers (residents) and internal systems and processes -- **it is recommended that LNN develop a robust quality policy for the organisation.** The broad contours of such a quality policy will be as follows:

- LNN will lay down a policy of providing timely and quality services to the citizens of Lucknow. To this effect, it will also develop and synergise a city-level environment and health policy to offer a certain defined quality of life.
- LNN will aspire to fully comply with the stipulations of the MSW Rules, 2000 in a time-bound manner. To this effect, the environment policy, as mentioned earlier, will establish a synergy to prevent pollution of air, surface and ground water, etc.
- LNN will define a policy of keeping its solid waste management-related assets in good condition. To this effect, it will provide adequate resources for manpower and routine maintenance, upkeep, repairs, servicing, replacement, etc.

5.9.8 Environment, health, and safety policy

LNN shall develop a policy on environment health and safety aspects addressing the needs of the community in general, and the officials and sanitary workers in particular who are involved in sanitation and solid waste management works. The policy will mandate the preparation of monthly reports by the Municipal Commissioner on environmental and public health conditions across the town -- this is intended to serve as a cross-check on the effectiveness of the sanitation services. The policy will also specify mandatory annual medical check-ups to be commissioned by the Municipal Corporation for its sanitary workers, a mechanism for meeting health costs, and provisions for group medical insurance, if any.

5.10 Community Organization and Participation

A set of interventions/measures for eliciting higher participation of the community (the customer) are briefly described in the sections that follow.

5.10.1 Community organization

Successful community management in any organization is possible through formation of small distinguishable groups with designated leadership. LNN must draw from the successful experience of several cities in the country where community-based organizations such as resident welfare associations, mohalla committees, market/traders associations, women's groups, kitchen garden groups, and rag-pickers' groups, have been created and effectively involved in various municipal services. **In the above context, and in line with the 74th Constitution Amendment, it is recommended that LNN should co-ordinate with CBOs/ RWA/ward committees for decentralized planning and monitoring.**

Community organization along the above lines will help LNN in mobilizing the respective communities for awareness creation and in soliciting its participation in the new initiatives. A regular communication through these channels will help in building bridges with the community and increase confidence on both sides.

5.10.2 Community mobilization and Consultation

Recognizing its own limitations, **LNN should take advantage of the strengths for community mobilization available with some of the leading personalities and civil society groups of the town. It must solicit their participation for anchoring a campaign on the issues of environmental sanitation, MSW management, public health, aesthetics and quality of life, etc.**

After strengthening the civil society structure, **LNN must adopt a system of organizing regular consultations with stakeholders on the issues of, among others, environmental sanitation, MSW management, public health and hygiene, quality of life and urban governance/development in general.**

In order to ensure a high level of transparency and thereby cooperation, it is strongly recommended that **LNN holds consultation with civil society/ community on the MSW management plan in particular and the city sanitation plan in general.** The feedback received from the community will help in optimizing resources and improving service levels.

5.11 Financial Estimates of Implementing Interventions

LNN has outsourced the collection, transportation, and scientific disposal of waste. Hence, the cost of the majority of the interventions suggested above will be borne by the Concessionaire. In turn, LNN will be required to pay the Concessionaire a tipping fee which is Rs 562 / MT. The tipping fee will be constant for first three years of the Concession Period and thereafter it increases at a rate of 4% every year. LNN will also be required to bear the expenditure towards organizing IEC/Awareness Campaigns, the details of the same are provided in 7.

6. Institutional Assessment

This section provides an overview of the governance structure in Lucknow, challenges and interventions required for the effective delivery of sanitation services in Lucknow.

6.1 Institutions Providing Sanitation Infrastructure/Services

The institutional landscape in Lucknow includes a number of institutions, besides LNN, that are responsible for the governance of the city and for providing urban infrastructure and services to its citizens. Apart from the local institutions, various departments and agencies of the state government play important roles in provisioning of sanitation infrastructure. The following figure provides a perspective of the agencies involved and their role with regard to sanitation infrastructure and services.

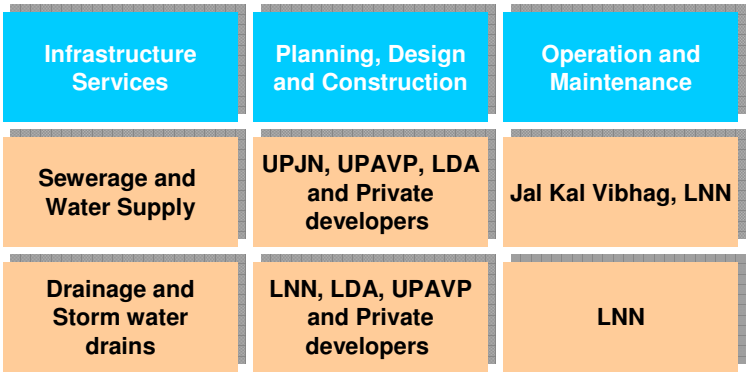
Figure 23: Agencies involved in provisioning of sanitation infrastructure and services

Source: Discussions with LNN and Jal Kal Vibhag and Lucknow CDP

*It should be noted that LJS has been merged with LNN and now is referred as Jal Kal Vibhag, LNN.

The above table highlights the critical role played by LNN and Jal Kal Vibhag in the *delivery* of sanitation services. However, their task becomes difficult because a number of agencies are involved in the *creation* of sanitation assets.

Figure 24: Roles and responsibilities in delivery of sanitation infrastructure and services



There was a fragmentation of roles and responsibilities in MSW previously; however, collection, treatment, and disposal of MSW has been outsourced to a private developer since January 2011.

Source: Lucknow CDP and discussions with LNN and Jal Kal Vibhag

**It is to be noted that LJS has now been merged with LNN and is now referred as Jal Kal Vibhag, LNN.*

Multiple agencies are involved in the creation of sanitation assets. These assets are subsequently transferred to Jal Kal Vibhag/LNN for O&M. The fragmentation of roles creates downstream problems for Jal Kal Vibhag and LNN in integrating these assets and operating and maintaining them.

6.2 Resolving institutional fragmentation

There needs to be a convergence between the planning and delivery of urban infrastructure development and management functions. This ensures effective linkages between asset creation and asset management so that the infrastructural services created in cities are not only maintained efficiently but also become self-sustaining over time.

The Model Municipal Law (MML) suggests that municipal corporations should be responsible for the following 'core municipal functions', which include

- Water supply;
- Drainage and sewerage;
- SWM;
- Economic and social development plans;
- Transportation systems including construction and maintenance of roads, bridges, ferries, and other inland water transport systems;
- Community health and protection of environment;
- Construction and maintenance of slaughterhouses.

Accordingly, the entire range of sanitation functions in any city should be vested in a single (well-structured, capacitated, and (financially) resourced) institution. While the vesting of sanitation-related functions in a single institution would be desirable and indeed is an agenda that needs to be pursued, it is unlikely that significant formal changes in institutional arrangements can be brought about in the near term.

Hence, as a short-to-medium term solution, an option could be explored asking the City Sanitation Task Force (CSTF) to drive the Sanitation agenda for Lucknow and overcome the institutional fragmentation of roles. The CSTF's functioning shall be supported by City Sanitation Cell and a Code of Conduct Manual (PM).

Surat District-Level Coordination Committee (SMC) Case Study

Surat is one of the first cities in India to have a 'District-Level Coordination Committee' to sort out issues related to development work. It is a unique setup where functionaries from different departments discuss issues that require inter-departmental coordination. The key members include senior officials from the Municipal Corporation, Police Department, Chambers of Commerce, officials from various state parastatals, and the Collector. This committee does not have any constitutional authority; it is just a forum wherein officials meet once a month to iron out important issues facing the city.

6.3 Designating the City Sanitation Task Force as Monitoring Agency

CSTF is envisaged as a body through which the key public institutions engaged with, or whose working has implications for, the city sanitation are represented. The CSTF offers a platform for all stakeholder institutions to come together, reflect, strategize, and coordinate on sanitation-related issues. Presently, such platforms are missing. In the medium-to-long term (as the decentralization agenda unfolds), the CSTF, together with the associated City Sanitation Cell, is envisaged to emerge as a full-fledged entity hosted within the Municipal Corporation, mandated with responding to the entire range of sanitation-related issues in the city (with all functions that are currently vested in various institutions). The CSTF may be expected to discharge the following roles (with support from the City Sanitation Cell):

- **Strategic planning for city sanitation issues and investments**

Lucknow is a rapidly emerging metropolis; the population of the city is expected to grow by 50% in the next 10 years (~30 lakhs at present) to reach 45 lakhs in 2021. CSTF should review the city's plans (CDP, master plans, CSP, etc.) in the context of development to ensure their relevance. For instance, Zone 4 is growing rapidly, and CSTF should re-examine the plans for the zone on an annual basis so as to ensure that the sanitation assets for this area are built considering ground realities, e.g., water availability, emerging socio-economic profile of the zone, technological options available, etc., and linked with the rest of the city's infrastructure.

- **Forum for coordination between agencies**

This is perhaps the most important role of CSTF. CSTF constitutes officials from all agencies providing urban services to citizens and thus provides a forum where the agency representatives can discuss, prioritize, and coordinate sanitation projects and interventions to resolve sanitation challenges of the city.

A number of investments are presently underway at Lucknow for collecting, treating, and disposing liquid and solid wastes, e.g., 345 MLD STP in Zone 3, outsourcing of MSW, etc. This CSP also envisages further investments in the sanitation infrastructure. Given this background, CSTF should facilitate the linking of the projects with the existing infrastructure. For instance, CSTF can be a forum wherein issues involving multiple agencies, such as linking and transporting wastewater to STPs and collection of waste from cantonment areas, can be discussed and solutions formulated.

- **Conceptualizing and implementing capacity building initiatives**

Sanitation traditionally has been a neglected sector. However, governments and citizens have gradually realized the criticality of sanitation in economic development[3]. This has led to increased focus on the development of sanitation technologies. While CSTF is not expected to recommend technological solutions, it should work towards ensuring that its constituent members are equipped to consider the entire range of technical options ranging from on-site to centralized sewerage treatment systems, on techno-economic considerations, so as to conceptualize interventions that are comprehensive and inclusive enough to cover all geographical locations and all sections of the society.

Given this background, CSTF will need to explore the on-going collaborations with bodies such as the Indian Institutes of Technology and Regional Centre for Urban and Environmental Science (RCUES) that can provide the requisite training to the employees of CSTF members.

Besides sanitation technology, CSTF can also consider providing training on domains such as project management and stakeholder communication given the increasing complexity of projects that are to be handled by its members and the need for involving civic for making plans such as CSP successful.

- **Improving citizen awareness and participation in sanitation process**

A number of undesirable practices are prevalent in the city, e.g., mixing of biomedical waste with MSW, open defecation, dumping of solid in open spaces, etc. While an important cause of these practices is the lack of sanitation infrastructure, an equally important reason is the behaviour of the citizens. The IEC section has dealt with a number of interventions for increasing awareness among citizens and facilitating a transformation in their behaviour. CSTF should monitor the implementation of the IEC campaign and take course corrective measures as required. It should also coordinate with NGOs and prominent community leaders to improve the effectiveness of the campaigns.

- **Monitoring of outcomes**

Lucknow is in the cusp of a transformation; large investments are being executed under GOAP and JNNURM. CSP also envisages further investments in sanitation infrastructure.

CSTF should identify a series of indicators that will assess the effectiveness of these investments. These indicators will assist CSTF track the journey from the baseline value to the benchmark/final

[3] *The Water Sanitation Program of the World Bank estimates that India loses Rs. 2.4 trillion rupees on account of poor sanitation.*

indicator value. CSTF should set annual targets for indicators and appoint an independent survey agency for reviewing the actual progress annually/semi-annually. Based on the survey results, CSTF can deliberate on the actions required for achieving the benchmark indicators.

- **Creation of base-line data**

A key challenge in developing interventions for resolving challenges facing ULBs is the lack of data. CSTF should prepare a detailed list of data that needs to be collected and maintained. Indicative data points that should be collected are

- GIS maps covering road networks, landscapes, utilities, and infrastructure assets
- Soil investigation reports
- Contour maps
- Ground water table
- Air pollution indicators

6.3.1 Functioning of CSTF

Aspects related to the desired members of CSTF and manual that will it guide its functioning have been dealt with in the following section. [*The constitution of CSTF and its conduct manual are outlined in the following section*]

1. Constitution of CSTF

CSTF should be chaired by the Mayor and the Commissioner of Lucknow, and the Chairman/Managing Director/senior-most officials of the following organizations should be present:

- Jal Kal Vibhag, LNN
- UPJN
- SUDA
- UPAVP
- PWD
- UP Pollution Control Board (UPPCB)
- LDA
- DUDA
- Senior functionaries of Lucknow Cantonment
- Chambers of Commerce

Besides the above, LNN should nominate senior functionaries from NGOs and prominent citizens to be a part of CSTF.

2. City Sanitation Cell

The City Sanitation Cell is envisaged to play the role of a 'secretariat' that will support the following operations of the CSTF:

- Preparing and circulating the agenda for the CSTF meeting
- Obtaining and circulating information on the agenda that will be discussed in the CSTF meeting

- Drafting and circulating the minutes of the CSTF meeting

3. Code of Conduct Manual

The Code of Conduct Manual would document the guidelines for the functioning of CSTF. It would need to be agreed to by all institutions represented in the City Sanitation Council. An indicative list of processes that would be present in the Manual are

- Sharing of the institution's (a) strategic, (b) technical, and (c) investment plans with the members of CSTF and seeking their feedback on the same
- Discussing issues of location and prioritization of investment
- Discussing/coordinating linkages of assets created to local and city-wide infrastructure
- Coordinating while implementing projects
- Sharing of resources, e.g., manpower, data, etc.
- Resolution of disputes
- Appointment of independent experts/consultants and sharing of expenses
- Quorum, meeting frequency, scheduling emergency meetings, etc.

Bhubaneswar Municipal Corporation (BMC) Case Study

The Public Health Engineering Organization (PHEO) of Orissa develops, operates, and maintains the urban water supply and sewerage systems of all the 103 ULBs in the state. According to the 74th constitutional amendment, the responsibility of services like water and sewerage lies with the ULB. But the ULB neither has the capacity nor the technical skills to manage such services. So, an interim arrangement has been put in place between the Bhubaneswar Municipal Corporation (BMC), PHEO, and the State Government of Orissa for a period of three years, which would be extended subject to the annual review. This arrangement rests on a memorandum of understanding (MOU), which is similar to the Code of Conduct Manual; salient features of the MOA, i.e., the role of the concerned parties, and the review and advantages of such an arrangement have been described subsequently.

Roles of BMC, PHEO, and State Government of Orissa

BMC – participate in infrastructure planning and implementation, monitor service provisioning and funds, and monitor construction of capital works

PHEO – provide service (water supply and sewerage service), undertake infrastructure creation and expansion, and operate, maintain, and provide services as agreed between BMC and PHEO

State Government – Dispute resolution, capacity building support, introduction of policies and resolutions, review and monitoring

MOA also enlists a review and monitoring mechanism at four different levels:

a. ULB Level – Municipal Council on bimonthly basis
b. District Level – District Magistrate in district review meetings on quarterly basis
c. PHEO Level – Chief Engineer on quarterly basis
d. Housing and Urban Development Level – Director and Municipal Administrator on half-yearly basis

The advantages of such an arrangement is to fill the gap of technical know-how, provide better service to the citizens by fixing accountability and enhance BMC's role in decision making with respect to the expansion of service delivery and service provision. It would also lead to better management of utilities since there is just one organization constructing and managing it, which in this case is PHEO.

7. Awareness Generation

7.1 Background

This section presents a strategy for information, education, and communication (IEC) / awareness generation on sanitation, hygiene, environmental concerns, and public health in the city of Lucknow. The IEC/awareness generation strategy is an integral component of the CSP for Lucknow, which is understood to be critical for its success.

As a key first step to awareness generation strategy formulation for Lucknow CSP, different types of consumers in the city were identified; consumers were classified into general households, slum households, commercial units, industries, institutions, and hospitals and a sample survey was conducted[4]. Using primary survey data, an assessment of sanitation and hygiene awareness levels and present disposal practices was undertaken, which helped identify areas of focus of the campaign, aimed at specific target groups. In addition, literacy levels of the overall population and slum population were considered in the IEC strategy formulation.

Apart from primary data from surveys and secondary data from census, the strategy for awareness generation also draws upon consultations with residents/consumers, involving different methods including work shops; transect walks, structured focus group discussions, and informal/unstructured discussions. Stakeholder consultations in the city underscored the fact that sanitation awareness is accorded very high priority by citizens of Lucknow. Surveys and consultations in Lucknow also revealed the strength of social capital in the city (presence of NGOs, CBOs, SHGs, etc.); the IEC/awareness strategy is prepared in recognition of their potential to contribute to the campaign in different capacities.

Lucknow's previous experience in IEC was also sought to be understood and lessons drawn from the same for the IEC strategy for Lucknow CSP. The corporation's previous experience have been through rallies, advertisement, workshops (conducted by various cultural societies, NGOs) and even doing radio talks. In one of the instance, the corporation did a radio talk event with the citizens responding to their questions on door to door collection service. In particular, the city's recent experience in successfully spreading awareness on Census 2011, using IEC materials in *Urdu* language, is drawn upon for formulating the CSP IEC/awareness generation strategy.

7.2 Need for an IEC Strategy for Lucknow CSP

The need for an IEC strategy for CSP, Lucknow, emerges from the analysis of data on sanitation and hygiene awareness at household level as well as the study of existing waste disposal practices of

[4] *Primary surveys covered a sample of 1088 general/non-slum households, 540 slum households, 30 institutions, 50 industries, and 14 hospitals.*

households and industrial, commercial, and institutional establishments, as well as hospitals. The need for an IEC strategy for the city has been expressed by stakeholders in the city.

7.2.1 Existing Literacy and Sanitation/Hygiene Awareness at Household Level

The review of data on literacy levels and sanitation and hygiene practices as well as willingness to pay and general awareness provide a pointer to (a) the need for a campaign focus on general sanitation/hygiene awareness and its relation to health; (b) types of interventions that have to be designed; and (c) types of households to be identified/targeted through the awareness campaign. Table 26 summarizes the key parameters used to understand existing awareness levels among households in Lucknow (general and slum households); the details of variations in awareness levels according to zone and the level of education of respondent are given in Annexure 1.1.

***Literacy**:* The existing literacy levels in Lucknow are 67.46% for the overall population and 61% for slum population[5]. In other words, a significant proportion of the population (almost a third of the total and ~40% of slum population) is illiterate, calling for an awareness campaign design that is easily understood by all.

Sanitation and hygiene practices at household level: Primary survey data reveal that an overwhelming majority (99.9%) of general households followed the practice of washing hands before eating food, while none (0%) of the sample slum households followed this practice. Boiling or purification of drinking water using different means such as aqua guard/UV filters was indicated by less than 12% of general and slum households. With reference to the practice of washing hands with soap and water after faecal contact, awareness levels were relatively higher, with 99.9% general households and ~91% slum households indicating that they follow this practice. All such sanitation and hygiene practices need to be adequately covered by the IEC campaign.

7.2.2 Present Waste Disposal Practices and Awareness Levels of Households

- ***Unsafe Sanitation:*** Households without access to safe sanitation, i.e., those practicing open defecation as well as those with toilets connected to open drains, are clearly a key target group for the proposed awareness campaign for CSP, Lucknow. Open defecation (OD) was found to be prevalent among ~5% of general households and ~16% of slum households. Toilets directly connected to open drains were reported by 3% of general households and about 5% of slum households.

  Inter-zonal variations are observed in the prevalence of unsafe sanitation practices among general population, with Zone 5 reporting the highest (~15% households) prevalence of unsafe sanitation and Zone 4 reporting the lowest (~3%). The analysis of slum population indicates that Zones 4 and 2 depict the worst scenario, with 38% and 33% of their population, respectively, practicing unsafe sanitation.

[5] *Slum households comprise 7.75% of the total households in the city.*

The same parameter when analyzed with respect to education levels reveals that among general households, unsafe sanitation is more prevalent among the illiterates, while among the slum households, both illiterate and educated people report the same (refer Annexure 1.1 for details).

In addition, though primary survey data did not capture this aspect, reconnaissance surveys and focus group discussions with households having access to toilets with septic tanks revealed the practice of manual cleaning of septic tank sludge (i.e., by hiring manual labour) and unsafe dumping of sludge by all such households. This renders the large majority of households with toilets connected to septic tanks as those with unsafe sanitation practices as well, rendering them a key target group for the sanitation campaign.

- *Unsafe solid waste disposal practices:* Over 40% of general households and 72% of slum households reported dumping solid waste in open spaces; while this is partly attributable to the lack of access to door-to-door collection service and/or access to community bins, it is also indicative of the lack of awareness about the environmental health implications of such a practice.

  Only 1% of general households and ~4% of slum households indicated that they undertake waste segregation; it is interesting to note that a larger proportion of poor households practice segregation. This trend is observed in all zones of the city (except Zone 5), irrespective of educational qualification. Levels of willingness to undertake segregation were found to be similar among slum and non-slum households at ~19%; this could be enhanced through awareness creation. Since waste segregation at the source is one of the first key steps in sound SWM, there is a need to focus on this aspect in the IEC campaign.
- *Revealed preference for Sanitation:* This parameter was analyzed for general/non-slum households as well as slum households to understand their levels of awareness on different sanitation options. The primary survey data are revealing and highlight the acute need for awareness generation. Of the 54% sample general households and 61% sample slum households without UGD connections, ~30% and more than 50%, respectively, were not aware of sanitation options; only 44% and 24%, respectively, were aware of the UGD option.
- *Willingness to pay* for water and sanitation was expressed by roughly 50% of general/non-slum households, but only about 40% indicated willingness to pay for SWM. Among slum households, the need for sanitation and SWM services appears to be greater, with about 50% of such households willing to pay for the same; however, only about 40% of sample slum households indicated willingness to pay for water. There is a need for a special focus on Zone 1 for IEC activities as it has reported the lowest levels of willingness to pay – with a mere 4% households indicating willingness to pay for sanitation and 19%, for water supply (refer Annexure 1.1)

  The perception of waste management as a free service apparently exists among majority of the population as indicated by the low level of willingness to pay among general households (44%) as well as slum households (57%). This trend of low willingness to pay continues in Zone 1 (7%) among the general population, while among slum households, willingness to pay is the lowest (33%) in Zone 4 (refer Annexure 1.1).

It is increasingly recognized in programs/projects of this nature across the world that willingness to pay can be boosted by organizing awareness campaigns on the cost of service provision and the multiple benefits of safe environmental sanitation services. Hence, this will be a key focus area of the sanitation awareness campaign in Lucknow.

- *General civic awareness:* One of the leading questions in the primary survey was regarding the ongoing infrastructure projects in the city, which helped understand the level of general civic awareness among households, which has a bearing on the awareness campaign. The campaign can be successful only if there is a high degree of awareness about CSP and its features and a high degree of civic engagement. Survey data revealed low levels of general civic awareness – 28% among general households and only ~19% among slum households.
- *Need for IEC:* The above findings point to the need for a targeted awareness campaign, focusing on increasing awareness, especially among slum dwellers, about the ill effects of open defecation, options available for better sanitation, and the benefits of connecting to the UGD network. In addition, transect walks and focus group discussions also point to the need for a targeted awareness generation campaign that recognizes that different types of households (e.g., slums, core areas, urban villages, illegal housing colonies, areas with floating population, etc.) need different approaches/strategies. Hence, the IEC strategy for Lucknow CSP targets all these different categories of households.

Table 29: Awareness indicators for general and slum households (%)

	INDICATORS	GENERAL HOUSEHOLDS (N* = 1,088)	SLUM HOUSEHOLDS (N = 541)
1	Unsafe sanitation prevalence		
1a.	Open defecation	5.15	15.53
1b.	Toilet connected to open drains	3.03	4.62
	Total	8.18	20.15
2	Revealed preference for sanitation (among those not connected to UGD)		0.00
2a.	Not aware of options	15.81	32.72
2b.	Low-cost sanitation	7.44	7.21
2c.	Septic tank	7.26	6.47
2d.	Toilet with UGD connection	23.81	14.79
	Total households without UGD connection	54.32	61.18
3	Willing to pay		
3a.	Willing to pay for improved sanitation services	52.94	52.31
3b.	Willing to pay for water	53.03	40.30

	INDICATORS	GENERAL HOUSEHOLDS (N* = 1,088)	SLUM HOUSEHOLDS (N = 541)
3c.	Willing to pay for improved SWM	43.57	56.75
4	SWM services		
4a	Dumping waste in open spaces	40.72	72.27
4b	Practicing waste segregation	1.01	4.44
4c	Willing to undertake waste segregation	19.30	19.78
5	Health and hygiene		0.00
5a	Washing hands before eating	99.91	0.00
5b	Washing hands with soap and water after faecal contact	99.91	90.94
5c	Boiling/purification of drinking water	3.77	12.2
6	Awareness about ongoing infrastructure projects	27.76	19.41

*Source: Primary Survey, * N = Total number of samples*

7.2.3 Present Waste Disposal Practices and Awareness Levels of Commercial, Institutional, and Industrial Consumers and Hospitals

A survey of shops, commercial establishments, hospitals, industries, and institutions was undertaken to understand the present waste disposal practices, awareness of sanitation options, willingness to pay, and other parameters having a bearing on the design of the awareness campaign for CSP targeting coverage of all types of consumers other than households. Table 27 below summarizes the results of the primary survey of such (non-household) consumers.

- *Sanitation Access:* Although ~67% of the commercial units are covered with toilets connected to UGD, as many as 33% do not have toilets. In case of industrial units, only 8% have toilets connected to UGD, while 10% have no toilets. There is clearly a need to sensitize people about the importance of providing adequate sanitation facilities at work place. All the surveyed hospitals were found to be practicing safe sanitation – all had toilets connected to either septic tanks or the UGD network.
- *Awareness of/Preference for UGD:* In the commercial sector, a majority of the units (66.67%) without toilets/UGD networks expressed preference for the same. All the hospitals and institutes surveyed were found to be having toilet facilities, and a majority of them (77% and 70%, respectively) were found to be covered with the UGD network. In the case of industries, however, connection to the UGD network is only 8%.
- *SWM practices.* A matter of concern in the case of SWM practices is that almost all industries are mixing industrial waste with municipal waste and around 82% are disposing it

in open spaces. Among hospitals, the survey finding reveals that close to ~25% of the hospitals are mixing hospital waste with municipal waste and around 8% of them are disposing the same in open spaces. Among commercial units as well as institutions, the general trend of disposing solid waste without segregation in open spaces is observed. This may be due to the lack of awareness about the impact of these practices on the environment, resistance to adoption of new practices/attitudes, and lack of appropriate solid waste collection and disposal systems. While a proper SWM system (as discussed in Chapter 4) is required at the city level, it has to be supported and popularized by a strong IEC campaign that can influence/orient people on matters concerning the environment, public health, people's responsibilities towards the same, etc.

- *Willingness to pay:* Yet another matter of concern is the abysmally low willingness to pay expressed by units of all kinds (commercial, industrial, institutional, and hospitals) pointing to the special attention needed in IEC to generate awareness on costs of service provision, thereby boosting levels of willingness to pay, without which a sustainable change in the current situation does not seem possible. Willingness to pay for sanitation services is nil among commercial units and industries, while it is less than 10% among hospitals and institutions. The fact that the highest willingness to pay - for improved water supply - is only 15% (reported by hospitals), and the same for better SWM is only 7% (reported by institutions) speaks volumes about the need for awareness generation about the cost incurred in providing these facilities and also about the perception of the people about themselves as free benefactors of all services from the government.

Table 30: Awareness indicators- hospitals, commercial, institutional and industrial consumers (%)

	Indicators	Commercial Units (N = 84)	Hospitals (N = 13)	Institutes (N = 30)	Industries (N = 50)
1	**Sanitation Access**				
1a.	Units without toilets	33.33	0	0	10
1b.	Units with existing connection to UGD	66.67	76.92	70	8
2	**Sanitation Preference (among those not connected to UGD)**				
2a	Not aware of options	0.00	NA	100	NA
2b	Low-cost sanitation	33.33	NA	0	NA
2c	Septic tank	9	NA	0	NA
2d	Toilet with UGD connection	66.67	NA	0	NA
	Total	100	NA	100	NA
3	**Willingness to Pay**				
3a	Willing to pay for improved sanitation services	0.00	7.69	6.67	0

	Indicators	Commercial Units (N = 84)	Hospitals (N = 13)	Institutes (N = 30)	Industries (N = 50)
3b	Willing to pay for water	11.90	15.38	6.67	2
3c	Willing to pay for improved SWM	2.38	0	6.67	0
4	**SWM**				
	Units disposing solid waste in open spaces	8.33	7.69	16.67	82
	Units mixing waste with municipal waste	NA	23.08	NA	100
	Practicing waste segregation	10.71	61.54	3.33	-
	Willing to undertake waste segregation	-	-	6.67	-
5	**General Civic Awareness**				
	Awareness about ongoing infrastructure projects in the city	0.00	23.08	20	4

Source: Primary Survey

- *Need for IEC:* As in the case of households, primary survey findings for hospitals, industries, commercial establishments and institutions point to the urgent need for a focused awareness campaign, clearly targeting awareness generation among bulk generators as well as small, localized generators of waste. The IEC strategy for Lucknow CSP targets each of these categories of consumers, identifying specific areas of focus for each category.

7.2.4 Identification of Target Areas and Target Groups for the IEC Campaign

The need for an IEC campaign clearly emerges from the primary survey data analyzed above. In addition to survey data, field visits and focus group discussions clearly reveal the need for identification of areas of focus and specific target groups within each category of consumer, as indicated below.

Households are classified into (1) notified and non-notified slums; (2) illegal housing colonies, (3) urban villages located within the city and on the outskirts, (4) core areas (old parts of the city), (5) general areas, and (6) areas with floating population. The need for specific IEC strategies for each of these categories of households is understood and addressed. Specific target groups are identified within each category, e.g., for (1) slums – all household members are targeted; (2) illegal housing colonies – men, as key decision makers in the household, and household helps, as target groups; (3) urban villages – target groups include men, women, and children; (4) core areas – target groups include households and businessmen/traders; (5) general areas – target groups include residents and household helps; and (6) areas with floating population – target group is the floating population.

Commercial units are classified into bulk generators of waste (e.g., hotels, malls, etc.) and smaller, unorganized shops and establishments; both types clearly require a different approach in terms of IEC.

Industries include large, small, and medium industries. The target group for IEC is industries generating/discharging effluents/waste.

Hospitals include medium and small hospitals that are presently not practicing safe disposal of biomedical waste (the larger hospitals were observed to be practicing safe disposal of biomedical waste and are therefore not an area of focus). The target group within this consumer category for the IEC campaign comprises clinics, small and medium hospitals, and nursing homes.

Slaughter houses are classified into (1) organized LNN slaughter houses and (2) small butcher operated shops/units, of which the latter clearly emerge as the target group.

7.2.5 Identification of Areas of Focus of the IEC Campaign

At an overall level, the following areas of focus are identified for the IEC campaign:

1. Sanitation and hygiene
2. Environmental degradation and public health implications of unsafe sanitation, benefits of safe sanitation and solid waste disposal practices
3. Reduce, reuse, and recycle concepts and concepts such as reduction of carbon footprint and how these can be translated into action by citizens/institutions/businesses/industries etc.
4. Role of different types of consumers/entities in CSP ('what I can contribute to my city' campaign)
5. Cost of service and the need to adopt and pay for improved services
6. Grievance redressal procedures for CSP
7. Awards and incentives w.r.t. CSP

Table 28 provides details of the IEC strategy for Lucknow, summarizing areas of focus for each category of consumer.

Table 31: IEC strategy for Lucknow

No.	Category	No	Target areas	Target group	Priority	Strategy	Interventions	Aspects targeted in campaigns	Implementation
A	Households *	1	Notified and Non-Notified Slums	Priority groups women and children	1]Open Defecation (OD) 2] MSW disposal in open spaces 3] Segregation of waste	Interactive Communication	1] Mohalla Campaigns (meetings explaining ill effects of poor sanitation), Street Plays (Nukad Nataks), Door to door campaigns, 2] Learning by doing initiative 3] Campaigns in government schools/schools located close to slums 4] Campaigns in hospitals/clinics near slums 5] Pictorial Hoardings 6] Local cable television campaigns	1] Health and Hygiene Practices 2] Behaviour Change 3] Solid waste management practices 4] Cost of not having sanitation and cost of providing sanitation 5] Information services provided by LNN, how can they be availed, what their charges, their benefits and grievance redressal mechanism	NGOs/Rotaries / Rotaract/Lions Clubs
		2	Illegal Housing Colonies	Men and household helps/maids	1] Unsafe disposal of waste water	While regularisation of colonies is a larger policy	1] Door to door campaigns 2] Hoardings, Pamphlets and	1] Constructing toilets for servants by housing societies;	LNN (Door to door campaign) and Media Agency

No.	Category	No	Target areas	Target group	Priority	Strategy	Interventions	Aspects targeted in campaigns	Implementation
					2] MSW disposal in open spaces 3] Segregation of waste	level issue with significant socio-economic ramifications, in the interim, until such a policy is adopted/ implemented, educating the residents on the importance of sanitation shall be key.	Newspaper Advertisements	2] Cost of not having sanitation and cost of providing sanitation; 3] Benefits of service access and being in the tax net; and 4] Information on services provided by LNN, how can they be availed, what their charges are, and grievance redressal mechanisms in place.	appointed by LNN for all the rest
		3	Urban Village located and within City and Outskirts	1] Men [Take decisions and resist setting up of toilets. Women are generally pro toilets.] 2] Women	1] OD 2] MSW disposal in open spaces 3] Disposal of animal waste	Interactive Communication	1] Motivators/leaders /service providers who can influence men of the urban village households 2] Campaigns in government schools/schools located close to	1] Health and Hygiene Practices 2] Behaviour Change 3] Cost of not having sanitation and cost of providing sanitation 4] Information	Tying with service providers and NGOs

No.	Category	No	Target areas	Target group	Priority	Strategy	Interventions	Aspects targeted in campaigns	Implementation
				and Children			urban village 3] Campaigns in hospitals/clinics near urban villages	services provided by LNN, how can they be availed, what their charges, their benefits and grievance redressal mechanism	
		4	Core Areas [Old parts of the city]	Households and businessmen / traders	1] Unsafe disposal of waste water 2] MSW disposal in open spaces		1] Engaging with local religious leaders, trade associations/communities 2] Campaigns in government schools/schools located close to Core Areas 3] Campaigns in hospitals/clinics near Core Areas	1] Health and Hygiene Practices 2] Solid waste management 3] Information services provided by LNN, how can they be availed, what their charges, their benefits and grievance redressal mechanism	LNN (Engaging with religious leaders/trade association) and NGOs for campaigns
		5	General Areas	Residents and household helps/maids	1] MSW disposal in open spaces		1] Engaging with Resident Welfare Associations (RWAs) 2] Campaigns in	1] Constructing toilets for servants 2] Cost of not having sanitation	Rotary Clubs/Rotaract / Lions Clubs, Media and

No.	Category	No	Target areas	Target group	Priority	Strategy	Interventions	Aspects targeted in campaigns	Implementation
							government schools/schools	and cost of providing sanitation 3] Segregation of MSW 4] Information services provided by LNN, how can they be availed, what their charges, their benefits and grievance redressal mechanism	NGOs
		6	Areas with Floating Population		1] OD 2] MSW disposal in open spaces [Minor Problem]		1] Hoarding, posters and wall paintings	No campaign envisaged	LNN
* Households practicing unsafe sanitation practices e.g. Open Defecating Households, Toilets opening into open drains, Unsafe disposal of septic tanks									
B	Commercial	1	Bulk Generators of waste [hotels,	Smaller not organized shops, malls,	1] Dumping of Solid waste in the		1] Engaging with trade associations 2] Publishing the	1] MSW Practices e.g. waste segregation,	

No.	Category	No	Target areas	Target group	Priority	Strategy	Interventions	Aspects targeted in campaigns	Implementation
			malls, etc] and Smaller not organized shops, malls, etc	etc	open. Solid waste is not segregated 2] Lesser than required no. of public toilets 3] Septic Tank maintenance		name of serial defaulters in the Newspaper (i.e. those dumping waste). Community pressure will ensure that the shops dumping waste in open will stop. 3] Fiscal benefits for composting and recycle and reuse	disposal and treatment at source 2] Septic maintenance - ill effects of not maintaining septic tanks 3] In situ treatment of waste by bulk generators such as malls/hotels (to be supported by an amendment in the municipal bye-laws)	
C	Industrial								
		1	Large Industries	Industries generating effluents	1] Treatment of effluents prior to their discharge		1] Engaging with Industries association 2] Fiscal incentives for treating and reusing waste 3] Community - pressure- Publish	1] Awareness on Polluter pays principle 2] Awareness on penalties and incentives for treating/not treating waste. An	LNN with Pollution Control Board Officials

No.	Category	No	Target areas	Target group	Priority	Strategy	Interventions	Aspects targeted in campaigns	Implementation
							names of serial defaulters (i.e. those caught discharging effluent without treatment).	industry or a group of Industries located in common area must have an ETP. If they don't, they will have to pay 3x of existing sanitation taxes 3] Impact on environment caused by not treating waste	
D	Hospitals	1	Medium	Clinics, Medium and Small Hospitals and Nursing Homes	1] Preventing contamination of MSW and bio medical waste		1] Engage with local medical association 2] Display waste management process in prominent locations in the Hospital/Clinic 2] Community - pressure- Publish names of serial defaulters (i.e. those caught	1] Hazards of mixing bio medical waste and MSW 2] Information on private contractors handling Bio Medical Waste	Private Contractors handling Bio Medical Waste, Local Medical Association and Rotary/Lion Clubs

No.	Category	No	Target areas	Target group	Priority	Strategy	Interventions	Aspects targeted in campaigns	Implementation
							mixing bio-medical waste and MSW more than thrice).		
E	Slaughter-house	1	Organized LNN Slaughterhouse	Small Butcher Operated Meat Shops	1] Preventing disposal of slaughter house waste with MSW		1] Increase awareness on waste management through community/religious leaders	1] Hazards of present system of waste disposal	NGOs and RWAs

7.3 Steps in Operationalizing IEC Strategy

7.3.1 Identification of Partners

The City Sanitation Task Force shall identify the following partners for campaign design and implementation:

1. Umbrella NGO: An umbrella NGO with significant experience in conducting awareness campaigns locally/in the rest of the country will be appointed; experience in sanitation sector will be given added weightage. The umbrella NGO must be based in Lucknow. The role of the NGO shall be to train and monitor IEC implementation by smaller, local NGOs and other partners.
2. Local NGOs: Mapping and identification of smaller, local NGOs in Lucknow working in specific zones; selection of credible local NGO partners using selection criteria defined in consultation with the umbrella NGO. The role of the local NGOs shall be to implement the IEC campaign in a locality or defined area of jurisdiction.
3. Media house: There are several media houses in Lucknow; some of them such as Dainik Jagran, which has a CSR initiative called Jagran Pahal, are already active in the city. Media houses shall be involved in design of the campaign.
4. Schools: Schools will be an intrinsic part of the IEC campaigns. School children will be encouraged to change sanitation and hygiene behaviour in their respective homes and localities and encouraged to develop a healthy respect for a clean city. School staff and students shall be oriented by the NGOs responsible for IEC implementation and monitoring; campaign directives for schools shall be issued by the Department of Education, GoUP, to ensure their participation. Three schools showing maximum participation and results will be publicly recognized and awarded each year.
5. Civil society: The umbrella NGO (with CSTF support) shall be responsible for enlisting the support of civil society groups such as Lucknow Connect and the Sahara Welfare Society, which have several eminent citizens as members. Their active support for the campaign shall ensure greater acceptability and ownership of the campaign by the community.
6. Community groups: Existing community groups formed under various governments and NGO programmes such as SHGs, CDS formed under SJSRY must be mapped and their strengths/weaknesses/capacity building needs for campaign implementation identified.
7. Theatre academies: Support of entities such as Sangeet Natak Academy/Bhartendu Natak Academy for conceptualizing street plays and training of SHGs/CBOs/school children to perform the same.
8. Religious leaders of national stature who reside in the city must be closely involved in the campaign; consultations with such leaders and information sharing on the objectives and expected outcomes of the campaign/CSP, in general, shall be the responsibility of CSTF and the umbrella NGO.

9. Location/trade-specific traders' associations, industrial associations, etc., must be identified and enrolled in the campaign. Lists of such associations that are already available with political parties/LNN must be used for the identification of potential partners.
10. Line departments/partners such as the State Pollution Control Board and Department of Education, which can help implement and monitor the CSP IEC campaign and its impact.

7.3.2 Preparatory Activities

Preparatory activities will include extensive consultations with the public, NGOs, eminent citizens, civil society, community groups, line departments, etc., for identifying partners/campaigners, orientation of councillors as key motivators of different categories of consumers, identification of sources of funds for IEC (e.g., the local private sector could sponsor hoardings and campaign material and benefit from advertisement rights in the same), identification of training/capacity building needs of partners/campaigners, initiation of mohalla-level meetings and padayatras by councilors and eminent citizens to make people aware of the program, and displaying some features of the program in prominent locations, e.g., railway stations, bus stops, municipal offices, main markets, etc.

7.3.3 Design of Campaign

The design of the campaign shall have two components: (1) design of capacity building programmes for IEC implementation (training of trainers programmes) and (2) design / conceptualization of the Campaign itself, i.e., logo/slogans, advertisements (print/FM radio[6]/strip advertisements for television[7], slides to be displayed in local cinema halls), hoardings, pamphlets, street plays, etc.

The Campaign shall initially be designed as an intensive campaign for the first 5 years and will be reviewed in the fourth year of implementation to determine future areas of focus. Its focus may need to be redefined continuously over the period of CSP implementation, tapering off the intensity (and resource requirements) after the initial phase.

CSTF shall either appoint a media agency, or, enlist the support of a local media agency, if willing and able to bear costs under its CSR initiatives, for the design of the Campaign. Street plays shall be conceptualized by a local Natak Academy, which will be enlisted for the purpose. The Campaign shall be designed in consultation with CSTF, the umbrella NGOs and prominent citizens' groups.

7.3.4 Production of Publicity Material

Following design, production of publicity material (hoardings, posters, handouts, slides for cinema halls, radio advertisements, strip advertisements for Cable TV, etc.) shall be undertaken. While appropriate budgetary provisions are made for the same, CSTF should explore the possibility of funding of such material by local business houses, which may be given incentives to invest in the form of advertising rights/display of their logo on the publicity material.

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6 *FM radio is evidently a popular medium which has a wide audience among all sections of society in Lucknow*

7 *Since full-fledged television advertisements would require significant budgets, strip advertisements during popular programmes through local cable TV operators is a much more viable option and is therefore considered.*

7.3.5 IEC Implementation

The responsibility for co-ordination of implementation of the CSP IEC Campaign shall be with the umbrella NGO, which will co-ordinate Campaign implementation by local NGOs/CBOs and community groups. IEC implementation costs will include administrative costs of the umbrella NGO and local NGOs/CBOs and Natak Academy etc. and cost of implementation of the campaign on air (airtime for television/radio) / print (refer Table 28 for IEC Costs).

7.3.6 Awards and Incentives

The following sanitation-related awards and incentives are proposed, to ensure sustainability of the IEC campaign:

- Cleanest Ward Award : This will be an annual award; the non-cash component will be received jointly by the Councilor and citizens' representative who actively engages in IEC; the cash component (Rs. 1 lakh for first prize/cleanest ward and Rs. 50,000 for second prize) shall be an incentive fund for the ward that may be used for tree plantation, rain-water harvesting, or any other sanitation-related / green initiative / eco-friendly activity in the ward.
- Cleanest School Award: This will be an annual award; One school in each zone shall be awarded Rs. 25,000/ and a citation for cleanest school premises and exemplary community outreach by students.
- Award for Best Sanitation Worker(s): Two municipal sanitation workers shall be honoured every year (first and second prize of Rs. 30,000 and Rs. 20,000 each).
- In addition, financial incentives to LNN employees who volunteer to participate and achieve defined targets in the IEC Campaign and Monitoring Activities on behalf of CSTF are proposed and budgeted for. The total budget for awards and incentives listed above is Rs. 750,000 per annum.
- Other incentives recommended to be given by LNN to households and other consumers include:
- incentives for green initiatives such as rain water harvesting by giving discounts in water and sewerage charge;
- incentives for processing/treating of Solid Waste by giving discounts in Property Tax rate.

7.4 IEC Costs and Phasing

7.4.1 IEC Costs

The total cost of the IEC Campaign for CSP Lucknow for the initial phase of 5 years is estimated at Rs. ~14.7 crores; Table 29 provides the break-up by principal components; the base cost per annum is estimated at Rs. 2.9 crores, which is escalated at 6% per annum. Following the initial phase, costs need to be reviewed on a five yearly basis for planning/budgeting and on a quarterly/half yearly and annual basis as part of project monitoring and reallocation/revisions in estimates, as required.

Much of the envisaged IEC costs may be possible to meet through Corporate Social Responsibility funds of large business houses with a local presence, e.g. TCS. Media costs may be possible to reduce through partnerships with local media and seeking their CSR funds for support. Tie-ups with UNICEF, Wateraid, Oxfam and other international agencies with a local presence for IEC may also help

7.4.2 Phasing of IEC Campaign

The IEC Campaign shall be implemented in a phased manner:

1. Initial Phase of IEC: The first five years of CSP implementation shall be covered in this phase. This will be a phase of intensive campaigning for awareness generation. IEC implementation in this phase shall precede/run parallel to CSP implementation in a locality/area, i.e., apart from the city-wide broad awareness campaign, there will be intensive campaigning in the areas/wards/zones where project implementation is about to place/is taking place. The required focus of the campaign shall be reviewed each year and the Campaign implemented according to plan.
2. Subsequent Phases (3 phases spanning 15 years): IEC Strategy shall be reviewed at the end of each phase and focus areas / target groups identified for each subsequent phase. A less intensive campaign is envisaged in subsequent years, assuming that a majority of the population shall be made aware in the initial phase. Less cost intensive components (e.g. a few hoardings, posters, pamphlets etc.) shall be (re)designed for each phase using contemporary themes that strike a chord with consumers and address IEC requirements in those years.

7.4.3 Monitoring of IEC

The primary responsibility for monitoring of CSP IEC activities shall lie with the CSTF. Table 28 indicates which other entities (such as prominent citizens, Residents' Welfare Associations and Ward Councilors) shall help the CSTF monitor a particular segment of consumers. These entities shall be enlisted for regular monitoring in specific areas/zones where CSP implementation is going on, as and when required. They will be responsible for alerting CSTF in case of any issues in implementation.

CSTF members shall review progress on a quarterly/half yearly/ annual basis.

A Citizens' Report Card for CSP Implementation including IEC activities is also proposed and budgeted for as an annual activity in the first five years; the citizens' survey shall be conducted by an independent agency appointed by CSTF. Decisions on awards and incentives may be partly based on the independent survey/external monitoring.

Table 32: IEC Costs

Rs. in crores

COMPONENT	COST (RS. CR.) FOR 5 YEARS	COST IN FIRST YEAR (RS. CRORES)	PHASING OF IEC EXPENDITURE – LNN					
			2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Preparatory Activities [one time first year expenditure]	0.10	-	-	0.10	-	-	-	
Design of Campaign (5 yearly activity)	1.25	0.25	-	0.25	0.27	0.28	0.30	0.32
Publicity Material Production (hoardings, posters, Cable TV strip ads, etc)	2.5	0.5	-	0.50	0.53	0.56	0.60	0.63
IEC Implementation (administrative costs of umbrella NGO, local NGOs, airtime, printing etc.)	10.42	2.08	-	2.08	2.21	2.34	2.48	2.63
Annual Awards and Incentives	0.40	0.08	-	0.08	0.08	0.09	0.10	0.10
Total	**14.67**	**2.90**	**-**	**3.01**	**3.09**	**3.27**	**3.47**	**3.68**

Source: CRIS Analysis

7.5 Sustainability of IEC Campaign

Sustainability of the IEC Campaign shall be critical to the success of CSP. In order to ensure that IEC is not a one-time activity and is sustained throughout the duration of CSP, the first step is to ensure a budget for IEC for the years beyond the initial phase; CSTF will be responsible for ensuring this budgetary provision. It will also be important to ensure complete ownership of the Campaign by the residents of Lucknow[8] (for which some lessons may be drawn from the Kerala experience in literacy campaigns in the 1980s) and involve school children as the torch bearers of the Campaign. Citizen monitoring of CSP and the IEC campaign through Report Cards etc. is expected to help sustain interest and involvement of the people in the Campaign. Annual awards and incentives are also expected to help keep up the momentum and lead to sustainability of the Campaign

[8] *This was a factor critical to the success of the Kerala Literacy Campaign in the 1980s, often lauded as one of the most successful IEC initiatives in India, which was embraced/owned by the public as a result of efforts of the State government and district administration and the strategy to involve eminent local people including academicians, literary figures, religious scholars etc. In the people's committees set up for the Campaign in villages and at municipal ward level in urban areas.*

8. Financial Assessment

The 'as-is' financial assessment of the ULB presented in the situational analysis report (submitted as the previous deliverable) forms the basis for the analysis at this stage. A financial model has been developed to depict the financial position of LNN. The model can be used to calculate future surpluses under various scenarios involving combinations of internal revenue improvement, state support and financing terms.

A detailed financial model has been prepared to provide for the future financial position of the ULB based on the financial projections of the income and expenditure. The FOP provides the direction on the future revenue and expenditure streams based on the existing revenue and capital streams and also based on the ongoing and future (priority) projects of the ULB. It also provides a direction on the ability of the ULB to undertake any further investments.

8.1 Key Assumption

Historical data pertaining to the previous five years commencing from 2005-06 to 2009-10 was used to arrive at the growth trend for each major income and expenditure item. 2008-09 was used as the base year for the growth projections. Subsequently, a twenty year financial projections were made commencing from 20010-11.

The key assumptions for the base case are provided below.

Table 33: Key assumptions made to derive projections

Source	Assumptions
Revenue & Expenditure for LNN	
Growth rate of properties	5% growth year on year for the period of 20 year under consideration
Coverage of properties under property tax net	Target coverage has been assumed to be 90% which has targeted to be achieved in 2015
Average consolidated annual rental value of properties	ARV has been assumed to increase by 10% for the year 2010-11 and 65% for year 2011-12 based on discussions with LNN officials on account of land rate revision. For rest of the years periodic increase of 25% after every 5 years
Property Tax	As per the gazette notification the property tax can be charged at 15% of average annual value of the property
Other tax revenues like vehicle tax, animal tax, theatre tax, advertisement tax or drainage tax	Growth assumption has been worked out either on the basis of CAGR for the past 5 years or on the discussions held with LNN officials.
Fees and charges like	Growth assumption has been worked out on the decadal

Source	Assumptions
education fees, health fees, and market fees	growth rate of population, inflation rate etc. which has come out of the discussions with LNN officials.
Income from Municipal properties like rent of land, buildings, vehicle and other municipal properties, etc.	Growth assumption has been worked out on the lease rental growth rates and CAGR for the past 5 years. The income from municipal properties has been increasing at 13% for the past 5 years thus for projecting the future income we have projected the increase to be 10% based on discussions with LNN officials.
Other miscellaneous income like interest income, penalties, etc.	Growth assumption has been worked out on the lease rental growth rates and CAGR for the past 5 years which again have been derived out of the discussions with LNN officials.
Transfer income and grants	Income generated from the registration of properties has been increased at the rate of increase of properties whereas the municipal fund devolved out of the state government fund has been increased by 8% based on discussions with LNN officials.
Salary & Wages expenditure of LNN	This has been increased by 12.36% every year assuming a hike in the dearness allowance at the rate of 6% semi annually. However the arrears for the 6th pay commission which is Rs. 85 crores which has been assumed to be paid over the coming 5 years.
Administration & General	Based on discussion it has been assumed to be 10%
Repairs & Maintenance	Based on discussion it has been assumed to be 10%
Pension expense	It has been increased at the rate of 15% as the number of increase in the number of employees retiring from the Government job is increasing and further Rs 2.5 crores on account of arrears which has been considered due for payment in year 2011-12.
Water Tax	As per the gazette notification the water tax can be charged at 12.5% of average annual value of the property.
Water Charges	As per the definition water charges would be the differential amount between the actual consumption metered & water tax in case the actual consumption is higher amount covered in the water tax slab. However, in the past the entire revenue collected from the commercial connections including the water tax as well has been recorded under the water charges. Since nothing has been formalized for the metered regime therefore we have gone ahead with water tax component only.
Connection Ratio – Residential Properties	As per the data provided by Jal Kal Vibhag, LNN the current coverage of water connections is 72% which shall be 95% by the year 2015
Connection Ratio – Residential Properties	As per the data provided by Jal Kal Vibhag, LNN the current coverage of water connections is 45% which shall be 60% by the year 2015

Source	Assumptions
Sewerage Tax	As per the gazette notification the sewerage tax can be charged at 3% of average annual value of the property
Meter Rent	For each of the commercial connection the meter rent is Rs. 10 per month whereas for residential connection the meter rent is Rs. 6 per months per connection.
Salary & Wages expenditure of Jal Kal Vibhag, LNN	This has been increased by 12.36% every year assuming a hike in the dearness allowance at the rate of 6% semi annually. However the arrears for the 6th pay commission which is Rs. 15 crores which has been assumed to be paid over the coming 2 years.
Supplies, Chemicals, General Repairs etc.	As per the inflation data the rate of increase has been assumed to be 6% year on year.
Electricity & Energy Expenses	As per the inflation data the rate of increase has been assumed to be 6% year on year.
Liabilities occurred as on March' 2011	
Payments to contractors for work related to street lighting, rubbish removal, etc.	As of March' 2011 the amount was Rs. 134 crores which should be paid over the next 5 years starting from 2011-12.
Electricity expenses due for Jal Kal Vibhag, LNN	As per the budget for the year 2010-11, the due payment against electricity expenses was Rs. 161.21 crores which has been assumed to be paid over the next 5 years. In the past the state government has made payments against the due on behalf of Jal Kal Vibhag which further gets adjusted against LNN's share of Government income on account of Octroi duty.
World Bank and bridging loan	As per the budget for the year 2010-11, the due payment against the interest accrued is Rs. 6278.78 lakhs whereas the principal amount due is Rs. 2194.81 lakhs. It has been assumed that LNN makes the total amount due which is Rs. 8473.58 lakhs in next 20 years.
LNN's share for JNNURM projects	Rs. 28087.27 lakhs which is required for the implementation of JNNURM projects has been assumed to be completed in the year 2011-12.
LNN share for the JNNURM projects operation and maintenance expense	It has been assumed that the O&M expense would be 2% of the sanctioned project cost starting from the year the plants are assumed to be commissioned i.e. 2012-13.
Escalation factor	6% has been assumed to be the escalation factor for the O&M expenses
IEC Campaign Cost	
CSR component of IEC campaign cost	Assumed that Rs. 20 crore of IEC implementation initial phase is borne by corporate as a part of CSR.
Escalation factor	Escalation rate has been assumed at 6% p.a.

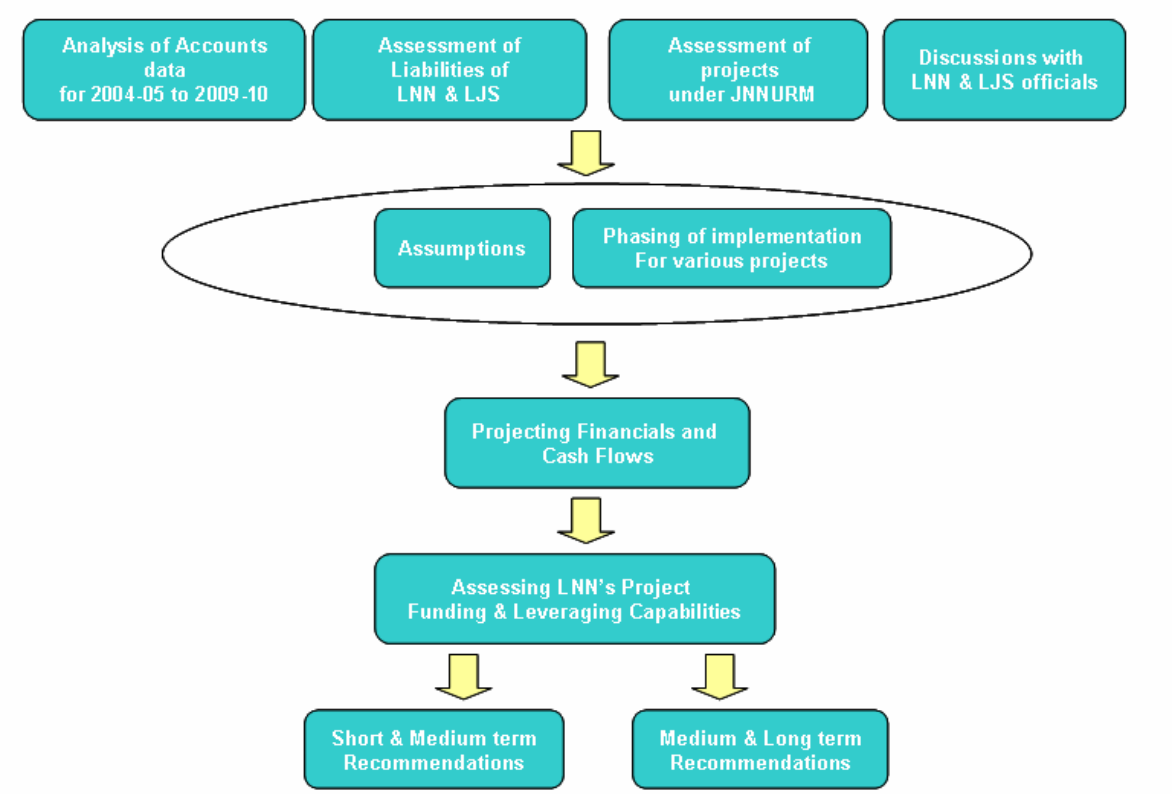
Source	Assumptions
Contingency fund	Contingencies have not been assumed
Awards and incentives	Awards and incentives assumed at Rs. 50 lakhs.
Fund spent on IEC campaign	It has been assumed that after 5 years Rs. 1 crore per year would be the amount spent on the IEC campaign
Interventions for sanitation sector	
Individual toilets	67,435 toilets at an average cost of Rs. 13,000 which amounts to total investment of Rs. 87.67 crores.
Conversion of single storey toilets to multi storey	50% of single storey toilets have been assumed to be converted to multi storey toilets with an average cost of Rs. 60,000 for each seat amounting to Rs. 6.21 crores.
New Public Toilets	A total 5,568 seats are planned to be added with cost per seat to Rs. 75,000 leading to a capital expense of Rs. 41.76 crores
Operation & Maintenance of public toilets	O&M has been assumed to be an outsourcing activity (PPP) on a “pay and use” basis
Option for cleaning of Septic tanks	Vacutug shall be used for the cleaning the septic tanks on the narrow roads cost per equipment shall be Rs. 2,50,000 for each of the equipment. The city has a requirement of around 130 vehicles in order to sanitise the city.
Decentralized system and Mobile Toilet Vans	The cost of the same has not been calculated owing to a number of factors detailed in the sections in the chapter on Sanitation.
Solid Waste Management	
Operation and maintenance cost of SWM project on PPP basis	O&M charges for the SWM project are not being funded by JNNURM. Thus it accounts for additional burden on LNN. The tipping fee as per the concession agreement signed by LNN for the next 30 years and thereafter it increases at a rate of 4% every year.

8.2 Financial Operating Plan

The objective of the Financial Operating Plan (FOP) which gives a multi-year forecast of finances for the medium term is to assess the Corporation’s investment capacity for the set of ongoing and identified priority projects.

The methodology adopted for preparation of FOP is represented below.

Figure 25: Methodology for Financial Operating Plan



The FOP assesses the investment-sustaining capacity of Lucknow Nagar Nigam in a scenario wherein the existing and the priority projects identified are included. The level of investment Lucknow Nagar Nigam can sustain is then determined by studying the overall surpluses.

8.3 Financial Projections

The financial projections of the Nagar Nigam have been done for a period starting 2010 – 11 and ending 2029 – 2030. The following table provides the financials for select years.

Table 34: Projections of LNN Financials

Rs. in crores

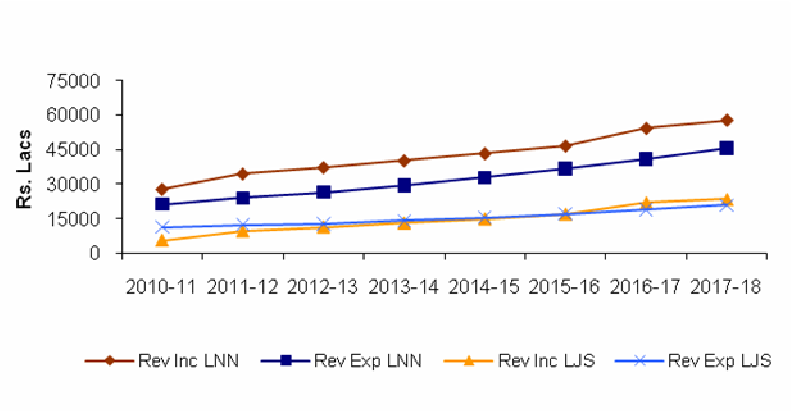
PARTICULARS	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Revenue Income (LNN)	279.82	346.36	374.30	403.23	434.07	467.13	543.11	578.60
Revenue Expenditure (LNN)	213.64	240.48	265.15	295.49	329.38	367.24	409.55	456.84
Revenue Surplus / (Deficit) (LNN)	66.18	105.88	109.15	107.73	104.69	99.89	133.56	121.76
Revenue Income (Jal Kal Vibhag)	56.10	96.86	113.54	130.82	149.61	170.35	219.99	235.20
Revenue Expenditure (Jal Kal Vibhag)	113.82	124.46	128.35	141.39	155.82	171.82	189.55	209.22
Revenue Surplus / (Deficit) (Jal Kal Vibhag)	(57.72)	(27.60)	(14.81)	(10.56)	(6.21)	(1.46)	30.44	25.99
Overall Surplus / (Deficit)	8.46	78.28	94.34	97.17	98.48	98.43	164.00	147.74

Source: CRIS Analysis

LNN's revenue surplus is expected to increase to Rs 78.28 crores in 2011-12. This increase in revenue is primarily driven by revision of ARV which is said to be an increase of 75% over a period of 2 years i.e. 2010-11 and 2011-12 (ARV of properties has remained constant for the past 12 years). The reassessment of properties aims at evaluating the rental values of the properties and ensuring that the same are brought closer to reflecting the current market trends. Thus LNN has an increased tax base, by virtue of which there is around 13% increase in the revenue collection.

Further to mention that the sudden increase in the revenue of both LNN and Jal Kal Vibhag in the year 2016 – 2017 is on account of 25% hike which has been assumed annual value of property after every 5 years.

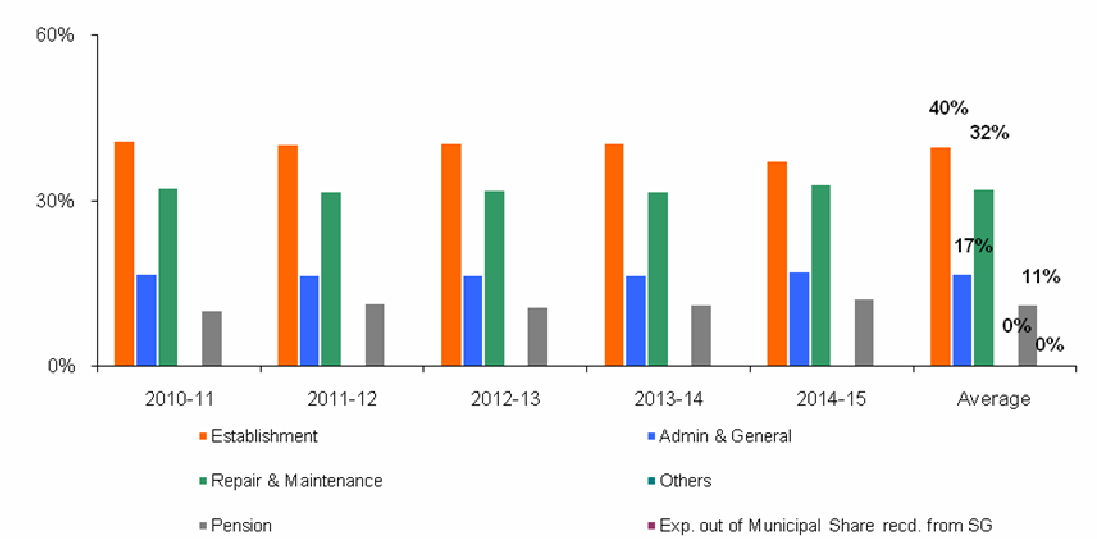
Figure 26: Revenue Income and Expenditure Pattern



The operations of Jal Kal Vibhag have caused a revenue deficit year on year which is on account higher cost of supplying potable water. The condition of Jal Kal Vibhag would improve after implementation of volumetric based charging for the services provided and improvement in operational efficiency. This improvement in the operation efficiency expected to be brought about due to the merging of the LNN and Jal Kal Vibhag which shall further increase the number of properties under the tax net.

It may also be noted here that projections have not taken into account any grant component while arriving at the projections owing to the high degree of uncertainty in terms of quantum of grants. The figure below provides the assessment of share of salaries and wages and other expenses of the total revenue expenditure on account of the LNN. It may be noted that salaries account for almost 40% of LNN's expenditure.

Figure 27: Revenue Expenditure Pattern of LNN



8.4 Ongoing and Proposed Capital Investment

Under the ministry of Urban Development, there are several components which have funding options for sanitation. The urban infrastructure and Governance component has funds for building sewerage network, pumping stations and sewage treatment plant. This specific work is going on in Lucknow. Extension of sewer lines is in progress.

The projects which the Nagar Nigam has received approval for under JNNURM are worth Rs 1616.13 crores. Based on the funding pattern under JNNURM, LNN is expected to make investments to the tune of Rs 485 crores in these projects. Also, the Nagar Nigam is required to bear the escalation in costs of the approved projects which might result in increased LNN's commitment towards JNNURM projects. However as per the discussion with JNNURM project officers the escalation in the project cost is highly unlikely and the projects would be completed in the stipulated cost. The commitment of Nagar Nigam towards the JNNRUM projects for the year 2010 – 2011 and 2011 – 2012 are Rs.159 crores and Rs.122 crores respectively.

Table 35: Funding Pattern of Projects under JNNURM

Rs. in crores

Name of project	Sanctioned project cost	Overall funding receivable based on sanctioned project cost			Allocation of pending grant funding			
		GoI (50%)	GoUP (20%)	LNN (30%)	2010-11	2011-12	2012-13	2013-14
Sewerage works District I	236.23	118.12	47.25	70.87	17.72	0.00	0.00	0.00
Municipal Solid Waste Management	42.92	21.46	8.58	12.88	0.00	9.66	0.00	0.00
Water Supply Works Phase I Part I	388.61	194.31	77.72	116.58	29.15	0.00	0.00	0.00
Sewerage works District III - Part I	262.16	131.08	52.43	78.65	29.49	29.49	0.00	0.00
Storm Water Drainage	325.21	162.61	65.04	97.56	36.59	36.59	0.00	0.00
Sewerage works District III - Part II	214.43	107.22	42.89	64.33	24.12	24.12	0.00	0.00
Water Supply Works Phase I Part II	146.57	73.28	29.31	43.97	21.98	21.98	0.00	0.00
Total	1616.13	808.06	323.23	484.84	159.04	121.83	0.00	0.00

Source: LNN

The outstanding liabilities on account of LNN as of the Dec 2010 are provided in the Table 35. The outstanding due on these liabilities in past have been taken up state government which further was adjusted against the LNN's share in the state government income called as Raj Vitt Aayog i.e. the compensation provided by the State Government in lieu of abolishing Octroi. Therefore we have to account for these liabilities in order to adjudge the investment sustenance of LNN.

Table 36: Committed Liabilities (Existing)

Rs. in crores

PARTICULARS	REMARKS	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Contractual Payments	Rs. 134 Crores paid over 5 years	0	26.80	26.80	26.80	26.80	26.80
Electricity Expense Liability for Jal Kal Vibhag	Rs. 161 Crores paid over 5 years	0	32.26	32.26	32.26	32.26	32.26
World Bank – Principal	Rs.21.94 Crores due as principal	0	1.1	1.1	1.1	1.1	1.1
World Bank – Interest Payment	Rs. 62.78Crs due as interest	0	3.14	3.14	3.14	3.14	3.14
Total Liabilities on LNN	Year on year liabilities of LNN	0	63.30	63.30	63.30	63.30	63.30
JNNURM Projects Capex	LNN contribution Rs.280.87 Crores	159.04	121.83	0	0	0	0
JNNURM Projects Opex	2% of the project cost from 2012-13	0	0	31.46	33.35	35.35	37.47
Funds Required for JNNURM Projects		159.04	121.83	31.46	33.35	35.35	37.47

Source: LNN & CRIS Analysis

8.5 Capital Investment Plan – Proposed Projects

The Capital Investment Plan for the City Sanitation Plan of Lucknow which identifies various development works, projects and initiatives that need to be taken up for meeting the sanitation objectives for the city, keeping in line with the City Vision and Sector Vision as discussed in the introduction chapters.

The projects have been identified based on discussion and suggestion by various stakeholders, during the Stakeholder Workshops and focused group meetings, and also on the basis of demand assessment to fulfil current service delivery gaps and meet future demands of the city.

The Capital Investment Plan also provides a summary of total investments required for the city, the impact of proposed investments on institutional finances and suggest alternate financing strategies if possible. The details with regard to the each project have been taken separately in the sections focusing on sanitation situation and solid waste management. These investments estimates are

outside the incremental investment which the Corporation would have to take up year on year with expansion in population or if there is an increase in the city limits of the Corporation.

8.5.1 Sanitation Interventions

Lucknow Jal Nigam has prepared a master plan for the sewage sector with a design population of 2041. A detailed DPR has also been prepared for the Sewerage Dist II and IV. The sanitation projects identified for LNN covers the access to safe sanitation technology options which includes provision of public toilets and regular cleaning of septic tanks focusing on low-cost sanitation facilities and environment management.

Table 37: Summary of Capital Investments - Sanitation

		Capital Expenditure – LNN							
Sanitation	Unit	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Revamp of existing toilets	Rs. Crores	0	2.59	2.59	0.00	0.00	0.00	0.00	0.00
New Public Toilets	Rs. Crores	0	12.53	12.53	16.70	0	0	0	0
Vacutug	Rs. Crores	0	0.80	4.35	0.00	0.00	0.00	0.00	0.00
Total	Rs. Crores	0	15.90	27.81	16.70	0.00	0.00	0.00	0.00

Source: CRIS Analysis

8.5.2 Solid Waste Management

LNN has outsourced the services of collection, transportation, processing and disposal of MSW. Under a project funded by JNNURM scheme, a Private Player has been appointed for the collection, transportation and scientific disposal of waste. The private player has started collection of garbage from the 63 wards and is likely to cover all the 110 wards by July 2011. The additional burden on LNN apart from the sanctioned cost is the payment of tipping fee which is Rs 562 / MT constant for first three years and thereafter it increases at a rate of 4% every year.

Therefore the financial implications of interventions for Solid Waste Management are broadly on Awareness and Institutional Strengthening which have been covered under IEC campaign.

Table 38: Summary of Operating Expenditure Required for MSW

		Operating Expenditure – LNN							
Solid Waste Management	Unit	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Tipping Fee	Rs. Crores	0.77	0.80	0.83	0.86	0.92	1.06	1.14	1.22

		Operating Expenditure – LNN
Source: CRIS Analysis based on DPR on MSW		

8.5.3 Institutional Strengthening

The need for an IEC Strategy for the City is also an acute felt need expressed by stakeholders in the City. The IEC Campaign shall be implemented in a phased manner:

Table 39: Summary of Operating Investments - IEC

IEC	Cost (Rs. Crores)	Capital Expenditure – LNN							
		2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Campaigns	14.67	0.00	3.01	3.09	3.27	3.47	3.68	0.00	0.00
Source: CRIS Analysis									

8.6 Capital Investment Sustenance

Based on the revenue deficit that the Nagar Nigam would be accruing over the time period viz. between 2010-11 and 2029-30, the sustainable investment for the Nagar Nigam would always be the focus area. Therefore exploring the alternative financing option would be of high importance.

The table below provides year wise summary of capital investments for each sector. The detailed bifurcation for each the sector has already been covered in earlier sections.

Table 40: Summary of Capital Investments

PARTICULARS	REMARKS	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Surplus/ (Deficit) Available	Rs. Crores	(150.58)	(106.85)	(0.42)	0.52	(0.17)	(2.35)
Sanitation Sector	CAPEX	0.00	15.90	27.81	16.70	0.00	0.00
	OPEX	0.00	0.30	0.00	0.00	0.00	0.00
Solid Waste Management	OPEX	0.77	0.80	0.83	0.86	0.92	1.06
IEC		0.00	3.01	3.09	3.27	3.47	3.68
Proposed Investment		0.77	20.01	31.73	20.83	4.39	4.74
Net Surplus/ (Deficit)		(151.35)	(126.86)	(32.15)	(20.31)	(4.56)	(7.09)

Source: CRIS Analysis

Thus the accrued deficit needs to be addressed before undertaking any new big ticket projects. Some of the measures recommended to augment shortfall in revenue are mentioned below.

- **Enhanced Recovery of Operation and Maintenance Costs** – Under the special provision of Municipal Act the state government has made a provision of levying reasonable user charges as a measure for the recovery of full operation and maintenance costs. The estimates shall be provided in Annual Budget of ULB which after council's and state government's approval can be implemented. Hence it is recommended to proceed with the implementation of tariff and user charge revision to rationalize tariffs. In order to make the operations maintenance of the utility services it is mandatory and gradually achieving the capital investment sustainability.
- **Public Private Partnership** - Evaluating the options of Public Private Partnership, wherever possible and feasible, is another innovative means of addressing the investment gap. This would not only bridge the investment gap but also provide for better service delivery to the masses. Further the LNN should act as a monitoring agency through City Sanitation Task Force in long term.

- **Optimizing regular capital expenditure:** At present, LNN incurs regular capital expenditure to the tune of approximately Rs. 55-60 crores (escalated at 10% per annum). Though most of these investments are directed towards undertaking civil works and up-gradation activities, LNN may explore the option of optimizing the regular expenditure undertaken.
- **Levying additional taxes/charges:** NMC can also explore the option of levying sewerage charges. Few cities in the country are exploring the option of introducing sewerage charges as a percentage share of the water bill generated. This charge is primarily aimed at covering the capital cost involved in the laying of the sewerage system.

8.7 Financing Options

Achieving the Millennium Development Goals (MDGs) will not be possible unless an institution or group of individuals, preferably the intended users, is willing to pay for the new facilities required. Even though the infrastructure can be provided, that will fail if the infrastructure itself is not able to cover its ongoing operation and maintenance. So, it is unsustainable to provide and then maintain the services to cities. The sustainability of most sanitation systems depends on having adequate recurrent funds for operations and maintenance. Financing is often regarded as the defining factor in sanitation development. However, with a good citywide sanitation plan, a municipal government will plan to access finances from other sources, such as central government, provincial government, the private sector and the public.

Increasing the municipal budget allocation for sanitation requires commitment from all relevant decision makers, both in the legislative and executive bodies. Approval from the local legislature is important, and such support can be gained if the City Sanitation Task Force designs awareness-building activities for all decision makers and residents of the city. Thus, strategies for developing funding for sanitation needs to be supported by strategies for developing non-technical components, especially community participation, policy and regulation, and institutions.

Table 41: Possible Financing Options

Sr. No.	Financing Source	Rationale
1.	13th State Finance Commission	The 13th State Finance Commission has funding for Urban Local Bodies. Under the SFC for the year 2010-2011 two installments of Rs.8.59 crores each have been already received in the July 2010 and Jan 2011 respectively. As per the guidelines the amount shall be utilized for service level benchmarking in Sewerage, Water Supply, Drainage, and Solid Waste Management sectors.
2.	ILCS	The Centrally Sponsored Scheme of Low Cost Sanitation for Liberation of Scavengers started from 1980-81 initially through the Ministry of Home Affairs and later on through the Ministry of Welfare. From 1989-90, it came to be operated through the Ministry of Urban Development and later on through Ministry of Urban Employment and Poverty Alleviation now titled Ministry of Housing & Urban Poverty Alleviation. The main components are Central Subsidy of 75%, State Subsidy of 15% and beneficiary share

Sr. No.	Financing Source	Rationale
		of 10%.
3.	International Agencies	Being the capital city, Lucknow has a huge potential for the city development. Already agencies like JICA, WWF, USAID, and several other international agencies have been funding to meet the development objectives of the city. Thus, Nagar Nigam and Lucknow Development Authority should bring in international agencies to fund city in terms maintaining its sanitation and catering to the needs of the urban poor.
4.	PPP	Public Private Participation is another potential area which has been explored by the Nagar Nigam to an extent but not to the maximum. Till now public toilets have been constructed with PPP and also recently solid waste management project has been undertaken on PPP basis. This would relieve the city from capital investment and reduce the burden in bringing finance. A number of PPP options have emerged which include: service contracts; performance-based service contract; joint sector company to implement and finance the project; a management contract for operations and maintenance (O&M); and construction cum build-operate-transfer (BOT) contract.
5.	Rajiv Awaas Yojana (RAY)	The goal of this scheme is the provision of central support for slum redevelopment and construction of affordable housing conditional to a set of reforms necessary for urban development to become inclusive. This specific programme also would enable the city to achieve complete sanitized situation as the major problem of sanitation arises from slums and Ray would take care of this issue.
6.	Infrastructure Development Fund	The fund is evolved from the income that is being transferred on account of stamp duty received against the sale of land or buildings within the municipal limits. In case the land or building is falling within the municipal limits, it attracts an additional stamp duty of 2% over and above the normal 5% stamp duty. Income generated on account of additional stamp duty is distributed among the three development authorities, i.e. LNN, LDA and UP Housing Board in equal proportion. The fund can be utilized for the development of the infrastructure.

8.8 Section Summary

LNN has a high revenue deficit which has to be balanced by augmenting the revenue streams by optimizing regular capital expenditure, raising user charges in the sewerage sector, and commission more projects on PPP among others to bridge the investment deficit. LNN would need to undertake a detailed study to determine the levers it can utilize to boost revenues and cut costs.

9. Way Forward

This is document is the Final City Sanitation Plan where an in depth assessment of Lucknow's sanitation infrastructure assessment has been made and the document clearly outlines Broad strategies and Interventions to be adopted to achieve the desired Vision for the city of 'Lucknow'.

The ethos around which a City Sanitation Plan is put together is the notion of participatory planning. The planning process has to be a consultative one, with stakeholders representing a wide spectrum of interests taking part in the discussions and dialogue leading to the formulation of a vision and development objectives, identification of priorities etc.

Keeping this in mind, the final city sanitation plan should always be seen as a 'work-in-progress plan' which should be renewed/improvised based on the experience gained in implementing it by the City Sanitation Task force and other key stakeholders in the city.

10. Annexure

10.1 Annexure I: Members of City Sanitation Task Force in Lucknow

कार्यालय नगर निगम, लखनऊ

D-528/MC/AMC-PK/2010 दिनांक 15.10.2010

कार्यालय ज्ञाप

राष्ट्रीय शहरी सैनीटेशन पॉलिसी के प्राविधानों के अंतर्गत लखनऊ शहर के लिए सिटी सेनीटेशन टास्क फोर्स का गठन किया गया है जो निम्नवत् है:–

क्र. सं.	नाम व पदनाम	टास्क फोर्स का पद	मो.नं.
1	महापौर	अध्यक्ष	
2	नगर आयुक्त	संयोजक	
3	श्री पी.के. श्रीवास्तव, अपर नगर आयुक्त	सहसंयोजक	9415609558
4	मुख्य अभियन्ता, नगर निगम लखनऊ	सदस्य (पदेन)	9415607774
5	श्री एस.के. जैन, परियोजना प्रबंधक, जे.एन.एन.यू.आर.एम.	सदस्य	9026860092
6	नगर स्वास्थ्य अधिकारी, नगर निगम लखनऊ	सदस्य (पदेन)	9415607775
7	डा. एस.सी. दुबे, जोनल स्वास्थ्य अधिकारी, नगर निगम लखनऊ	सदस्य	9415607924
8	संयुक्त आवास आयुक्त, लखनऊ जोन, उ.प्र. आवास एवं विकास परिषद	सदस्य (पदेन)	
9	सचिव, लखनऊ विकास प्राधिकरण, लखनऊ।	सदस्य (पदेन)	9918001503
10	श्री के.ए. अन्सारी, परियोजना प्रबंधक, अस्थाई गोमती प्रदूषण नियंत्रण इकाई, उ.प्र. जल निगम लखनऊ।	सदस्य	9473942564
11	श्री सी.के. गुप्ता, परियोजना प्रबंधक, गोमती प्रदूषण नियंत्रण इकाई–द्वितीय, उ.प्र. जल निगम, लखनऊ।	सदस्य	9473942576
12	श्री आर.पी. सिन्हा, परियोजना प्रबंधक, गोमती प्रदूषण नियंत्रण इकाई–चतुर्थ, उ.प्र. जल निगम लखनऊ।	सदस्य	9473942578
13	श्री रघुवेन्द्र कुमार, सचिव, जलकल, नगर निगम लखनऊ	सदस्य	8853098202
14	क्षेत्रीय अधिकारी, उ.प्र. प्रदूषण नियंत्रण बोर्ड, लखनऊ	सदस्य (पदेन)	9415157947
15	सहयुक्त नियोजक, सम्भागीय नियोजन खण्ड, लखनऊ	सदस्य (पदेन)	
16	श्री रनीश चन्द्र वर्मा, परियोजना अधिकारी, डूडा	सदस्य	8874210078
17	श्रीमती नंदिनी कृष्णा, सोशल एंड कम्युनिटी डेवेलपमेंट आफीसर, पी.आई.यू., नगर निगम लखनऊ।	सदस्य	9415029462
18	डा. (श्रीमती) सरोज श्रीवास्तव, सरोज नर्सिंग होम, महानगर लखनऊ	सदस्य	9335162006
19	श्री फारूख रहमान खान, प्रोग्राम आफीसर, ऑक्सफेम इंडिया लखनऊ	सदस्य	9935387786
20	श्री जॉनसन जियासीलन, प्रोग्राम आफीसर, वॉटरएड, लखनऊ	सदस्य	9793509964
21	सुश्री श्रुति मेहता, सीनियर एक्जक्यूटिव, एच.आर. टाटा टेलीसर्विसेज, 2, आर.एफ. बहादुरजी मार्ग, शक्ति भवन के पीछे लखनऊ।	सदस्य	9235509919
22	श्री इम्तियाज अंसारी, सहायक अभियंता एवं जोनल इंचार्ज, सुलभ इंटरनेशनल राज्य शाखा अलीगंज लखनऊ।	सदस्य	9450787913
23	श्री दुर्गेश वाल्मीकि, उ.प्र. सफाई मजदूर संघ, नगर निगम लखनऊ	सदस्य	9415001091

आवश्यकतानुसार टास्क फोर्स में परिवर्तन किया जा सकता है।

सिटी सेनीटेशन टास्क फोर्स के कार्यः -

- शहर के सैनीटेशन के लिए नागरिकों में जागरुकता पैदा करने हेतु प्रचार प्रसार कराना।
- कार्यदायी संस्था द्वारा किए जाने वाले कार्यों का अनुश्रवण करना एवं मार्गदर्शन प्रदान करना।
- कमेटी की बैठक प्रत्येक माह में कम से कम एक बार आहूत की जायेगी।

(शैलेश कुमार सिंह)
नगर आयुक्त

प्रतिलिपि – मा. महापौर / अध्यक्ष एवं समस्त सदस्यगणों को सूचनार्थ प्रेषित।

(शैलेश कुमार सिंह)
नगर आयुक्त

The City Sanitation Task force comprise of the following:

- Mayor , Lucknow (Chair Person)
- Municipal Commissioner, Lucknow Nagar Nigam
- Additional Municipal Commissioner, Lucknow Nagar Nigam
- Chief Engineer (JNNURM), Lucknow Nagar Nigam

Representatives from various agencies:

- U.P Jal Nigam
- Jal Kal Vibhag, LNN (earlier Lucknow Jal Sansthan)
- Lucknow Development Authority
- River Conservation Department
- Pollution Control Board
- Public Works Department
- UP Awas Vikas Parishad
- Town and Country Planning Department (TCPD)
- District Urban Development Authority
- District Health Officer
- Representative from RWAs/NGOs
- Eminent Senior Citizens
- Sulabh International
- Other Relevant departments

10.2 Annexure II: List of key consultations held in Lucknow

Table 42: List of Stakeholders Consultations held

Date of Visit	List of Participants
8th Sept 2010	Introduction to CSP –Key stakeholders for all institutions
15th October 2010	Discussion with the core group and formulation of the task force
19th Nov 2011	1st Meeting City Sanitation Task Force Meeting
15th 2010-11th Dec 2011	Discussion with the core group and Survey under taken for the city
10th Jan 2011	2nd Meeting on CSTF
20TH Feb 2011	3rd Meeting of CSTF

Date of Visit	List of Participants
7th Mar 2011	4th Meeting with CSTF and Meeting with NGOs
19th Apr 2011	5th Meeting with CSTF on the Draft CSP

10.3 Annexure III: Support Systems

Based on our discussions with the authorities, it was realized there exist strong support systems providing assistance in carrying out reforms and implementing various measures to improve the sanitation situation across the city.

1. State Water & Sanitation Mission

The state water & sanitation mission located in Lucknow along with the UP Jal Nigam provides support in monitoring & evaluating the water quality checks for the city. The rigorous process of continuous monitoring and assessment enables the institution to keep a check on the poor quality of the water and also keep a tab on the utilization of water treatment plant and other aspects related to the provision of supplying safe drinking water to the citizens.

2. Manyawar Sri Kanshiramji Shahri Dalit Bahulya Basti Samgra Vikas Yojana

The Honourable Chief Minister of Uttar Pradesh with a view to improve the living conditions of the Dalit dominated bastis of urban areas, has decided to implement Manyawar Sri Kanshiramji Shahri Dalit Bahulya Basti Samgra Vikas Yojana. Under the scheme approximately Rs. 2000 crore would be spent to improve the living conditions.

Likewise, various other schemes like Manyawar Sri Kanshiramji Shahri Samgra Vikas Yojana, Sarvjan Hitay Shahri Garib Makan (Slum area), Malikana Haq Yojana and Manyawar Sri Kanshiramji Shahri Garib Avas Yojana have also been implemented for the benefit of the Dalits and the deprived society residing in urban areas. Under the scheme the bastis would be saturated with all the 18 programmes in a phased and timely manner. It has been suggested that the master plan of the selected bastis would be prepared by the Chief Town Planner. Under the scheme, facilities like drinking water supply, sewerage, drains, and solid waste management (waste management), construction of C.C. roads and closed drains in selected dalit bastis, electrification/street lighting etc. would be provided.

Besides, these bastis would also get the benefit of pension schemes, mother and child welfare health centres, set up of primary schools, ration cards for eligible persons, housing facilities, community centres, beautification of parks, and benefit under the employment schemes like Swarn Jayanti Shahri Rozgar Yojana, Pradhan Mantri Rozgar Yojana, Saghan Mini Dairy Yojana (wherever applicable), Khadi Gramodyog for eligible persons, and benefit from Swachchhkar Vimukti Yojana.

Apart from above, schemes such as Savitri Bai Phule Shiksha Madad Yojana, U P Mukhyamantri Mahamaya Garib Arthik Madad Yojana and Mahamaya Garib Balika Ashirwad Yojana would also be implemented.

3. Air and Noise Pollution

A study was undertaken by CSIR – Indian Institute of Toxicology Research, Lucknow in April-May 2011 (Ref: Assessment of Ambient Air Quality of Lucknow City during Pre-Monsoon, 2011 – Findings of a random survey by CSIR – Indian Institute of Toxicology Research, Lucknow) to determine the air and noise pollution in the city. The following things were concluded:

- The RSPM (PM_{10}) level at all the monitoring locations of residential, commercial and industrial areas were higher than the National Ambient Air Quality Standard (NAAQS).
- Fine particle ($PM_{2.5}$) level at all the monitoring locations of residential, commercial and industrial areas were higher than the NAAQS (60 µg/m^3)
- The concentration of gaseous pollutants, SO_2 and NO_x were well below the prescribed NAAQS (80 µg/m^3) at all the locations.
- Decreasing trend for the RSPM was found at all the locations over the 2006 data till last year except at Vikas Nagar, Hussainganj, Charbagh, and Aminabad. The present values showed higher level in most the locations which may be due to local construction activity.
- The noise level at all the locations except in industrial areas during day and night time showed lower level than the respective permissible limits.
- Level of lead at all locations found to be under permissible limit (1000 ng/m^3) except in Aminabad.
- Level of nickel at all locations found to be under permissible limit when compared with annual average (20 ng/m^3) except in Aliganj, Vikas Nagar, Charbagh and Chowk.
- Overall results indicate that RSPM and associated metals are one of the major causes for deterioration of ambient air quality.

The reason could be attributed to rapid increase in vehicular as well as human population, wherein both are responsible for environment and human health specifically in urban areas. To curb the pollution four Air Quality Monitoring System stations for air pollution monitoring and five continuous Ambient Noise Monitoring Stations have already been installed and operated to keep a check on air and noise pollution in Lucknow by Central Pollution Control Board (CPCB) and UP Pollution Control Board (UPPCB).

10.4 Annexure IV: Press coverage of consultations held in CSP

Lucknow, September 08, A meeting was held in Municipall Corporation head office on “How to keep the city clean?”, The purpose of meeting was to develop Lucknow City Sanitation Plan, in which many officers from various departments participated along with the representatives of Crisil Infrastructure Advisory who will be formulating the City Sanitation Plan for Lucknow.

शहर को स्वच्छ रखने पर हुई चर्चा

डीपीआर को लेकर हुई बैठक में भाग लेते अधिकारीगण

लखनऊ, 8 सितम्बर (जास) : शहर को कैसे साफ-सुथरा रखा जाए, इसको लेकर नगर निगम मुख्यालय में बैठक हुई। लखनऊ के 'सिटी सेनीटेशन प्लान' को लेकर विस्तृत कार्ययोजना (डीपीआर) तैयार करने के उद्देश्य से हुई इस बैठक में कई विभागों के अधिकारियों के अलावा डीपीआर तैयार करने वाली संस्था 'क्रसिल इंफ्रास्ट्रक्चर एडवाइजरी' के प्रतिनिधियों ने भी भाग लिया।

नगर निगम मुख्यालय के बाबू राजकुमार श्रीवास्तव सभागार में आयोजित बैठक में शहर से जुड़े तमाम आंकड़ें पेश किए गए। अपर नगर आयुक्त पीके श्रीवास्तव ने बताया कि 'सिटी सेनीटेशन प्लान' की विस्तृत कार्ययोजना (डीपीआर) का व्यय जापान की संस्था 'जायका' (जापान इंटरनेशनल कारपोरेशन) वहन करेगी। योजना का उद्देश्य शहर में खुले शौचालयों को व्यवस्थित करना है। इसके अलावा खुले में शौच करने वालों को चिह्नित कर उनके लिए समुचित शौचालय की व्यवस्था कराना है। इसके जरिए शहर को साफ-सुथरा माहौल दिया जा सकता है। उन्होंने बताया कि शहर में सीवर, लाइन की लम्बाई, घरों में शौचालयों की स्थिति, पानी की स्थिति, जनसंख्या बढ़ने का ग्राफ, मलिन बस्तियों की संख्या व शहर की सफाई व्यवस्था से जुड़ी जानकारियां संस्था ने मांगी हैं।

• 'सिटी सेनीटेशन प्लान' का डीपीआर बनेगा

All the service level indicators for Basic Services in City were presented during the meeting which was held in Babu Rajkumar Srivastava Committee Hall of Municipal Corporation head office. Additional Municipal Commissioner Mr. P. K. Srivastava told that the preparation of City Sanitation Plan would be funded by Japan International Cooperation Agency (JICA).

The City Sanitation Plan shall asses the infrastructure needs for the city and measures to be taken up to ensure sanitation facilities to all. It shall also create awareness among the people about sanitation facilities. The virtue of this plan is to make the city clean. CRISIL shall prepare the plan for Lucknow.He also mentioned the Crisil Infrastructure Advisory has asked for the data related to existing Sewerage System, Length of the line, condition of toilets in households, water supply condition, population increase, numbers of slums and data related to cleaning mechanism of the city. The Corporation and other parastatals shall facilitate to provide the relevant data to CRISIL Team.

10.5 Annexure V: Press coverage of consultations held in CSP

Nodal agency details about sanitation plans

TIMES NEWS NETWORK

Lucknow: The proposed city sanitation plan (CSP) for Lucknow inched a step further with Crisil, the agency deputed for the purpose, giving a presentation before members of CSP task force at the Lucknow Municipal Corporation (LMC) on Tuesday.

The agency had given a representation earlier also highlighting the civic loopholes that needed to be plugged before proper amenities are provided to the people of Lucknow.

Issues pertaining to zero discharge toilets and a availability of mobile vans to dispose off city garbage were also raised at the meeting attended by city mayor Dinesh Sharma, who also happens to be the chairman of CSP task force.

Members also sought to know if a separate department to over see solid waste management can be established.

Ganj, other markets to have mobile toilets

GREEN CITY Sanitation task force moots zero discharge toilets designed by IIT-Kanpur for those areas, which don't have a network of sewer lines

HT Correspondent
lkoreportersdesk@hindustantimes.com

LUCKNOW: Hazratganj is the 'Oxford Street' of Lucknow. It has all the conveniences for the general public – be it a multi-level parking lot, posh showrooms, garbage bins and telephone booths, but the market doesn't have a public toilet. Often people visiting the boulevard have to go another place for relieving themselves. Similar is the problem in Charbagh, Aminabad and Chowk markets.

Lucknow Municipal Corporation has come up with the idea of placing mobile toilets in these markets.

During the meeting of City Sanitation Task Force on Tuesday, residents raised the issue of certain areas of the city not having public toilets. Members of the task force had various suggestions.

They mooted new toilets for areas where land is available. And at places where toilets already exist, there was a proposal to convert them into double storey ones. The members also suggested mobile toilets for places where there is no land for toilets. Zero discharge toilets designed by IIT Kanpur were proposed in those areas, which don't have a network of sewer lines. These toilets separate the water from the waste, which is stored in a tank placed inside. The waste is later disposed of into gas plants while the water is recycled for flush.

A model of the mobile loos to be placed in Hazratganj and other areas of the city.

Additional municipal commissioner PK Srivastava said, "The presentation made by Crisil during the meeting stressed on keeping Lucknow clean and green and saving groundwater table from contamination."

He said, "We are already in the process of changing the LMC rulebook so that the corporation gets the right to fine residents spreading filth on streets. But we will still take strict action (issue challan) against those littering streets."

CLEAN THOUGHT

- Members of the task force suggested new toilets for areas where land is available.
- There was a proposal to convert the already-existing public toilets into double storey ones. They suggested mobile toilets for places where there is no land available for toilets.
- Zero discharge toilets These toilets designed by IIT Kanpur toilets separate the water from the waste, which is stored in a tank placed inside.
- The waste is later disposed of into gas plants while the water is recycled for flush.

10.6 Annexure VI: Invitation to citizens of Lucknow to give suggestions for CSP

सात प्रतिशत लोग खुले में करते हैं शौच

सिटी सेनीटेशन प्लान तैयार करने वाली संस्था के सर्वे में सामने आए तथ्य

कार्यालय संवाददाता

लखनऊ

राजधानी में पक्के घरों में रहने वाले पाँच से सात प्रतिशत लोग खुले में शौच करते हैं। पब्लिक शौचालयों की एक सीट का इस्तेमाल 130 से 135 लोग करते हैं। जबकि मानक के अनुसार यह 30 से 35 होना चाहिए। इन तथ्यों की जानकारी एक निजी संस्था के सर्वे में हुई है। यह संस्था राजधानी के लिए सेनीटेशन प्लान तैयार कर रही है। शनिवार को सेनीटेशन प्लान हेतु सुझाव देने के लिए बने टॉस्क फोर्स की बैठक हुई।

सिटी सेनीटेशन योजना आगामी 15 वर्षों को ध्यान में रखकर तैयार की जा रही है। दिल्ली की क्रिसिल इन्फ्रास्ट्रक्चर सेनीटेशन प्लान को तैयार करने में लोगों को मिलने वाली सुविधाओं का खाका तैयार कर रही है। संस्था को यह काम जापानी कम्पनी जायका ने दिया है। जायका ने इस योजना के लिए लखनऊ व मुम्बई को चुना है।

क्रिसिल ने 25 वार्डों के दो हजार परिवारों की वर्तमान सुविधाओं व संसाधनों का सर्वे कराया है। इसमें सामने आया कि बेहतर सेवा के लिए लोगों को चार्ज देने में दिक्कत नहीं होगी। कम्पनी ने पेयजल आपूर्ति, सीवर की स्थिति, कूड़े की मात्रा पर भी सर्वे किया। शनिवार को बैठक में इसके अध्यक्ष डॉ. दिनेश शर्मा, टीसीएस के जयन्त कृष्णा, सुलभ के वाईडी माथुर, गोमतीनगर जनकल्याण समिति के ब्रकेश्वर तिवारी, यूनीसेफ से रिटायर अगस्टीन, क्रिसिल की मैनेजर मोनिका बहल व सरकारी अधिकारी अफसर शामिल हुए। अपर नगर आयुक्त पीके श्रीवास्तव ने बताया कि अगली बैठक मार्च के पहले सप्ताह में होगी।

टास्क फोर्स के सुझाव

- 35 लाख आबादी के हिसाब से योजना तैयार हो
- गुजरात व कर्नाटक की तर्ज पर बने स्वच्छता नीति
- गंदे पानी को रिसाइकिल कर उपयोग में लाने की व्यवस्था
- बाहर से आने वालों के लिए पब्लिक शौचालय की व्यवस्था
- सालिड व मेडिकल वेस्ट के निस्तारण की व्यवस्था
- डेरियों की व्यवस्था की जाए
- पालतू कुत्तों को दूसरे के घर के सामने टॉयलेट कराने पर रोक लगे

आप भी दे सकते हैं सुझाव

सेनीटेशन प्लान के लिए आप भी सुझाव दे सकते हैं। अपर नगर आयुक्त पीके श्रीवास्तव कहते हैं कि आम आदमी को भी इसमें जोड़ा जाएगा। लोग अपने सुझाव दे सकते हैं। मार्च में होने वाली बैठक में ऐसे लोग शामिल हो सकते हैं। आम आदमी, सामाजिक व स्वैच्छिक संस्थाओं के प्रतिनिधि उनके कार्यालय में संपर्क कर सकते हैं।

Clipping A

कैसे बदलेगी राजधानी का सूरत

हकीकत

सफाई का स्तर भयावह और जागरूकता का अभाव, रिपोर्ट में खुलासा

लखनऊ। राजधानी में सफाई का स्तर और सच सामने आ गया है। लोगों में सफाई और स्वच्छता को लेकर जागरुकता न के बराबर है। क्रिसिल की रिपोर्ट में जिन बातों का खुलासा हुआ है उससे तो यही लगता है।

शनिवार को नगर निगम में सिटी सैनिटेशन पालिसी की बैठक आयोजित हुई। शहर में सैनिटेशन पालिसी को लागू करने के पहले सर्वेक्षण का कार्य क्रिसिल नाम की संस्था कर रही है। सर्वेक्षण के नतीजों को फेडिंग जायका नामक जापानी संस्था कर रही है। संस्था ने राजधानी के 26 वार्डों के दो हजार घरों में बातचीत कर वृहद सर्वेक्षण किया और जो नतीजे सामने आए वो चौंकाने वाले हैं। सर्वेक्षण के नतीजों के अनुसार पक्के मकान में रहने वाले पांच से सात प्रतिशत लोग अभी भी खुले में शौच कर रहे हैं। घरेलू कचरे के सुरक्षित निस्तारण को लेकर भी लोग गंभीर नहीं हैं। लोगों के घरों में सेप्टिक टैंक तो हैं लेकिन उनकी सफाई तब तक नहीं होती जब तक वे ओवरफ्लो नही होते हैं। लोगों में शौच सफाई को लेकर भी जागरुकता का स्तर काफी नीचे है। राजधानी में बाहर से आने आबादी भी सफाई पर असर डालती है। सर्वे में एक राहत की बात भी रही। यहां जब लोगों से यह पूछा गया कि क्या वे कूड़ा उठाने के बदले में पैसा देंगे तो लोग इसके लिए तैयार दिखे। बैठक में इस बात पर भी चर्चा हुई क्या कूड़ा फैलाने वालों पर किसी तरह का जुर्माना लगाया जाए।

सिटी सैनिटेशन प्लान 32 लाख की आबादी के लिए बनाया जा रहा है। चूंकि राजाधानी का दायरा बढ़ रहा है इसलिए इसे लागू करने की तैयारियां की जा रही है। स्वच्छता नीति के लिए गुजरात और कर्नाटक का माडल अपनाया जाएगा। इस बैठक की अध्यक्षता महापौर दिनेश शर्मा ने की। बैठक में क्रिसिल के सदस्यों को छोड़कर टाटा कंसलटेंसी के जयंत कृष्णा, सुलभ इंटरनेशनल से वाई डी माथुर, गोमती नगर जल कल्याण समिति से वुकेशवर तिवारी, आक्सफेकम और वाटरएड के प्रोगाम आफिसर फारूख और जानसन, डूडा के परियोजना अधिकारी नगर निगम, जल निगम और जल संस्थान के अधिकारी मौजूद थे। कार्स

सिटी सैनिटेशन पालिसी की बैठक को संबोधित करते मेयर डा. दिनेश शर्मा।

Clipping B

Clipping A – The following clipping appeared in Hindustan Times on February 20th, 2011. It covers the facts related to the existing situation of Sanitation in Lucknow and suggestions as provided by the City Sanitation Task Force committee to improve the existing situation of Sanitation in the city.

Clipping B - The following clipping appeared in Jan Sandesh on February 20th, 2011. The article mentions on the existing situation and the overall process for the formulation of the City Sanitation Plan.

10.7 Annexure VII: JNNURM Projects

Approved Projects

Sewerage District I

This district is situated on the east side of Lucknow City and has one STP called Daulatganj Sewage Treatment Plant at Gaughat area. For treating wastewater, this STP uses a biological process called "Fluidised Aerobic Bio-reactor (FAB) Treatment Process" and the present design capacity is of 42 MLD. Wastewater flows into Nagaria, Gaughat, Sarkata and Pata Nalas. Nala flows are tapped, diverted and pumped to Daulatganj STP.

A new STP of 14 MLD to be constructed on FAB technology has been proposed to treat the sewage water. The combined capacity at Daulatganj will then be increased to 56 MLD. The total cost of the project is Rs. 236.23 crore.

There is a proposal to lay three trunk sewers namely Lakarmandi Sewer, Mushabag Sewer and Hardoi Road Trunk Sewer of size varying from 400mm to 1800mm in diameter. The outlet of the sewer will discharge the sewage into the sump at Daulatganj STP.

Sewerage District III Part I

This district is situated on the left bank of River Gomti, which is called Trans side. The Kukrial nala is the largest nala on the Trans Gomti side. This sewerage district is divided into two portions by Kukrail nala. The right portion is proposed as Part-I and left portion is proposed as Part-II. In order to facilitate the sewerage system, both parts will be independent.

The existing Trans Gomti Trunk Sewer (TGTS) is a brick sewer of 900mm diameter from Daliganj D/S. This sewer is 40 years old and is damaged and choked almost throughout its stretch. Moreover, it does not have sufficient hydraulic carrying capacity. Rehabilitation of this sewer line is not found to be a cost effective measure; hence, it is essential to replace the existing trunk sewer with a new RCC trunk sewer for a total length of 3500 metres.

Lucknow Development Authority and Housing Board are developing some residential colonies such as Aliganj, Jankipuram Vikash Nagar, Nirala Nagar. The sewer system has sufficient capacity to meet requirements till 2041 (the design period). All sewage collected from these sewer networks is discharged directly into Kukrail nala. Hence, it is proposed that the sewage be collected through the proposed trunk sewer under JNNURM.

Works sanctioned under Gomti Action Plan Phase-I and Phase-II have been incorporated and provisions for the remaining works have been made. The following sanctioned works are incorporated in the JNNURM works.

a. S.T.P. (Kakraha)

b. S.P.S. (Rooppur Khadra, Mohan Meakin, Daliganj U/S & D/S, TGPS, Kukrail etc.)

c. M.P.S. (Gwari)

d. Main Sewers (Maheshganj, Kedarnath, etc.)

This District-III (Part-I) shall consist of four separate sewerage zones, each with its own pumping stations as follows:-

a. Zone A – Mahesh Ganj Sewer, Rooppur Khadra sewage pumping station, Mohan Meakin Sewage Pumping Station, Daliganj U/S Sewage Pumping Station, and Daliganj D/S Sewage Pumping Station
b. Zone B - Trans Gomti Trunk Sewer and Trans Gomti Pumping Station
c. Zone C - Lonia Purwa Sewage Pumping Station
d. Zone D – Maha Nagar Sewer, Kalyanpur/Khurram Nagar Sewer, and Kukrail Sewage Pumping Station

Sewerage District III Part II

This district is on the left bank of River Gomti which is called Cis side. This District-III (Part-II) shall consist of two separate sewerage zones, each with its own pumping stations as follows:-

a. Zone E - Kukrail Nala interceptor left bank and Lekhraj sewage pumping station
b. Zone F - Gomti Nagar No. 1 sewer and Gomti Nagar No. 2 sewer, Gomti Nagar main sewer, Guari Main pumping station, and sewage treatment plant

Proposed Projects

Sewerage Projects for Districts II and IV

District II

This district is on the south side of Sharda Canal and, at present, the area has no sewage treatment plant. Though some areas have existing sewer networks developed by the Lucknow Development Authority (LDA); however, collected sewage is discharged into nalas. A large part of this area is occupied by low-density peri-urban settlements.

According to the DPR, it is proposed that each and every house of the city be connected by sewer system. It is proposed that three trunk sewers be laid, namely, Sarojani Nagar Sewer, Chilawan-Garaura Sewer and Trans Sharda Trunk Sewer of size varying from 1000mm to 2000mm diameter for an approximate length of 21.50 km. The outlet of the sewer will discharge the sewage into the sump at Khwajapur. Approximately 3160 km of branch sewer has been proposed to cater to the future population.

The ultimate capacity of the treatment plant proposed for the year 2040 is 108 MLD. A potential site has been identified near an area to the south/east of the Airport. The effluent could be discharged to the Sai River or to irrigation. The addition of maturation ponds to reduce faecal coliform counts would significantly increase the land requirements probably beyond the limits of land available. The effluent would then be chlorinated further, if land cannot be acquired for the maturation ponds.

District IV

This district is on the right bank of River Gomti, which is called the Cis Side, and includes the old city core with an old sewerage network. The main interceptor sewer named as Cis Gomti Trunk Sewer

runs parallel to the river along the west to east axis leading to Cis Gomti Pumping Station (CG Pumping Station) near Nishatganj Bridge. It receives city sewage through lateral collector sewers.

In the past, the sewage from CG Pumping Station used to be pumped through a rising main across Nishatganj Bridge to a sewage farm. The rising main coming from TG Pumping Station also joined the rising main from CGPS and the combined rising main conveyed the city sewage to the sewage farm for irrigation. At present, however, this system is defunct and the sewage farm also has become non-existent. Therefore, the sewage from CG Pumping Station goes directly into River Gomti.

The GH Canal is the largest drain on the Cis side and has wider sections and longer lengths. At present it serves as a storm water and wastewater drain for the city and carries a substantial amount of sullage. Two old trunk sewers run parallel to the GH Canal on both banks. These sewers, however, are now defunct.

The district, at present, has no sewage treatment plant. Under the GoAP the sewage from this district is proposed to be conveyed to the sanctioned sewage treatment plant at Kakraha. In the present JNNRUM project, a new sewage treatment plant has been proposed at Mastemau and all waste water of the Cis Gomti area are proposed to be conveyed to the Mastemau STP.

This district shall consist of four separate sewerage zones, each with its own pumping station or new sewer as follows:

a. Zone H: The core city area along River Gomti conveying sewage to existing CGPS
b. Zone I: The core city area to convey the sewage to the proposed new Cis Gomti Relief Sewer
c. Zone J: GH Canal area conveying sewage to sanctioned GH Canal PS
d. Zone K: Arjunganj-Telibagh area to convey sewage in to proposed new sewer along Sultanpur Road

Tentative Timeline and Implications of the project

The detailed project report has already been prepared and submitted for approval to the Government of India. The project has been passed by the state authorities, but is yet to be approved by GoI.

10.8 Annexure VIII: Reform Progress under JnNURM

The Jawaharlal Nehru National Urban Renewal Mission (JnNURM) is a key initiative of the Government of India to support urban development in the country. It is a seven-year-long, reform-linked grant programme initiated in the year 2005–06. Sixty-five cities[9] are covered under the programme and are being provided financial assistance to take up projects in the identified sectors. Assistance for investment in urban infrastructure is contingent upon the attainment of various mandatory and optional reforms by urban local bodies (ULBs) and the respective state governments. The thrust of JnNURM is to ensure improvement in urban governance and service delivery so that ULBs become financially sound and can undertake new programmes in a sustained manner. There are seven cities in UP which are covered under JnNURM (Agra, Allahabad, Mathura, Meerut, Varanasi , Kanpur and Lucknow) . The MoA were signed for all the ULBs in 2007 to commit to implementation of various reforms under JnNURM.

Lucknow Nagar Nigam has taken several steps since the beginning of JnNURM to implement the various reforms. The Reform agenda is broadly classified into three categories :

- **ULB LEVEL REFORMS**
- **STATE LEVEL REFORMS**
- **OPTIONAL LEVEL REFORMS**

The table given below highlights the progress of reforms under JnNURM as on Mar 2011

[9] ***A*** *Cities/UAs with 4 million plus population as per 2001 census - 07*
B *Cities/UAs with 1 million plus but less than 4 million population as per 2001 census - 28*
C *Selected cities/UAs (state capitals and other cities/UAs of religious/historical and tourist importance) - 30*

Table 43: Reform Progress under JnNURM (ULB Level Reforms)

No	Reform Committed	Target Date	Present Status	Progress as on Mar 2011
ULB Level Reforms				
1	E-Governance set up	2007-08	Partially Complete	LNN has undertaken several steps for implementation of e-governance. Some of the e-governance modules are fully complete these are Property tax, Accounting, Birth & Death Registration, and Citizens Grievance monitoring, Personnel Management System and Water Supply Utilities The other modules are under progress like Procurement & Monitoring of projects, Health programs are under Progress. LNN has collaborated with electronics department of UP Government to run E-suvidha center which is providing services such as online property tax payment, form downloading etc. SWM project is being developed on PPP basis and modules of SWM shall be developed by private sector developer.
2	Shift to Accrual based Double Entry Accounting	2009-10	Partially Complete	Accounting Manual is being prepared in line with the National Municipal Accounting Manual but needs to be approved by the State Government LNN has adopted the double entry system but still not implemented fully accrual-based accounting system. Only the day to day entries are done under the double entry accounting system. The ULB has prepared the opening balance sheet as on 01.04.2009 subject to issues regarding the valuation of assets.
3	Property Tax	2009-10	Under Progress	Lucknow Nagar Nigam had committed to complete GIS by 2009-10.The GIS survey and maps have been under preparation and completed for four zones. LNN has engaged a firm GEOCAD was in Jan 2009 to carry out the GIS Survey. Upon completion of this GIS database shall be integrated with other services also.

No	Reform Committed	Target Date	Present Status	Progress as on Mar 2011
4	100% Cost Recovery (Water Supply)	2009-10	Under Progress	With respect to core services such as water and sewerage, majority of the functions were with state government parastatals agency till Jan 2010. Recently, state has transferred the some of the functions such as O&M of water supply to ULB. On account of this, no proper systems to take care of all the issues such as service delivery improvement and new user charges structure at ULB level has been defined till date. Jal Sansthan has become part of LNN in February 2010 and currently LNN is taking the same user charges as Jal Sansthan used to take.
	100% Cost recovery (Solid Waste)	Not Committed	Under Progress	LNN has recently issued a government order to levy user charges for SWM from Rs 10 to Rs 50 per month for each household. The collection will be done by Private player and deposited into an Escrow account. The User charges shall be collected from May 2011.
5	Internal Earmarking of Funds for Services to Urban Poor	2007-08	Achieved	LNN has earmarked only Rs 14 crore from total development budget of Rs 57 crore. This indicates earmarking of 25% from development budget in 2010-11. However the accounting provisions still needs to be completed.
6	Provision of Basic Services to Urban Poor	2011-12	Under Progress	Jalkal department of LNN is responsible for water supply in municipal limits of the LNN. Approximately 1500 to 2000 stand posts have been established in slum area. Duration of water supply is 4 to 5 hours on daily basis in slum area. It was also indicated presently 40 water tankers are available with Jal kal department and which reaches within 2-3 hours as and when required. Average distance of stand post is 200 mt from households. Water supply project is being implemented by Jal Nigam. Service standards shall be improved upon completion of such projects.

No	Reform Committed	Target Date	Present Status	Progress as on Mar 2011
NO	REFORM COMMITTED	TARGET DATE	PRESENT STATUS	PROGRESS AS ON MAR 2011
State Level Reforms				
S1	74th CAA (Transfer 12 sch. Functions)	2011-12	Under Progress	14 out of 18 functions are with ULBs. 4 functions remain to be fully transferred to ULBs i.e. Fire services, Public Transport, Urban Planning and Building Regulation (for 106 ULBs) and Social and Economic Planning.
	74th CAA (Constitution of DPC and MPC)	2007-08 (DPC) 2011-12 (MPC)	Achieved	DPCs have been constituted and are functional MPC needs to be constituted.
S2	Transfer-City Planning Function	2011-12	Under Progress	Urban Planning and Building regulation functions continue to be with Development Authorities in 106 ULBs including all 7 UIG cities.
	Transfer-Water Supply & Sanitation	2008-09	Achieved	In Mar 2010, The Water Supply function has been transferred to the ULB.
S3	Reform in Rent Control	2009-10		Rent Control legislation already has enough provisions relating to protection mechanisms for landlord and tenant
S4	Stamp Duty rationalization to 5%	2009-10	Achieved	Stamp Duty reduced to 5%
S5	Repeal of ULCRA		Achieved	ULCRA has been repealed
S6	Enactment of Community Participation Law	2007-08	Achieved	Amendments to act made, Ward Committees are yet to be constituted
S7	Enactment of Public Disclosure Law	2007-08	Achieved	Amendments to act is made but LNN still needs to begin disclosing the information as per the act

No	Reform Committed	Target Date	Present Status	Progress as on Mar 2011
Optional Reforms				
O1	Introduction of Property Title Certification System in ULBs	2011-12		No initiative undertaken
O2	Revision of Building Bye laws – streamlining the Approval Process	2008-09		The GoUP revised the Building Byelaws in 2008 and the LDA adopted the byelaws in order to streamline the approval process.
O3	Revision of Building Bye laws – To make rain water harvesting mandatory		Achieved	GoUP has revised the Building Byelaws in 2008 and also issued GO in this regard. LDA adopted the byelaws in 2009. Rain water harvesting has been made mandatory for construction of building more than 300 sq. mt under this byelaw.
O4	Earmarking 25% developed land in all housing projects for EWS/LIG	2009-10	Achieved	Housing and Township policies have been amended to provide such reservation.
O5	Simplification of Legal and Procedural framework for conversion of agricultural land for non-agricultural purposes		Achieved	The process is simplified in UP for all the Urban Local Bodies
O6	Introduction of computerized process of Registration of land and Property	2009-10	Achieved	Land and property registration has been computerized
O7	Byelaws on Reuse of Recycled Water	2009-10	Achieved	GoUP adopted provisions related to Recycle/ Reuse of water as specified in National Building Code in Building Bylaws-2008 (Bhavan Upvidhi-2008). All Urban Development Authority adopted such Building Bylaws in 2008. Presently LDA is responsible for building plan

No	Reform Committed	Target Date	Present Status	Progress as on Mar 2011
				approval and overseeing the reuse of recycle water. Byelaws have been amended by all development authorities to include measures for reuse of recycled water
O8	Administrative Reforms	2008-09	Under Progress	GoUP constituted committee under the chairmanship of Director of Local Bodies in 2006 to establish norms for the Categorization, Up gradation, Reorganization and the Rationalization ion of the Human Resources in ULB. Govt of UP has created post such as accounting cadre, revenue cadre, IT cadre, environment engineer, city managers at each ULB level to build their capacity. Further staffing norms needs to be created at ULB level.
O9	Structural Reforms	2008-09	Under Progress	Decentralization of Zonal Offices has been completed. Six Zonal offices have been established. Administrative power except financial powers has been assigned to Zonal Officers. Core services such as sanitation, sewerage, property tax demand and collections are being maintained at Zonal Offices.
O10	Encouraging Public Private Participation	2009-10	Achieved	GoUP amended the UP Municipal Act, 1916 in September 2009 and empowered the ULBs to enter into PPP agreement with private sector to implement the Infrastructure projects and discharge the services. LNN has taken several projects under PPP like the In integrated SWM project.

Source : Quarterly Progress Report under JnNURM (Jan-Mar 2011)

10.9 Annexure IX: Zero Discharged Toilets

Conventional techniques for disposing human waste are built on the premise that the nutrients contained in human excreta have little value, and that waste is suitable only for disposal. Such techniques assume that the environment is capable of assimilating the waste, or they shift the burden to downstream communities. These assumptions lead to linear flows of resources and wastes. Consequently, the environment is polluted, nutrients are lost, and a wide array of health problems results. Conventional systems in fact have become the part of the problem, not the solution. Solution of the problems faced by the society today: water pollution, scarcity of fresh water and loss of soil fertility depends upon how society deals with its wastes, specifically how it deals with human excrement.

The other solution of conventional practices, generally pit latrines, has been widely adopted in developing countries, primarily because it is inexpensive and requires no infrastructure. Though material is not removed from the confined pits, they are prone to periodic flooding, causing them to spill their contents. Liquids may leach into the ground and eventually be carried off-site contaminating nearby wells and underground aquifers. This option also has shortcomings especially in densely populated areas where space is limited and is not feasible in areas with hard ground or high water tables.

An alternative to the present practice could be based on the wisdom of isolating the water bodies from human and animal excreta.

Concept:

The system is based on the wisdom of isolating the water bodies from human and animal excreta and recognizes the fact that human excreta and urine are valuable resources for supporting agriculture. The toilets are identical to those in conventional water borne system as these are the most acceptable and known to be hygienically safe. The collection and processing of the waste, however, is entirely different from the conventional system. The solid and liquid matters are separated underneath the toilet seat itself. The liquid is passed through a micro filter and recycled for flushing the toilet; thus avoiding the excessive use of fresh water for flushing while no compromise is made on using the required quantity of liquid for completely flushing the toilet pan. This ensures that the hygiene in the toilet is of the highest standard. The excess flush solution and the solid matter are evacuated and transferred for processing to obtain valuable solid and liquid fertilizer. Eco-friendly coloring substances and specially developed microbial cultures are used to control odor in the recycled flush solution and fecal slurry.

Components of the Toilet System:

The toilet system consists of the following components (Figure 1).

1 Superstructure: The superstructure is similar to the conventional toilets used in typical domestic settings.

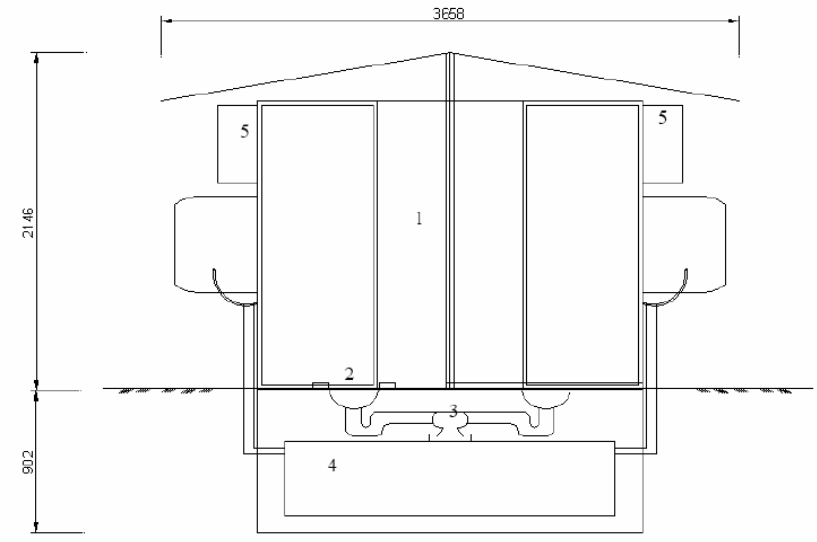
2 Toilet seat: The toilet seat could be either Indian or western style. The seat could be made of any material as per convenience. There is a water seal for odor control.

3 Solids-liquid separator: The separator is fixed below the toilet seat. The function of the separator is to separate the solids (feces) and the liquid (urine and water used for flushing and anal cleaning). The separator allows formation of a thin water film that adheres to the surface of the separator and flow outwardly while most of the solids move to the central portion and gravitate into the retention compartment of the Retention cum Polishing (RCP) tank. The solids gradually disintegrate to form slurry, which is then evacuated from the tank under gravity. The liquid is allowed to flow in the second compartment of the RCP tank.

4 Retention cum Polishing Tank (RCP Tank): The tank has three compartments and is fitted with a replaceable and easy to maintain micro-filtration devices to remove much of the suspended solids from the overflow of the solid-liquid separator. The clarified flush-water from the third compartment is then filled in the overhead tank for flushing either using motorized pump or hand pump.

5 Overhead tanks: There are two overhead tanks to hold fresh water and flush water. Both the tanks have separate plumbing fixtures. Fresh water is used only for anal cleaning and general cleanliness of the toilet premises.

Figure 28: Schematics of a typical pair of Zero Discharged Toilet System



Operation

At the commencement of the cycle pre determined amount of fresh water and flush solution is filled in both the tanks (the amount of water and flush solution is determined based on the cycle duration and number of persons using the toilet). Coloring substances and specially cultivated microbial cultures are added once in a day. The coloring substances and microbial cultures used are environment- friendly. The flush solution collected in the RCP tank is pumped back into the flush solution tank using motorized or hand pump; thus making the system a closed loop. The excess

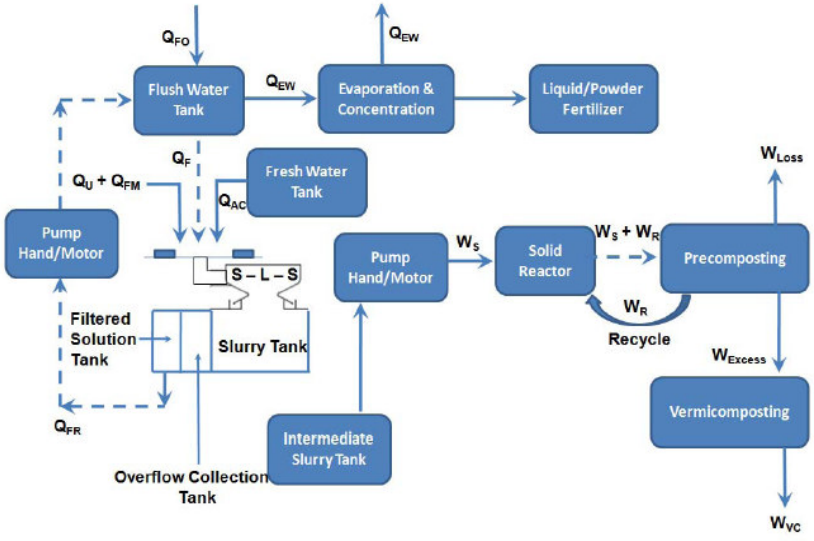
flush-water and fecal slurry are transferred and transported in sealed containers or through conduits to the humanure plant depending on the site conditions. The slurry and flush solution are processed at the humanure plant to obtain quality organic manure and powder/liquid fertilizers respectively.

Processing of Slurry: The slurry from the tank is first converted into a feed suitable for earthworms using aerobic activated pre-composting. Specially farmed earthworms convert the pre-composted fecal slurry into quality organic manure. The organic manure, which is cast of the earthworm, considered free from pathogens. The vermicast has been classified as quality manure by USEPA.

Processing of Flush Solution: The flush solution is allowed to evaporate in drying ponds. The water evaporates from the solution leaving the salts behind. After number of cycles of filling and drying the ponds contain a layer of salts which can be scrapped of. Another alternative is to produce the liquid fertilizer in the form of concentrated solution of NPK mixture. The flush solution may also be concentrated and dried using multi effect evaporator if availability of land is a constraint.

The flow diagram of the entire process and the layout of the toilet system are presented in Figures 2 and 3 respectively. A view of the toilet system is shown in Plate 4. The fecal slurry and excess flush solution are transferred using hand pump into covered containers which are then transported to the humanure plant. At the humanure plant the fecal slurry is mixed with the pre-compost in a cyclic manner, and after several cycles the pre-compost is vermicomposted to get quality organic manure. Figure 4 shows the photographs of transport of fecal slurry and the operations at the humanure plant to convert fecal slurry into quality organic manure.

Figure 29: Flow diagram for entire process for the Zero Discharge Toilets



Legend:

Q=Liquid flow rate (l/day); W=Solid flow rate (kg/day); S-L-S=Solid-Liquid Separator

Subscript Legend:

FO=Fresh water; F=Water flushed; AC=Water used for anal cleaning; U=Urine; FM=Fecal matter; FR=Flush water recycled; EW=Excess water removed for treatment; EV=Water evaporated; S=Slurry; R=Compost used for mixing; LOSS=Loss due to evaporation and decomposition; EXCESS=Excess precompost produced; VC=Vermi compost produced

Figure 30: Flow diagram for entire process (Zero Discharge Toilets)

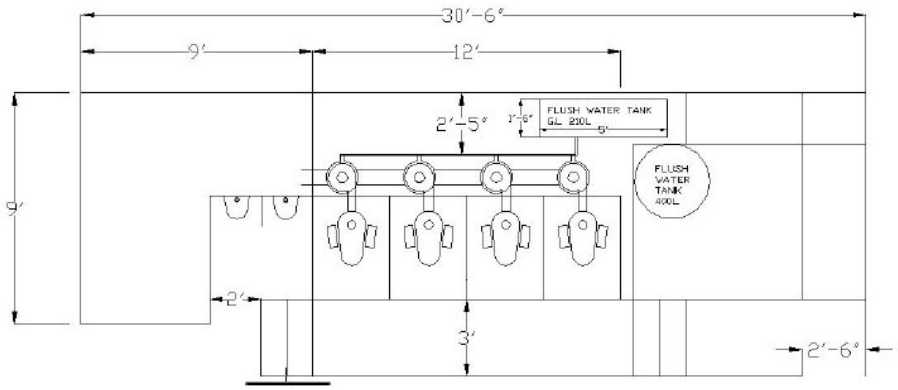


Figure 31: Pictorial representation of transport of fecal slurry and various operations at Humaure Plant

10.10 Annexure X: Manufactures and Suppliers list

10.10.1 Manufacturer and Supplier for Mobile Toilet Vans

Followings are some of the names of the manufactures / suppliers of SBR technology in India:

1. **IOTA Engineering Corporation**

   Contact details: IOTA Engineering Corporation, Opposite Plot No, 127 Udyog Vihar Phase-1, Daruhera Gurgaon -122016, Haryana, India, Email: iotain@yahoo.com, Phone: +919315873177, +919313011345, fax: +911165829754.

   IOTA Engineering Corporation in addition to MTV deals with the following machines used for sewer and sanitation management.

   Mobile Toilet Van, Chemical Toilets, Sewer cleaning machine (Power Bucket Type),High pressure jetting cum suction machine, Trailer mounted suction machine, Minijet sewer cleaning machine, Dumper placer, Sewer Rodding machine, Rickshaw Tipper, Manual sweeper, Road side open Drain cleaning machine, Refuse/Garbage compactor, Fogging machine, Water Tanker, Sewerage & Sanitation Equipments, Solid Waste Handling Equipments, Floor Cleaning Equipments, Chrmo-flex Sewer cleaning Rods, High Pressure jetting Hose, Garbage container, Dust Bins, Sewerage Disposal Pumps mounted on Trolley, Safety Equipments, Trailers on Trucks, Hydraulic Dumper placer, Hand Cart, Rickshaw Elevating plate form, Mobile Office, Carry away trolley of all size oil/water tankers, Solar Lights etc.

2. **Aarogya Exhibitors**

   Contact details: Aarogya Exhibitors, Shop No. 2, Mhada Complex, Nisarg Co-Operative Society, Gokhale Nagar, Pune, Maharashtra - 411 016, India, Phone: +912025673131, Mobile / Cell Phone: +919860008496/8600670707.

3. **Chopda Industries**

   Contact details: Chopda Industries, Chopda Hospital, Dindori Road, Panchvati, Nashik, Maharashtra - 422 003, India, Phone: +912532519209, Fax: +912532519209, Mobile / Cell Phone: +919823022209.

4. **Sriniwas Industries**

   Contact details: Sriniwas Industries, Flat No. 13, Shevanta Appartment, Sinhagad Road, Dhayari, Pune, Maharashtra - 411 041, India, Phone: +912332220121, Fax: +912332220121, Mobile +919665728874/9665728873.

5. **I. & C. Pt. Company**

   Contact details: I. & C. Pt. Company: No. 14/ 860, Basant Vihar, Near Mela Ground, Bahadurgarh, Haryana - 124 507, India, Fax: +911165829754, Mobile / Cell Phone: +919315873177/9313011345.

10.10.2 Manufacturer and Supplier of Sewer cleaning machines

1. **M K Tech Industries**

Contact details: M. K. Tech Industries, No. 1262, Baba Nagar, Opposite Uttam Factory, Meerut Road, Ghaziabad, Uttar Pradesh, India - 201 001, Phone: +911202723608, Fax: +911202704503, Mobile/Cell Phone: +919910706756/9810287768.

2. **Genesis Waste Handling Private Limited**

   Contact details: Genesis Waste Handling Private Limited, S-70/71, Loni Road, Industrial Area, Mohan Nagar, Sahibabad - 201 005, Uttar Pradesh, India, Phone: +911202658299, Mobile/Cell Phone: +919911569090/9818190759.

3. **IOTA Engineering Corporation**

   Contact details: IOTA Engineering Corporation, Opposite Plot No, 127 Udyog Vihar Phase-1, Daruhera Gurgaon -122016, Haryana, India, Email: iotain@yahoo.com, Phone: +919315873177, +919313011345, fax: +911165829754.

10.10.3 Manufacturer and Supplier for SBR technology used for tertiary treatment of wastewater

Followings are some of the names of the manufactures / suppliers of SBR technology in India:

1. **Ramky Infrastructure Limited**

   Contact details: Ramky House, Gulmohar Avenue, Rajbhawan Road, Samjiguda, Hyderabad - 500082, A.P., Email. info@ramky.com, Tel. 040 - 23310091

2. **M/s Jyoti Sales Corporation**

   Contact details: M/s Jyoti Sales Corporation, Sion, Kumbharwada 90 Feet Road, VLC No. 26, Dharavee, Mumbai – 400017, Tel. 022 – 24073047

3. **Triveni Engineering & Industries Limited**

Contact details: M/s Triveni Engineering & Industries Limited, 8th Floor, Express Trade Towers, Plot No. 15 and 16, Noida - 201301, Uttar Pradesh, Tel 0120-4308000

10.11 Annexure XI: Detail Implementation Plan for SWM for Lucknow

10.11.1 Integrated Municipal Solid Waste Management System

The contours of an integrated municipal solid waste management system are presented in the sections that follow. This system covers the entire supply chain of the waste material from primary storage to its ultimate disposal, interfaced with different sources of generation and stakeholders. The system has been developed keeping in consideration the inherent limitations of LNN, its experience from recent initiatives at the city level, experiences reported from across the country, and the ease with which LNN can aspire to achieve higher service levels over a reasonable period of time.

10.11.2 Coverage

It is recognised that an organic central part of Lucknow is called military cantonment where the permanent population is of the order of 2,50,000. In this area, solid waste management services are provided by the Lucknow Cantonment Board (LCB). It is understood that while the primary collection and transport services are effective, LCB does not have any facilities for treatment and disposal of solid waste. As a result, the solid waste from this area is found to be disposed off indiscriminately in 'low-lying' areas, endangering the environment and public health. In view of the associated health risks, **it is recommended that as a part of this integrated plan, LNN will establish an MOU with the LCB for lifting and transporting the collected waste from the latter's temporary dump sites and take it to its integrated Transfer and Disposal facility.**

Primary storage

With around 30% of the population of the city of Lucknow residing in low-income-like settlements, the community as a whole is characterised by a rather low level of awareness and concern, especially towards environment, aesthetics and public health. It is also recognised that civil society involvement in planning and delivery of municipal services is low. There are a few reliable/committed NGOs in the city which are working in the area of urban development and environmental conservation in general or solid waste management in particular. Capacity constraints and limitations of the LNN in community mobilisation and awareness creation are also well-recognised.

In view of this situation, promotion of the practice of source segregation, as mandated under the MSW Rules, 2000 from the outset will be an extremely challenging proposition. **It is therefore recommended that for a start, LNN will require residents and other categories of waste generators to at least store the waste at source in a single bin, and in return offer a reliable collection service** (It is noteworthy that LNN has achieved considerable success along these lines in selected areas where it has introduced a primary collection service in recent months with the help of a contractor). In due course of time, LNN will launch a sustained public awareness campaign and thereby attempt to motivate residents to take up source segregation. However, as stated earlier and as experienced over the last decade all over the country, segregation at the level of households, commercial establishments and institutions is extremely difficult to introduce and sustain over time and space (all the way to the landfill/treatment plant).

In order to address the issue of organic food waste to a certain extent, as indicated in the preceding section, **LNN will proactively promote the practice of 'Home Composting' among the willing households.** It will distribute robust composting bins at partial or full subsidy depending on resource availability. As a result of this interesting and simple initiative, scaled-up 'Home Composting' across LNN areas will help achieve compliance with the MSW Rules, 2000 to a considerable extent.

<u>Service Delivery</u>

The options available with LNN for service delivery for the promotion of 'Home Composting' are as follows:

- Create capacity within by training its Public Relations Officer or by employing a group of experienced and dedicated social workers (with Masters degree in social work) for awareness creation, community organisation, promotion, and for responding to queries by interested residents.
- Outsource the activity to a local committed NGO/contractor.
- Mandate the private service provider (PSP) who has been retained to provide the rest of the integrated solid waste management services.

The 'Home Composting' cell will be a part of the awareness creation section of the MSW management team. **Among others, LNN will set up a compost helpline to respond to queries and stock an adequate number of composting bins, and the supporting publicity material.**

10.11.3 Primary collection and secondary storage

Primary collection of waste from domestic, commercial, industrial and institutional sources and its secondary storage (temporary storage) at community waste depots (CWD) across Lucknow city will require different strategies depending on the layout of the respective areas, the relative locations of waste generators, average quantities of waste expected from each generator in a particular category, etc. The proposed strategy comprises a mix of motorised primary collection, manual collection through handcarts, and individual disposal at community waste depots.

The salient features of the system are as follows:

Door-to-door collection service

The system for door-to-door collection service will comprise the following:

- Seventy percent of the households will be covered by motorised primary collection service @ 1 vehicle per every 800 hh. This service will be provided primarily in localities which are not congested and are easily accessible.
- Thirty percent of the households will continue to be served through either a combination of handcarts and CWDs (community waste depots) or CWD alone. The service level will be @ 1 hand cart/200 households and 2.5 containers (of 4.5 cum each) for every 1000 households.
- The fleet of motorised vehicles and containers will have 20% stand-by capacity. For the initial four years, it will be augmented annually to achieve the desired service levels within a defined period. Subsequently, capacity will be increased once every five years in line with the population growth for maintaining the above specified service levels.

Community waste depots (CWD)

CWD will continue to be part of the system, though at a reduced level; CWD will comprise the following:

- All localities covered by a door-to-door collection service by handcarts will also be complemented by a system of community waste depots whereby closed metallic containers (of 4.5 cum capacity) shall be placed at a spacing of 500m. This will ensure that a person/municipal worker will not have to walk more than 250 m if she/he were to dispose off waste at a CWD.

- At all the CWD locations, aggregate storage capacity will be @ 2.5 containers (of 4.5 cum capacity)/1000 household which includes 100% stand-by.
- All areas covered under motorised primary collection will also have closed containers but at a higher spacing of 1000m.
- With the increasing efficiency of primary collection, LNN can decide to reduce the number of containers in such areas, gradually moving towards a 'bin-free' status.

Arrangements at all CWDs

- At all CWD locations, proper access for vehicles will be provided and the containers shall be placed on specially constructed concrete platforms.
- All unsightly fixed cement concrete structures constructed as receptacles for MSW will be demolished.

Collection from non-domestic sources

The system for collection of waste from a wide range of non-domestic sources, including bulk generators, will comprise the following:

- Waste from hotels, restaurants, marriage halls, community halls, etc. will be lifted daily by deploying a set of separate motorised primary collection vehicles in commercial areas. In mixed land use areas, same vehicles which serve households will also cover commercial establishments.
- All waste generators in commercial and industrial areas will be served through a combination of door-to-door collection service and conveniently placed closed containers.
- All sources characterised by bulk generation of putrefying waste like vegetable, fruit and flower markets; meat and fish markets; and temples and gurudwaras will be provided 4.5 cum containers at convenient locations. The number of containers will be determined for each such location and should be adequate corresponding to the estimated peak waste volumes/loads and also have 100% standby capacity. The frequency of lifting these containers will be at least once a day, which may be increased depending on the quantity of waste generated at the respective nodes.
- From all industries, large and small alike, non-industrial (non-process) waste will be collected through door-to-door service by deploying a separate set of motorised vehicles. In addition, after consultation with the respective industries, at least one closed container will be placed in each unit/establishment.

Replacements

Due to expected wear, tear and corrosion, timely replacement is a major feature of a good SWM system. According to the plan for LNN, all equipment and containers to be deployed for primary collection /secondary storage shall be replaced in full once every five years. Again, all vehicles deployed for motorised primary collection shall be replaced once every seven years.

Service delivery

The relevant options for service delivery for primary collection are as follows:

Motorised primary collection system

With regard to motorised and manual primary collection of waste, it is noted that LNN has already selected a large private operator for integrated solid waste management service across the city. The private operator is expected to evolve suitable models of engagement with the workers and the community. The tipping fee to be paid to the contractor is supposed to take care of the operation and maintenance cost of this function/ activity. LNN, on its part, through its sanitary inspectors will still be required to carry out supervision and monitoring of operations of the waste collectors and contractor.

10.11.4 Street sweeping and drain sweeping

Street sweeping and drain cleaning activities will continue to be carried out by the regular workers of the LNN as per the established beats for the existing hierarchy of roads and drains. They will be required to dispose off the collected waste (through a hand cart) into the nearest containers which will be placed along roadsides at the designated CWDs. In order to improve service levels, combinations of measures for personnel management are required to be taken:

- First and foremost, the municipal workers must be motivated and inspired by the department head to give better service. For instance, in Suryapet (AP), the Municipal Commissioner used to organise yoga camps for the workers and included a de-addiction programme to help them overcome the problem of alcoholism.
- A degree of discipline is required to be ensured.
- The municipal workers need to be offered appropriate incentives in the form of uniforms, personal protective equipment, annual rewards and recognition, etc.
- Monitoring and supervision by and Darogas is essential for higher performance.
- LNN should also consider community participation in monitoring of this service and in seeking its feedback on a regular (weekly/monthly) basis.

10.11.5 Secondary collection and transport

The salient features of the proposed system will be as follows:

- Waste collected by cycle-rickshaws and handcarts will be disposed off into closed containers to be installed at the designated CWDs. The containers will be lifted at least once a day by a dumper placer vehicle and transported to one of the two transfer stations.
- Waste from areas which are served through the motorised primary collection system will be transported to the transfer stations.
- Likewise, the containers to be installed in areas covered by motorised primary collection service will also be lifted and transported by the dumper placer vehicles to the transfer station. In view of the high population density and higher waste generation rates, the frequency of lifting shall be at least once a day. This can be increased to twice a day if the containers are found to be overflowing.
- At all commercial and institutional areas and all bulk generation locations, the containers will be lifted by the dumper placer vehicles in line with the expected waste loads.

Accordingly, the frequency of lifting in such areas will have to be fixed at more than once a day, ideally twice a day.

- The mode of secondary transport will depend on the distance to the transfer station/treatment and disposal facility and the economics of vehicle movement. Ideally, this should be carried out with the help of closed vehicles with large volumes between 9-13 cum, or with refuse compactor vehicles of 12-16 MT capacity.

Transfer station and long haul

Lucknow has a vast geographical spread of around 17,000 hectares. Considering the long distance to the treatment and disposal facility and travel within the city, **it is recommended that LNN evaluates the option of providing an adequate number of transfer stations at suitable locations** which will help economise the cost of long haul and improve the efficiency of operations. It is understood that LNN is proposing to construct two transfer stations to achieve this objective.

In view of the waste loads and distances involved, LNN will be required to deploy an adequate number of vehicles for long haul. This will comprise either compactor vehicles with 12-16 MT payload capacity or covered vehicles without compactors, but with large storage volume in the range of 14-19 cum.

Service delivery

As mentioned earlier, LNN has engaged a contractor for providing integrated solid waste management services for the city. Under this arrangement, the contractor has the responsibility of, among others, to transport waste from Community Waste Depots to the transfer stations and from there to the Sanitary Landfill Site. The contractor is expected to develop the zoning/routing plan and deploy its own manpower and vehicles of suitable type and in adequate numbers.

10.11.6 Waste treatment

Almost 30% of Lucknow's population resides in low-income/ rural settlements. However the socio-economic profile of the city is also characterised by strong commercial, institutional, and industrial sectors. It is a fast-growing city with a mixed demographic character -- low-income groups tend to dominate. Lower income levels have a direct correlation with the quality of domestic solid waste in terms of its organic, recyclable, and combustible contents. This aspect in turn puts a number of limitations on the options that can be considered for treatment of the mixed MSW.

The challenge of feedstock composition

Besides the food and yard waste (the major compostable fractions), typically, the urban mixed MSW, when it arrives at the treatment plant site is characterized by a high level of contamination due to the presence of, but not limited to, the following categories of wastes:

(a) House and road sweepings: dust, silt, sand, stones/debris, etc.

(b) Drain sludge: silt, sand, stones, etc.

(c) Small metallic matter: staples and metal pins, rejected blades, razors, etc.

(d) Glass and crockery: broken glass bottles, tube lights, bulbs, other glass objects, crockery, spoons, knives, etc.

(e) Plastics and rubber: a plethora of products made of high density, low density and linear-low density polyethylene, polypropylene, polyvinyl chloride, ABS, styrofoam, multilayer metal-coated packaging films, tyres, tubes, toys, etc.

(f) Heavy metals: diverse chemicals used in domestic, commercial, institutional sectors, batteries, etc.

(g) Rags/cloth, leather and paper

(h) Ceramics and terracotta: tea cups, tea pots, kulhars, other earthen wares/pots, etc.

(i) Sharps, needles, bandages used at the domestic level

(j) Human excreta: baby nappies, excreta of children and sick persons; sanitary napkins, etc.

(k) Discarded medicines: antibiotics, etc.

(l) E-waste: all type of discarded electronic gadgets

(m) Household chemicals used for cleaning, washing, disinfection, etc.

(n) Cattle waste, dead animals, slaughterhouse waste

(o) Combustion residues: ash, sand and fine earth from poor households and small restaurants, eateries, etc., which use coal and firewood as fuel

(p) Construction debris and demolition waste

(q) Hospital waste (a separate collection and treatment system is evolving)

(r) Industrial waste

In this context, it is extremely challenging, if not impossible to ensure that the above categories of waste do not mix with the compostable fraction (bio-degradable) produced at different categories of sources on a day-to-day basis. Moreover, it is recognized that the composition of the mixed waste keeps changing from day to day according to seasons, etc. For instance, in the monsoon, the waste will carry very high levels of moisture while in summer it generally carries relatively higher level of inerts, i.e., wind-blown dust, silt, sand, etc.

Because of such extreme diversity and variability, it is extremely difficult to carry out a separation of bio-degradable fraction from the rest of the mixed waste, manually or mechanically, with a degree of reliability in terms of potential contaminants. Further, the inert fractions and the rotting organic fraction adversely affect the processing equipment and machinery at the MSW treatment plant. For instance, the former causes severe wear and tear while the latter causes corrosion. These two factors lead to frequent breakdown of the equipment and eventually entail replacement (regular capex) in a much shorter span of time compared to a typical industrial plant.

Compost quality

Finally, from the point of view of an end-user like a farmer, the contaminants present in the form of inerts, glass dust, metal sharps, pathogens, heavy metals, antibiotics, etc. undermine the final quality of the compost and make it unsuitable for application on food crops. As a result, the compost derived from mixed MSW processing plants either gets low realization or low off-take, undermining its sustainability.

Lastly, it is recognised that the objective of treating mixed municipal solid waste is to reduce its volume and thereby minimise the land requirement for its eventual disposal into a sanitary landfill. Mixed MSW, as described in the preceding section, is not equivalent to reliable quality industrial feedstock. Therefore, whatever the method that is used for its treatment, it does not lead to value addition in the final product (e.g., compost, biogas, etc.) to such an extent that the investment (both in terms of the capex and opex) can pay for itself. This is evident from the closure of numerous MSW treatment plants across the country in the last two-three decades as well as from the closure of the biogas plant in Lucknow, which can be attributed to not just financial, but to a variety of inherent and external systemic factors.

Centralized composting

Notwithstanding the above, recognizing the large and rapidly growing waste quantities (1200 MT/day @ 3-5% pa) in the city and the fact that LNN has experienced difficulties in getting land for the SLF, waste treatment from the volume reduction point of view is considered to be necessary**. Given the large waste loads, a typical mechanized compost plant of about adequate capacity (800-1000 MT/d) is desirable.**

It is recommended that the compost plant be constructed alongside the SLF so that benefits in terms of logistics and operational integration can be achieved. Further, it is recommended that the plant be based on aerated static pile (ASP) technology which is an efficient version of the conventional windrow technology. ASP is a faster process because of externally induced aeration, so it will require lesser area and it will eliminate or minimize the problem of odour nuisance. It enables better control of the process and thereby superior product quality. ASP does not involve frequent turning of the waste piles/windrows and therefore its operation and maintenance cost is significantly lower than that of the windrow technology.

Decentralized treatment

The option of decentralized waste treatment, for example, community-level composting or biogas plants, has been experimented with in various cities by RWA, schools colonies, etc. **Although they sound appealing, but in view of the following issues and concerns which affect their initial set-up and undermine their operational sustainability, this paradigm of waste treatment is not recommended.**

- Problem of land availability and increasing cost of land in urban areas
- Issue of land use
- Concerns on potential odour nuisance and resistance from community
- Concerns on effective operation and maintenance of smaller facilities, availability of adequate funds, and skilled manpower

- Typical rapid decline in interest on the part of the community and general neglect of the treatment unit

'Home Composting': An ultimate decentralized format

Notwithstanding the above, **it is recommended that LNN promotes the practice of 'Home Composting' at the individual household level** for environmentally concerned and motivated citizens, which represents ultimate decentralized format for waste treatment. Salient features of the proposed system are as follows:

- The practice of **'Home Composting'** will be promoted among the willing households in low-density high-income habitations in the city and in plotted development areas. This represents the ultimate decentralization format and transfers the responsibility for proper O&M of the micro-operation to the concerned individual household.
- Since small waste quantities are involved at the individual household level, a composting bin has the least nuisance potential and represents one of the most effective tools of integrated waste management operations.
- LNN will offer appropriate incentive(s): (e.g., one-time rebate in Property tax, free or subsidized composting bins, etc.) to willing households to encourage them to adopt the practice of 'Home Composting' as a 'green hobby'.

Recycling centre

Adopting the 3R paradigm and creating some livelihood generation opportunities will involve the following:

- **LNN will facilitate the creation of recycling centres in different municipal zones for separate collection of potentially reusable and recyclable waste, e.g., paper, plastic, rubber, demolition waste, etc.**
- These centres will also collect, stock and safely dispose off hazardous waste generated in households, shops and establishments, institutions, etc.

Service delivery

At the outset, it is categorically defined that LNN will not consider waste treatment as a positive revenue-generating activity. All measures, as enumerated above, will be considered as efforts in the direction of volume reduction and thereby controlling the physical and environmental footprint of the sanitary landfill. Any possible revenue from such operations will be considered incidental and as a way of helping offset the overall operating costs. Relevant service delivery options which are available for LNN in the area of waste treatment, etc. are as follows:

Composting facility

The options for Operation & Maintenance of the composting facility are as follows:

- ***Option I:*** LNN sets up and runs the composting facility on its own. However, it may face difficulties in terms of finding suitable persons among its own low-rung workers, training

them, and marketing the finished compost. As a result, this option is not found to be really suitable.

- ***Option II:*** LNN engages a private operator for integrated operations. As mentioned earlier, it is noted that LNN has already entered into a 30-year contract with a private operator for integrated SMW operations; the operator will be responsible for among others, O&M of the compost plant, marketing of finished compost and safe disposal of rejects, etc. LNN has put in place an appropriate financial arrangement such that the operator is reimbursed all operating costs and has an incentive to sustain operations.

Home Composting

For distribution of composting bins and social marketing of the practice of 'Home Composting' among the residents of Lucknow, LNN or the contractor can explore the following options:

- Engage an external agency (NGO) or appoint a group of social workers to mobilize the existing community-based organization (CBOs) and create new ones, e.g., resident welfare associations in each locality, market associations, traders association, etc.
- The agency will be responsible for anchoring a sustained campaign on awareness creation and mobilizing community participation for, among others, municipal solid waste management, sanitation and other civic services.
- The agency will inform the public about all the initiatives that LNN will be taking to address the problem of MSW and the ways and means through which it will solicit their cooperation.
- The agency will carry out social marketing of municipal solid waste management services using the practice of 'Home Composting'/ 'Composting Bin' as a carrier of broader messages on environment and public health. It will encourage households to adopt this practice through locally improvised containers or it will distribute 'Composting Bins' of appropriate design and make, on behalf of LNN.

Recycling Centre

Operation of the Recycling Centre will be entrusted to 'self-help groups' of women / rag-pickers, i.e., a mix of semi-skilled and unskilled workers. The workers will be trained in sorting different grades of plastics and packaging material, domestic hazardous waste like batteries, discarded electronics, etc. For regular off-take of the sorted material, the centre will establish channels with potential end-users among industrial recyclers/re-processors.

<u>Financing of waste minimization efforts</u>

Salient features of the financing arrangements are as follows:

- LNN will commit to bear all operating costs under annual contracts/MoUs to be entered with all the service providers in its endeavor to minimize waste loads through different routes.
- LNN will provide either full or partial subsidy towards the cost of the 'Composting Bin'.
- LNN will facilitate the creation of recycling centres in terms of land, building construction, essential services, etc., and bear all costs of operation.

10.11.7 Waste disposal

LNN gives the highest priority to safeguarding public health and therefore until such time when the treatment operations get commissioned, it will dispose off all the mixed MSW into a sanitary landfill site (SLF). As described at the outset of this chapter, the SLF will serve as the bedrock for the entire city waste management system and will offer correspondingly appropriate capacity and life span for long-term safe disposal of the waste under all circumstances and seasons.

However, as elaborated in the preceding section, LNN will simultaneously implement all the other necessary measures at the city and community levels for minimising waste loads destined to the SLF. By adopting this strategy, LNN, over time, will aspire to comply with the MSW Rules, 2000 in terms of organic fraction in the latter.

LNN will develop a sanitary landfill site offering backend integration with the compost plant such that the rejects and excess waste or waste during plant shutdown can be easily transferred for safe disposal. The SLF will be designed for a period of about 20-30 years so that the integrated SWM operations in the city can be performed with a fair degree of reliability. In this respect, LNN must ensure availability of the required area of contiguous land with proper access roads, buffer zone for plantation, etc.

Service delivery

Sanitary Landill Operation and Management (SLOM) involves on a sustained basis waste reception, inspection, movement, compaction to a desirable density, provision of daily and intermediate soil covers, cell closures, leachate management (collection, treatment and disposal), landfill gas management (collection and disposal – venting or flaring), runoff control, trash/litter control, maintenance of green belt, routine environmental monitoring of surface and ground water and ambient air quality, etc. These are specialized operations; in a typical municipal set-up, the required capacity and capability is generally not available. In recognition of these limitations, LNN has already engaged a large contractor which is expected to deliver the above-mentioned services satisfactorily.

10.12 Annexure XII: IEC Needs Assessment

10.12.1 General Households by Different Zones of Lucknow

	Indicators	Zone-1	Zone-2	Zone-3	Zone-4	Zone-5	Zone-6	Overall
		% of HH	% of HH	% of HH	% of HH	% of HH	% of HH	% of HH
	Total no. of samples	**179**	**126**	**170**	**178**	**170**	**265**	**1088**
	Sanitation							
1	Unsafe disposal of liquid waste*							
1a.	Open defecation	2.23	1.59	8.24	2.25	13.53	3.40	5.15
1b.	Toilet connected to open drains	3.91	4.76	1.18	1.12	1.18	5.28	3.03
1c.	Manual removal of sludge from septic tanks; unsafe disposal of sludge	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**6.15**	**6.35**	**9.41**	**3.37**	**14.71**	**8.68**	**8.18**
	No. of HH who clean septic tank only on overflow	3.91	0.00	32.35	29.78	5.88	7.17	13.24
2	Revealed preference for sanitation among those not connected to UGD	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2a.	Don't know	14.53	0.79	18.24	0.00	28.82	24.53	15.81
2b.	Low Cost Sanitation	0.56	15.08	9.41	10.67	3.53	7.55	7.44
2c.	Septic tank	0.00	0.79	33.53	0.56	0.59	7.17	7.26
2d.	Toilet with UGD Connection	2.23	6.35	4.12	35.39	55.29	31.32	23.81
	Total	**17.32**	**23.02**	**65.29**	**46.63**	**88.24**	**70.57**	**54.32**

	Indicators	Zone-1	Zone-2	Zone-3	Zone-4	Zone-5	Zone-6	Overall
3	**Willingness to Pay for improved sanitation services**	**3.91**	**50.00**	**40.59**	**91.01**	**72.94**	**56.98**	**52.94**
	Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	**Willingness to pay for water**	**18.99**	**48.41**	**61.18**	**60.11**	**67.65**	**58.87**	**53.03**
	Solid Waste Management	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	No. disposing solid waste in open spaces	34.64	69.84	47.65	42.70	3.53	49.06	40.72
7	No. practicing waste segregation	2.23	0.79	0.59	0.00	1.18	1.13	1.01
8	No. willing to do waste segregation	5.59	7.14	17.06	1.12	40.59	34.34	19.30
9	Willing to pay for improved SWM	6.70	31.75	49.41	65.73	58.24	46.04	43.57
	Health and hygiene:	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	Washing hands before eating	100.00	99.21	100.00	100.00	100.00	100.00	99.91
11	Washing hands with soap and water after going to toilet	100.00	100.00	100.00	100.00	100.00	99.62	99.91
12	Washing hands with only water after going to toilet	0.00	0.00	0.00	0.00	0.00	0.38	0.09
13	Using boiled drinking water	1.12	9.52	6.47	2.25	1.18	3.77	3.77
14	Purifying drinking water through aqua guard/ uv filter	12.85	11.11	4.12	4.49	0.59	3.02	5.61
15	Awareness about ongoing infrastructure projects	3.91	7.94	29.41	56.18	17.06	40.00	27.76
	Source: Primary Survey							

10.12.2 General Households by level of Education in Lucknow

	Indicators	Illiterate	Primary - (1st to 5th)	Middle- (6th to 8th)	Secondary & Higher Secondary (9th to 12th)	Graduation	Post-graduation	Overall
		% of HH	% of HH	% of HH	% of HH	% of HH	% of HH	% of HH
		150	**43**	**218**	**317**	**279**	**81**	**1088**
	Sanitation							
1	Unsafe disposal of liquid waste*							
1a.	Open defecation	20.67	2.33	0.00	3.79	2.87	4.94	5.15
1b.	Toilet connected to open drains	12.67	2.33	0.00	1.89	1.79	2.47	3.03
1c.	Manual removal of sludge from septic tanks; unsafe disposal of sludge	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	33.33	4.65	0.00	5.68	4.66	7.41	8.18
2	Revealed preference for sanitation (among those not connected to UGD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2a.	Don’t know	22.00	16.28	23.39	15.46	8.96	8.64	15.81
2b.	Low Cost Sanitation	12.00	4.65	4.59	6.62	8.24	8.64	7.44
2c.	Septic tank	6.67	0.00	5.05	5.05	13.98	3.70	7.26
2d.	Toilet with UGD Connection	26.67	20.93	31.19	22.08	17.56	28.40	23.81
	Total	67.33	41.86	64.22	49.21	48.75	49.38	54.32

	Indicators	Illiterate	Primary - (1st to 5th)	Middle- (6th to 8th)	Secondary & Higher Secondary (9th to 12th)	Graduation	Post-graduation	Overall
3	No. of households who clean septic tanks only when it overflows	10.67	9.30	13.30	12.93	16.85	8.64	13.24
4	Willingness to Pay for improved sanitation services	47.33	51.16	53.67	47.95	58.42	62.96	52.94
	Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Willingness to pay for water	33.33	76.74	59.63	53.63	54.12	53.09	53.03
	Solid Waste Management	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	No. disposing solid waste in open spaces	0.67	62.79	56.42	47.00	39.43	40.74	40.72
7	No. practicing waste segregation	0.67	0.00	0.00	0.63	1.43	4.94	1.01
8	No. willing to do waste segregation	26.00	18.60	23.85	17.67	13.62	20.99	19.30
9	Willing to pay for improved SWM	32.67	32.56	45.41	44.48	49.10	41.98	43.57
	Health and hygiene	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	Washing hands before eating	99.33	100.00	100.00	100.00	100.00	100.00	99.91
11	Washing hands with soap and water after going to toilet	99.33	100.00	99.54	100.00	100.00	100.00	99.82
12	Washing hands with only water after going to toilet	0.00	0.00	0.46	0.00	0.00	0.00	0.09
13	Using boiled drinking water	4.00	9.30	3.67	4.42	2.87	1.23	3.77
14	Purifying drinking water through	0.00	20.93	5.50	5.05	3.94	16.05	5.61

	Indicators	Illiterate	Primary - (1st to 5th)	Middle- (6th to 8th)	Secondary & Higher Secondary (9th to 12th)	Graduation	Post-graduation	Overall
	aquaguard/ uv filter							
15	Awareness about ongoing infrastructure projects	32	18.60	22.48	24.61	38.71	33.33	27.76

** Note: Under unsafe disposal of solid waste, fill 1a. Households practicing open defecation, 2a. Households who have connected toilets to open drains, and 3a. Households cleaning septic tanks with private safai kamdar.*

10.12.3 Slum Households by different zones of Lucknow

	Indicators	Zone-1	Zone-2	Zone-3	Zone-4	Zone-5	Zone-6	Overall
		% of HH	% of HH	% of HH	% of HH	% of HH	% of HH	% of HH
	Total no. of samples	**90**	**85**	**85**	**82**	**82**	**117**	**541**
	Sanitation							
1	Unsafe disposal of liquid waste*							
1a.	Open defecation	16.67	29.41	5.88	36.59	7.32	2.56	15.53
1b.	Toilet connected to open drains	5.56	3.53	9.41	1.22	1.22	5.98	4.62
1c.	Manual removal of sludge from septic tanks; unsafe disposal of sludge	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**22.22**	**32.94**	**15.29**	**37.80**	**8.54**	**8.55**	**20.15**
2	Revealed preference for sanitation (among those not connected to UGD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2a.	Don't know	11.11	4.71	38.82	14.63	53.66	63.25	32.72

	Indicators	Zone-1	Zone-2	Zone-3	Zone-4	Zone-5	Zone-6	Overall
2b.	Low Cost Sanitation	6.67	12.94	1.18	23.17	2.44	0.00	7.21
2c.	Septic tank	4.44	9.41	4.71	18.29	0.00	3.42	6.47
2d.	Toilet with UGD Connection	11.11	16.47	20.00	18.29	28.05	0.85	14.79
	Total	33.33	43.53	64.71	74.39	84.15	67.52	61.18
3	No. of households who clean septic tanks only when it overflows	8.89	3.53	40.00	18.29	39.02	39.32	25.51
4	Willingness to Pay for improved sanitation services	54.44	57.65	31.76	50.00	48.78	65.81	52.31
	Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Willingness to pay for water	40.00	24.71	45.88	10.98	69.51	47.86	40.30
	Solid Waste Management	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	No. disposing solid waste in open spaces	55.56	60.00	48.24	92.68	96.34	80.34	72.27
7	No. practicing waste segregation	2.22	1.18	3.53	1.22	9.76	7.69	4.44
8	No. willing to do waste segregation	20.00	17.65	18.82	18.29	41.46	7.69	19.78
9	Willing to pay for improved SWM	60.00	45.88	67.06	32.93	82.93	52.99	56.75
	Health and hygiene:	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	Washing hands before eating	92.22	92.94	94.12	91.46	93.90	83.76	90.94
11	Washing hands with soap and water after going to toilet	92.22	92.94	94.12	91.46	93.90	83.76	90.94
12	Washing hands with only water after going to toilet	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	Using boiled drinking water	7.78	14.12	11.76	18.29	15.85	7.69	12.20
14	Purifying drinking water through aquaguard/ uv filter	6.67	3.53	4.71	4.88	6.10	3.42	4.81

	Indicators	Zone-1	Zone-2	Zone-3	Zone-4	Zone-5	Zone-6	Overall
15	Awareness about ongoing infrastructure projects	25.56	24.71	25.88	31.71	9.76	4.27	19.41
Source: Primary Survey								

10.12.4 Slum Households by level of education in Lucknow

	Indicators	Illiterate	Primary - (1st to 5th)	Middle- (6th to 8th)	Secondary & Higher Secondary (9th to 12th)	Graduation	Post-graduation	Overall
		% of HHs	% of HHs	% of HHs	% of HHs	% of HHs	% of HHs	% of HHs
		149	**68**	**120**		**74**	**3**	**414**
	Sanitation							
1	Unsafe disposal of liquid waste*							
1a.	**Open defecation**	**32.89**	**22.06**	**11.67**	**2.36**	**2.70**	**33.33**	**15.53**
1b.	Toilet connected to open drains	2.01	7.35	9.17	3.94	1.35	0.00	4.62
1c.	Manual removal of sludge from septic tanks; unsafe disposal of sludge	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	34.90	29.41	20.83	6.30	4.05	33.33	20.15
2	Revealed preference for sanitation (among those not connected to UGD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2a.	Don't know	30.87	29.41	27.50	35.43	43.24	33.33	32.72

	Indicators	Illiterate	Primary - (1st to 5th)	Middle- (6th to 8th)	Secondary & Higher Secondary (9th to 12th)	Graduation	Post-graduation	Overall
2b.	Low Cost Sanitation	16.11	2.94	5.83	0.00	8.11	0.00	7.21
2c.	Septic tank	6.71	7.35	7.50	5.51	4.05	33.33	6.47
2d.	Toilet with UGD Connection	17.45	20.59	16.67	9.45	10.81	0.00	14.79
	Total	71.14	60.29	57.50	50.39	66.22	66.67	61.18
3	No. of households who clean septic tanks only when it overflows	18.79	17.65	29.17	26.77	39.19	0.00	25.51
4	Willingness to Pay for improved sanitation services	48.99	36.76	62.50	55.12	63.51	100.00	54.16
	Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Willingness to pay for water	28.19	38.24	44.17	41.73	55.41	100.00	40.30
	Solid Waste Management	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	No. disposing solid waste in open spaces	80.54	60.29	75.83	70.08	63.51	100.00	72.27
7	No. practicing waste segregation	2.68	2.94	5.83	3.94	8.11	0.00	4.44
8	No. willing to do waste segregation	20.13	11.76	20.00	20.47	25.68	0.00	19.78
9	Willing to pay for improved SWM	48.32	50.00	60.83	54.33	75.68	100.00	56.75
	Health and hygiene:	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	Indicators	Illiterate	Primary - (1st to 5th)	Middle- (6th to 8th)	Secondary & Higher Secondary (9th to 12th)	Graduation	Post-graduation	Overall
10	Washing hands before eating	93.29	88.24	91.67	91.34	86.49	100.00	90.94
11	Washing hands with soap and water after going to toilet	93.29	88.24	91.67	91.34	86.49	100.00	90.94
12	Washing hands with only water after going to toilet	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	Using boiled drinking water	6.04	25.00	13.33	12.60	10.81	0.00	12.20
14	Purifying drinking water through aquaguard/ uv filter	1.34	4.41	3.33	6.30	10.81	33.33	4.81
15	Awareness about ongoing infrastructure projects	12.75	7.35	26.67	21.26	29.73	0.00	19.41

Source: Primary Survey

10.12.5 Hospitals

	Indicators	
		% of hospitals
	Total no. of samples	**13**
	Sanitation	0
1	Unsafe disposal of liquid waste*	
1a.	Toilet connected to open drains	0
1b.	Manual removal of sludge from septic tanks; unsafe disposal of sludge	0
	Total	0
2	Willingness to Pay for improved sanitation services	7.69
	Water	0.00
3	Willingness to pay for water	15.38
	Solid Waste Management	0.00
4	No. of hospitals mixing hospital waste with municipal waste	23.08
5	Disposing hospital waste in open spaces	7.69
6	Willingness to pay for improved SWM	0.00
7	Awareness about ongoing infrastructure projects	23.08
	Note: Includes hospitals not connected to UGD or those where septic tanks are manually cleaned	

10.12.6 Industries

	Indicators	
		% of industries
	Total no. of samples	**50**
	Sanitation	**0**
1	Unsafe disposal of liquid waste*	**0**
1a.	Open defecation	10.00
1b.	Toilet connected to open drains	0.00
1c.	Manual removal of sludge from septic tanks; unsafe disposal of sludge	0.00
	Total	0.00
	No. of units without any toilets	10.00
2	Willingness to Pay for improved sanitation services	0.00
	Water	0.00

	Indicators	
3	Willingness to pay for water	2.00
	Solid Waste Management	0.00
4	No. of industries disposing industrial waste in open spaces (disposal practice of industrial waste)	82.00
5	No. of industries mixing industrial waste with municipal waste (storage of waste)	100.00
6	Awareness about ongoing infrastructure projects	2.00

10.12.7 Institutions

	Indicators	
		% of institutions
	Total no. of samples	**30**
	Sanitation	
1	Unsafe disposal of liquid waste*	
1b.	Toilet connected to open drains	0
1c.	Manual removal of sludge from septic tanks; unsafe disposal of sludge	0
	Total	0
2	Revealed preference for sanitation (among those not connected to UGD)	0
2a.	Don't know	3.33
2b.	Low Cost Sanitation	0
2c.	Septic tank	0
2d.	Toilet with UGD Connection	3.33
	Total	0.00
3	Willingness to Pay for improved sanitation services	6.67
	Water	0.00
4	Willingness to pay for water	6.67
	Solid Waste Management	0.00
5	Disposing solid waste in open spaces	16.67
6	Practicing waste segregation	3.33
7	Willing to pay for improved SWM	6.67
8	Awareness about ongoing infrastructure projects	20.00
	** Note: Under unsafe disposal of solid waste pl. include 1a. Those households practicing open defecation, 2a. Those households who have connected toilets to open drains, and 3a. Those who clean*	

	Indicators	
	the septic tanks with private safai kamdar.	

10.12.8 Institutions

	Indicators	
		% of Commercial Units
	Total no. of samples	**84**
	Sanitation	0
1	Unsafe disposal of liquid waste*	0
1a.	Toilet connected to open drains	0
1b.	Manual removal of sludge from septic tanks; unsafe disposal of sludge	0
	Total	0
2	Revealed preference for sanitation (among those not connected to UGD)	0.00
2a.	Don't know	0.00
2b.	Low Cost Sanitation	10.71
2c.	Septic tank	0.00
2d.	Toilet with UGD Connection	22.62
	Total	0.00
3	No. of units without any toilets	33.33
4	Willingness to Pay for improved sanitation services	0.00
	Water	0.00
5	Willingness to pay for water	11.90
	Solid Waste Management	0.00
6	Disposing solid waste in open spaces	8.33
7	Practicing waste segregation	10.71
8	Willing to pay for improved SWM	2.38
9	Awareness about ongoing infrastructure projects	0.00

10.13 Annexure XIII: ILCS Scheme

Eligibility

a. The scheme is on 'All Town' coverage basis.

b. The proposal can be submitted by the urban local body (ULB) or organizations like Housing Board, Slum Clearance Board, Development Authority, Improvement Trust, Water Supply and Sewerage Board, Cantonment Board, etc. duly authorized by the State Government to the State Urban Development Authority for undertaking the programme.

c. The concerned ULB/ organization is required s to give an undertaking prohibiting dry latrines in the towns thereafter.

The States should select NGOs having adequate experience in this field that will be funded maximum to the extent of 15% over and above the total project cost to be borne by the Centre and States based on the ratio of 5:1 at different stages of implementation. Further, NGOs will be required to conduct a survey for identification of beneficiaries and the ULBs will finalize the list of beneficiaries on the basis of the survey to be conducted within a year. NGOs will also issue biometric photo identity cards, look after operation and maintenance of the converted units, and organize training / seminars for preparation of project reports and estimates by ULB/Development Authorities (DAs) after ensuring willingness of identified beneficiaries.

Financing Pattern

The scheme will be funded in the following manner:

a. Central Subsidy 75%, State Subsidy 15% and beneficiary share10%.

   The second instalment of Government of India subsidy portion (i.e. with reference to total funds earmarked for a given State/UT) will only be released after the State's share for the first instalment has been released. The subsidy will be released by Central Government directly. The funds will be released to State Urban Development Agency (SUDA), District Urban Development Agency (DUDA) or any other agency designated by the State Government. The services of the NGOs and community extension units of the municipalities selected for Urban Basic Services programme could also be utilized for motivating the community and for technical help.

b. The upper ceiling cost of Rs. 10,000/- may be fixed for the complete unit of a two pit pour flush individual latrine with superstructure (excluding States falling in difficult / hilly areas). For the States falling in the category of difficult and hilly areas, 25% extra cost may be provided for each two pit pour flush latrine. In other words, in States falling in the category of difficult and hilly areas, the upper ceiling cost will be Rs. 12,500/- for one complete LCS Unit.

c. 1% of total central allocation may be retained by the Ministry every year, to be utilized for MIS, Monitoring System, Capacity Building and IEC components. The IEC funds could be utilized for creation of awareness amongst the public on the advantages of using sanitary latrines, hygiene education in schools and colleges and Nehru Yuvak Kendras and Chetna Sanghs for non-student youth, carrying out surveys, news paper advertisements and mid term evaluation studies etc. States may also utilize or keep aside 1% of their allocation under this scheme for MIS, Monitoring System, Capacity Building and IEC components. The funds retained, if not utilized may be made available for ILCS projects. The IEC component may also include expenditure on field visits by the Ministry officials for better coordination with State

Governments/ Implementing agencies, outsourcing of manpower for speedy and effective implementation.

d. The Ministry will develop an IT enabled MIS and Monitoring System and similar systems will be created at the State & ULB level out of 1% earmarked for this purpose. MIS & Monitoring through quarterly Progress Reports along with Utilization Certificates which will ensure smooth release of subsequent instalment of funds.

Implementation

The scheme will be implemented by the Ministry of Housing and Urban Poverty Alleviation directly. First instalment of Government of India subsidy will be sanctioned along with signing of Grant Agreement subject to the condition that actual release of central subsidy will be made in 2 instalments related to actual demand of implementing agencies on their utilization capacity and field level demand. 25% of the subsidy will be released immediately after approval of the scheme.

The ULBs or the state agencies designated/ selected by the State Governments may send their proposals to the State Government, who after approval of the proposals by the State Coordination Committee will forward the same to the Regional Offices of HUDCO. Regional Offices of HUDCO after appraisal of the same will send the same to the HUDCO Headquarters. HUDCO Headquarters will scrutinize the proposals and send them to the Central Coordination Committee.

Central Coordination Committee

The implementation of the Scheme will involve the following stages:

a. Identification of beneficiaries for conversion of dry latrines in the State by the Local Bodies.

b. Proposals for conversion of dry latrines and construction of new latrines in the ratio of 75:25 will be submitted by the Urban Local Bodies to the State Urban Development Authority (SUDA)/ District Urban Development Authority. They will be discussed, approved and prioritized by the State Coordination Committee.

c. Submission of viable projects by the States to the Regional Offices of the HUDCO.

d. Appraisal of the projects by the Regional Offices of HUDCO and submit the same to the HUDCO Headquarters.

e. HUDCO Headquarters will scrutinize the project proposals and submit for consideration of the Central Coordination Committee of the Ministry.

f. The Coordination Committee in the Ministry of Housing and Urban Poverty Alleviation will be constituted under the chairmanship of Secretary (HUPA). The other members of the Committee will be representative from the Ministry of Social Justice & Empowerment, Central Public Health Environment and Engineering Organization (CPHEEO), HUDCO and concerned State's representatives.

g. The role of the Central Coordination Committee will be to consider the proposals submitted by the HUDCO and release of funds.

h. The Central Coordination Committee will meet at least once in every quarter of the year to have an overall review.

i. HUDCO will ensure appraisal of projects and monitor the implementation of the Scheme through its regional offices.

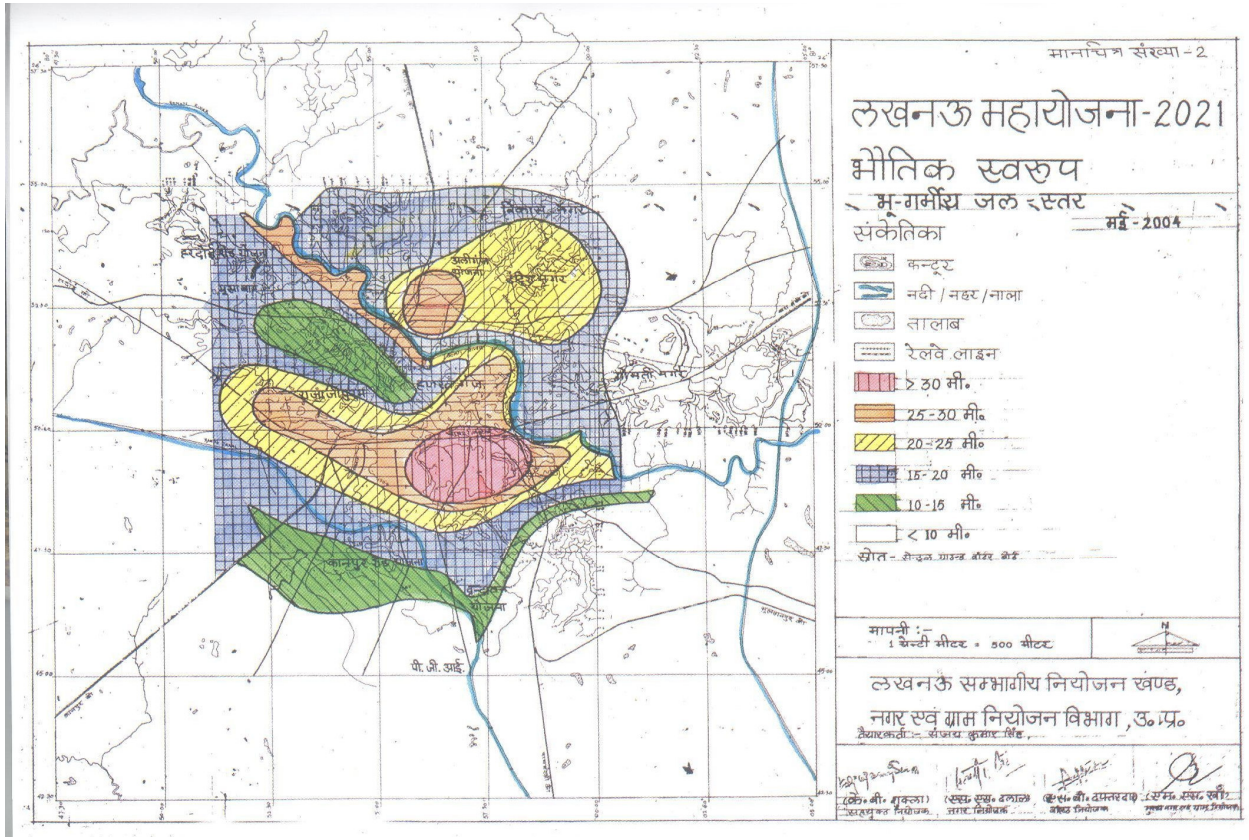
State Coordination Committee

Every State shall constitute a State Coordination Committee comprising of the representatives of Regional Office of HUDCO of the concerned departments of the State including the department dealing with social welfare to approve the project proposals at the state level and monitor the actual implementation including eradication of manual scavenging. The Committee will also ensure that the implementation of the scheme does not involve any cost and time over runs and strict monitoring of the same takes place at the State and Local level Bodies also.

In nutshell, LNN can obtain the maximum benefit from the ILCS scheme and provide individual toilets to EWS households.

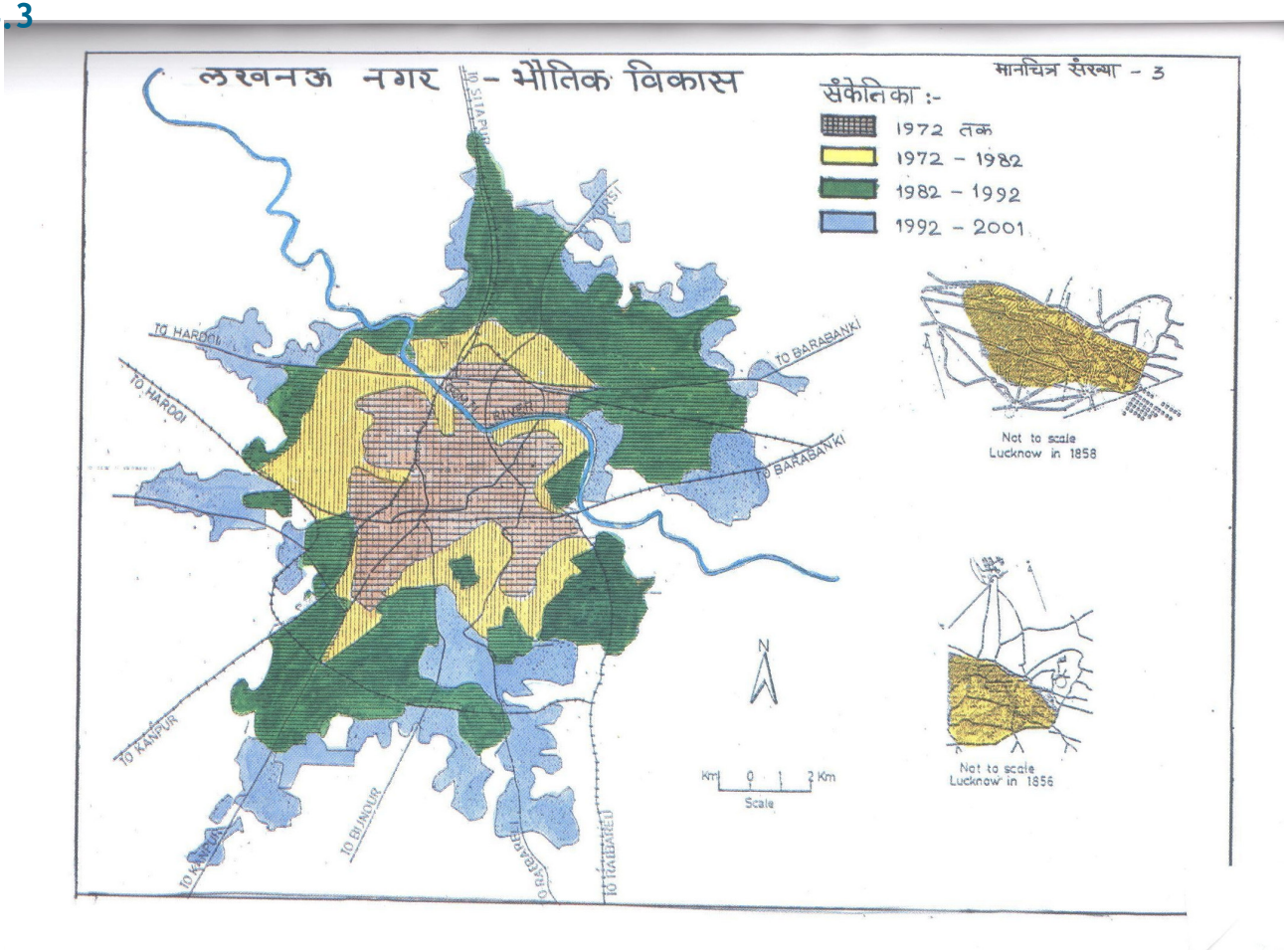
10.14 Annexure XIV: Maps

10.14.1 Master Plan for Lucknow

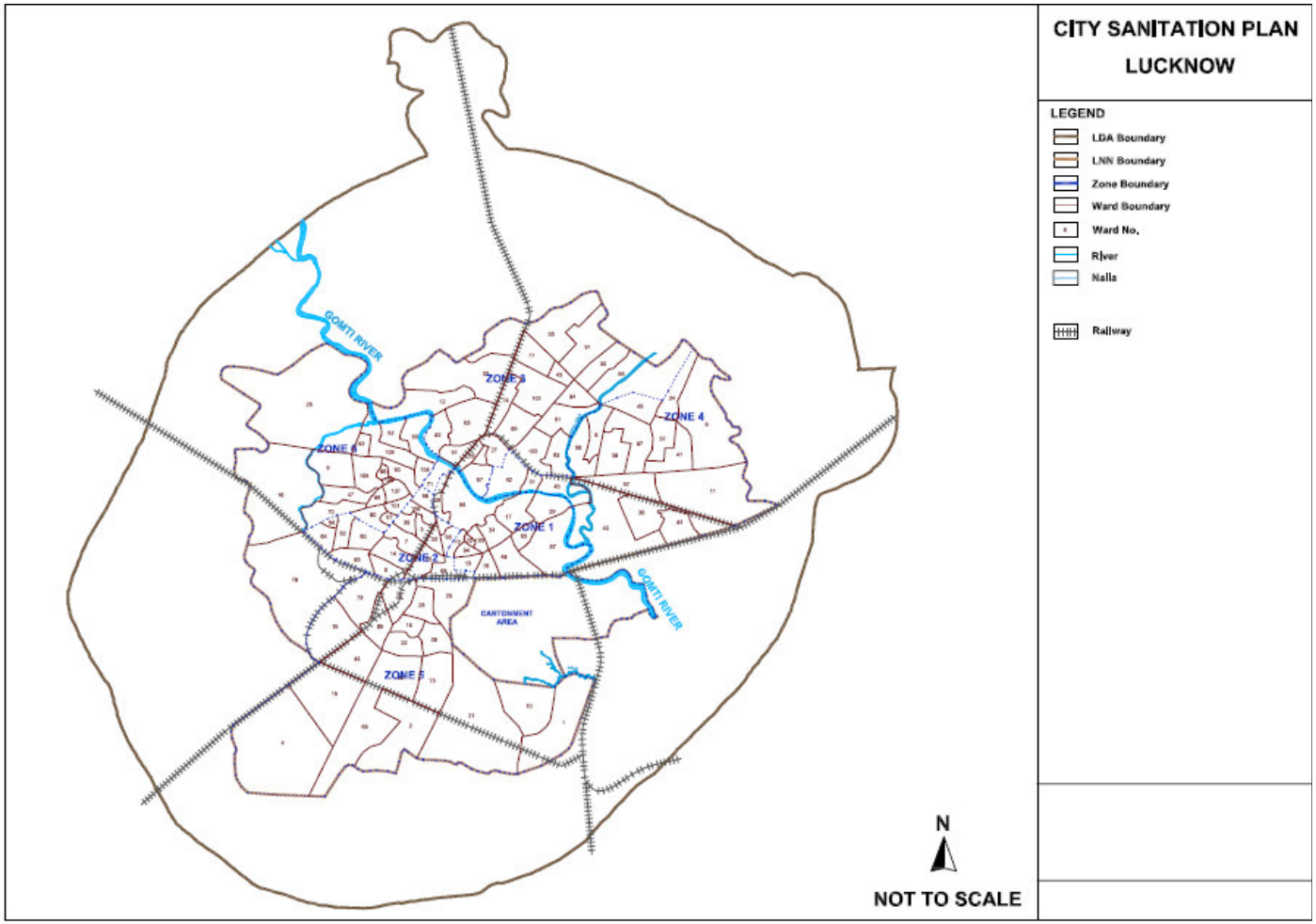


10.14.2 Map representing the Growth of Lucknow City

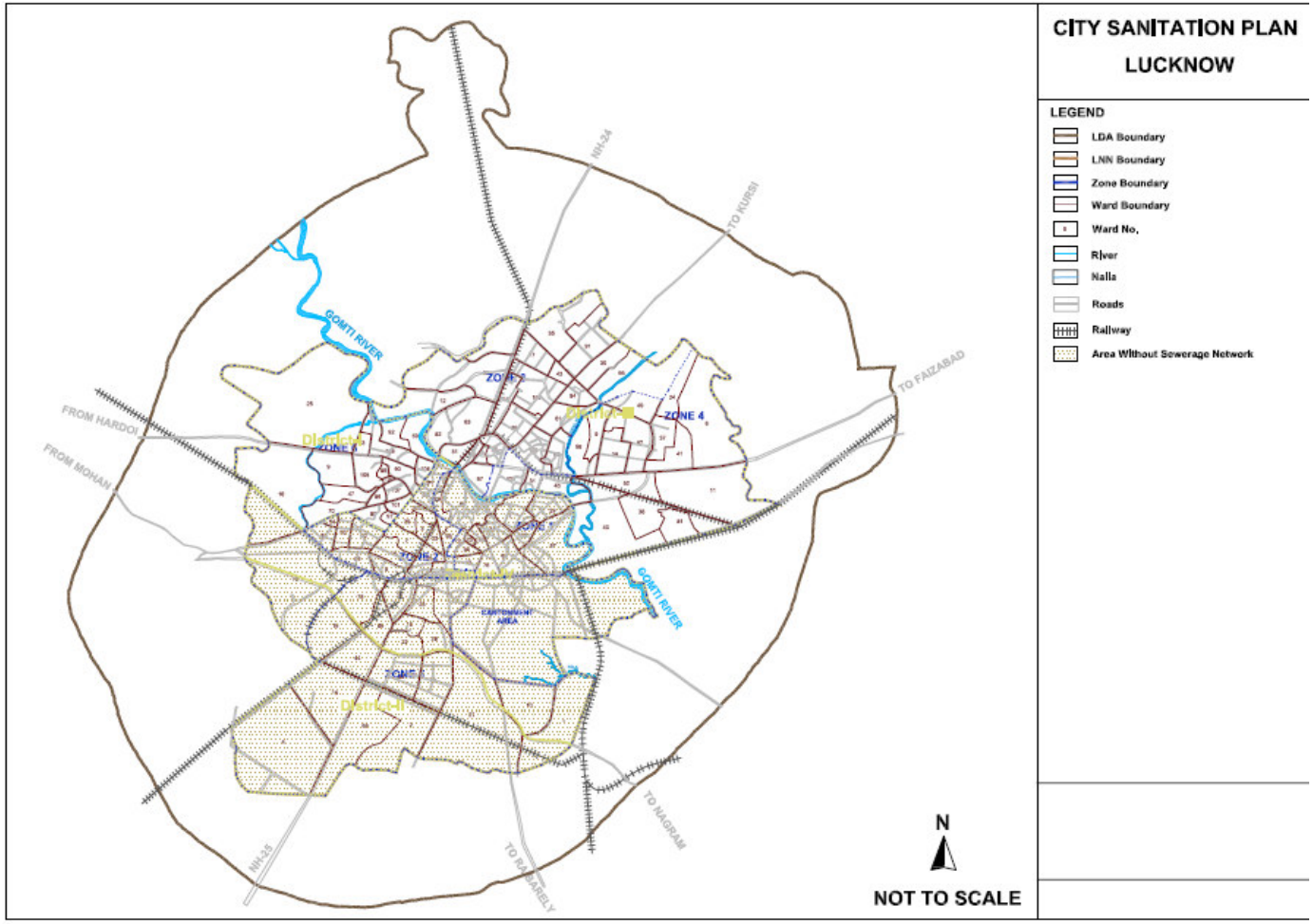
10.14.3



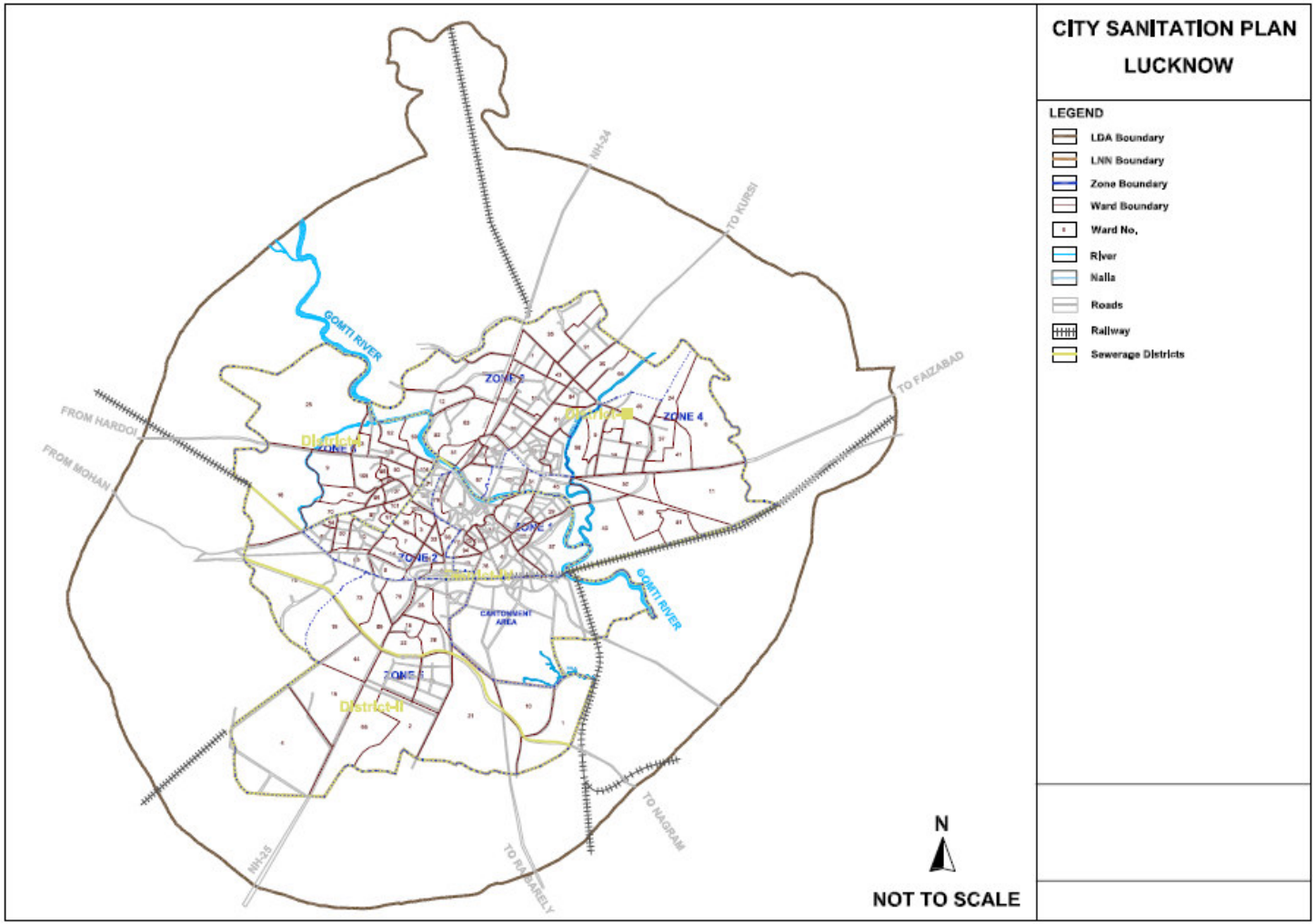
10.14.3 Administrative Zones



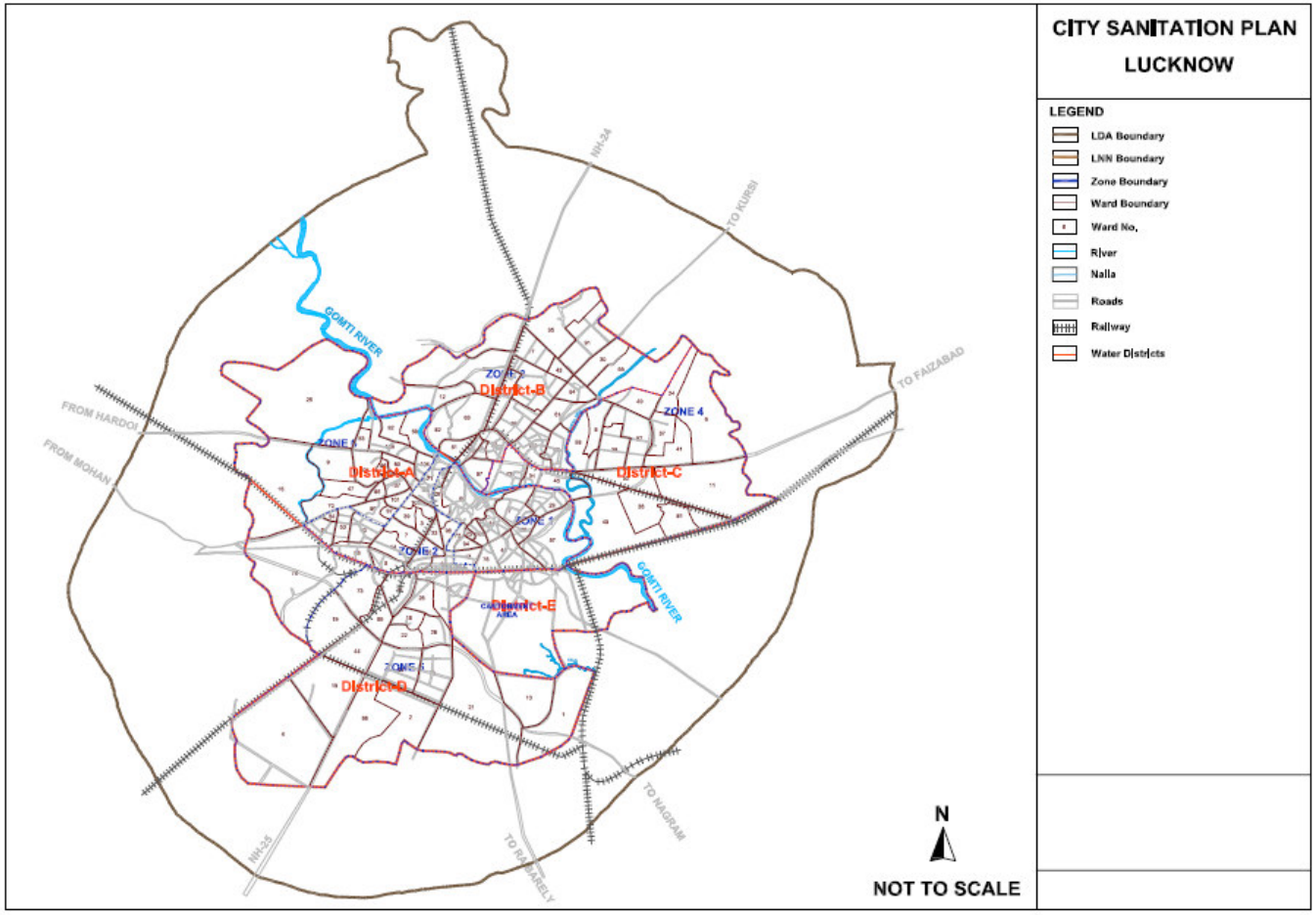
10.14.4 Sewerage Network



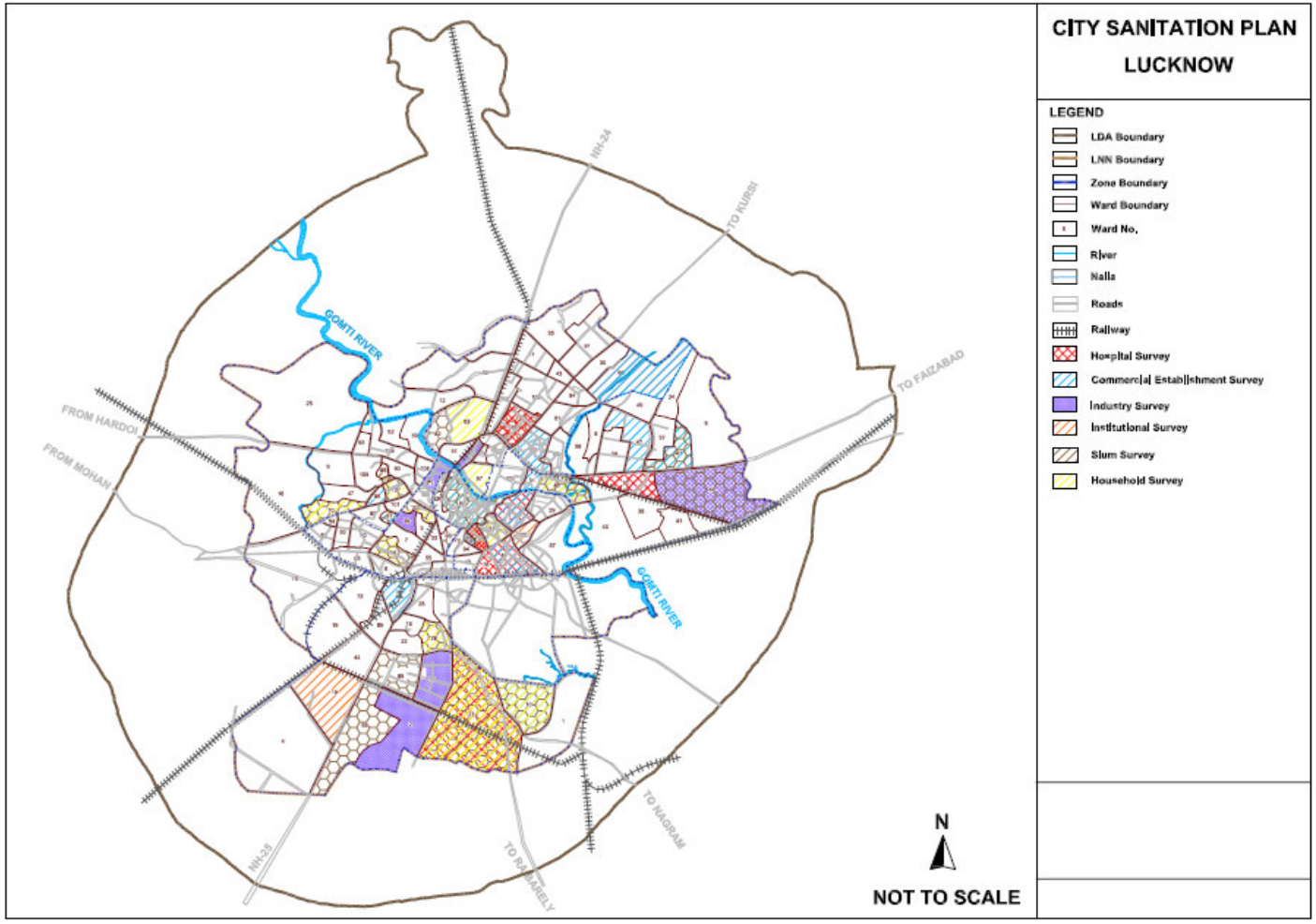
10.14.5 Sewerage Districts in Lucknow



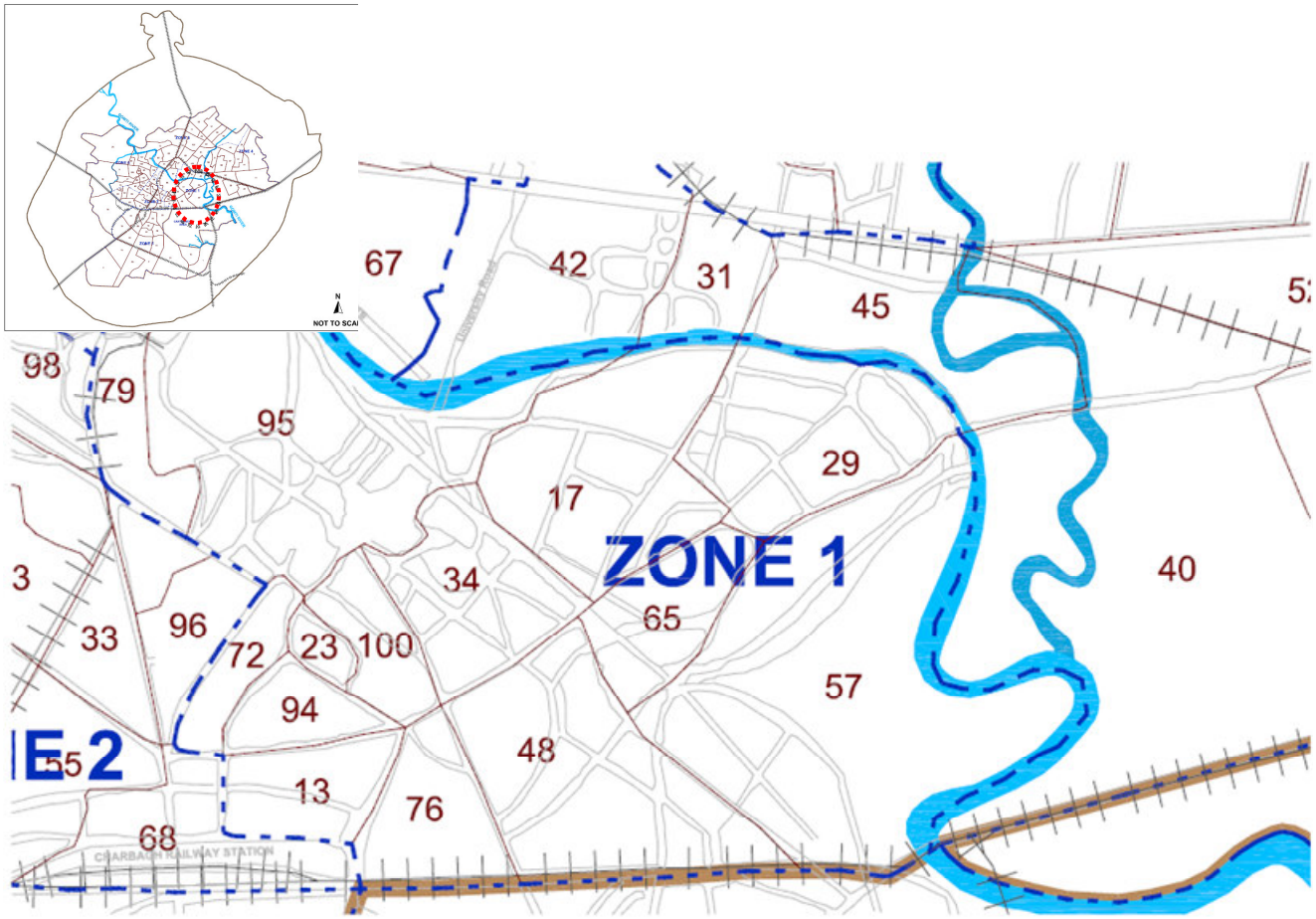
10.14.6 Water Supply Districts



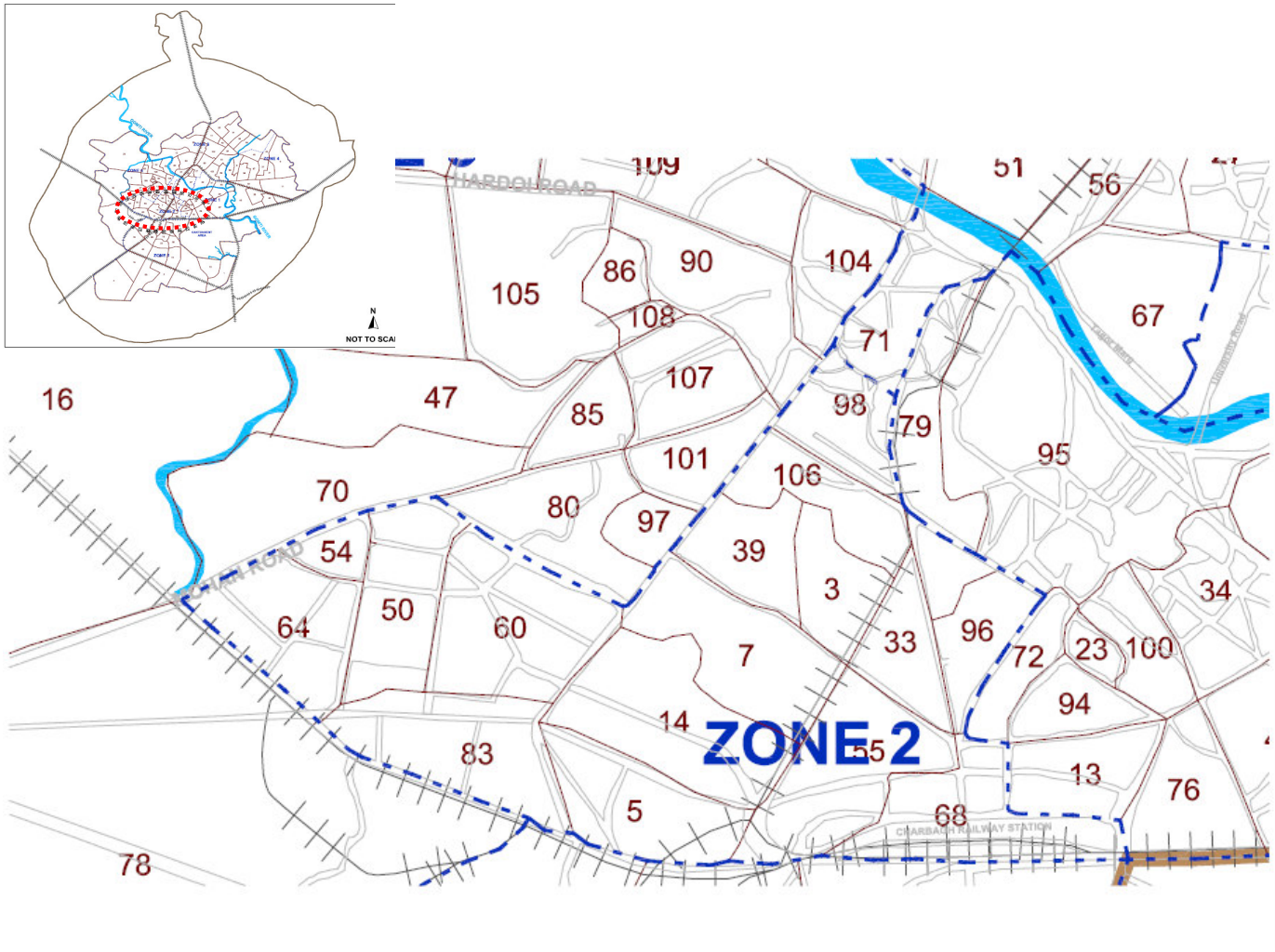
10.14.7 Sample for Survey



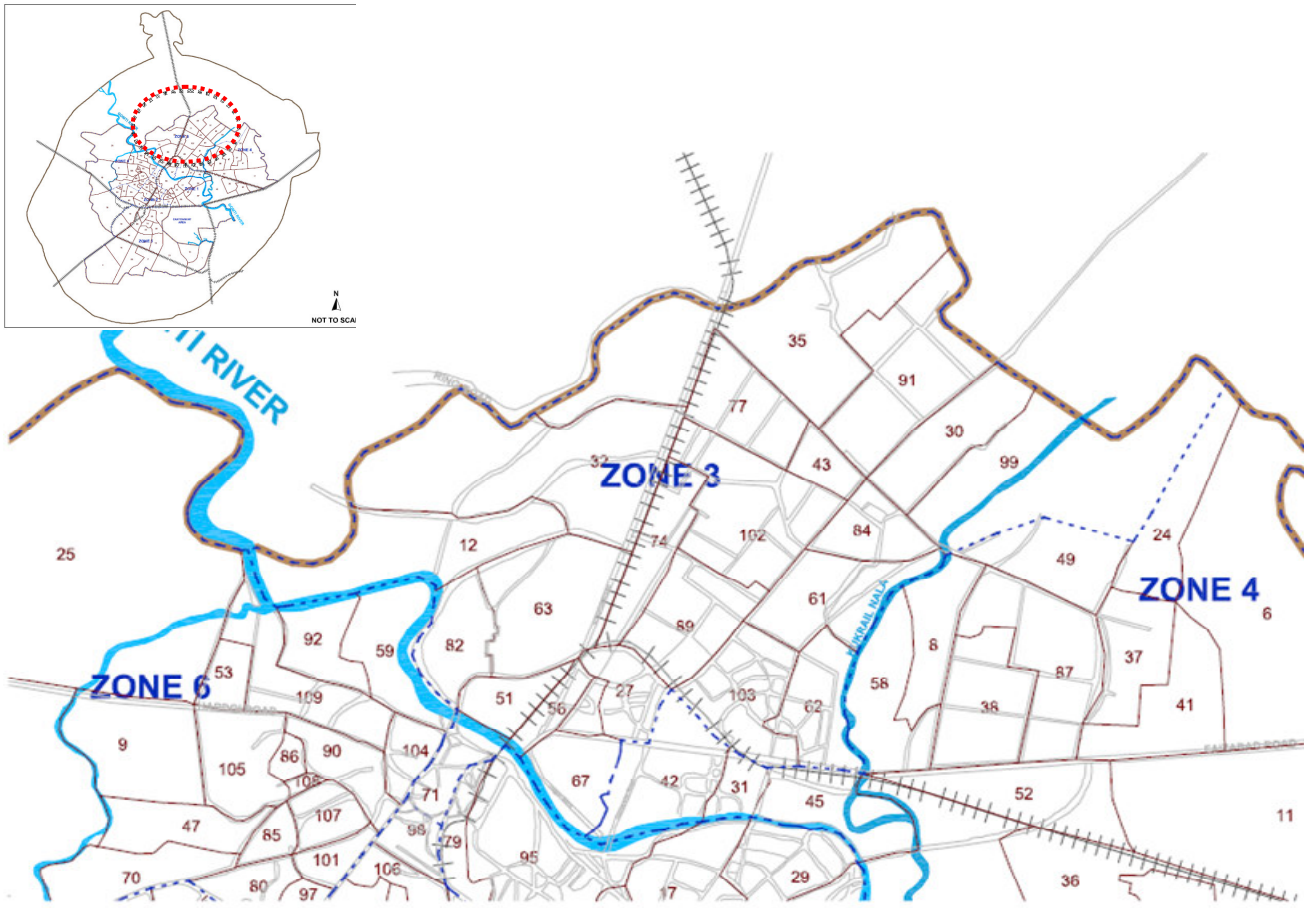
10.14.8 Map showing Zone 1



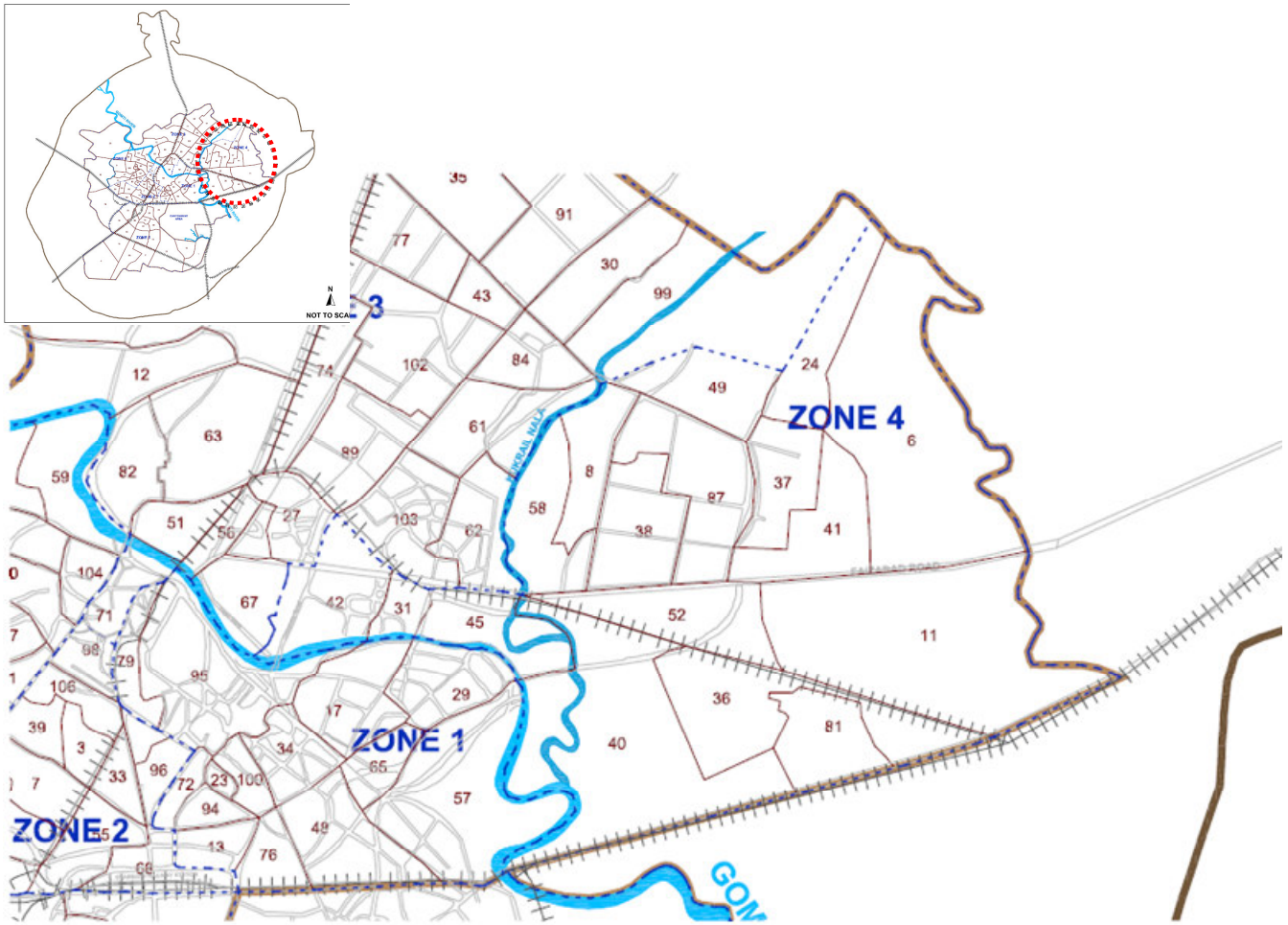
10.14.9 Map showing Zone 2



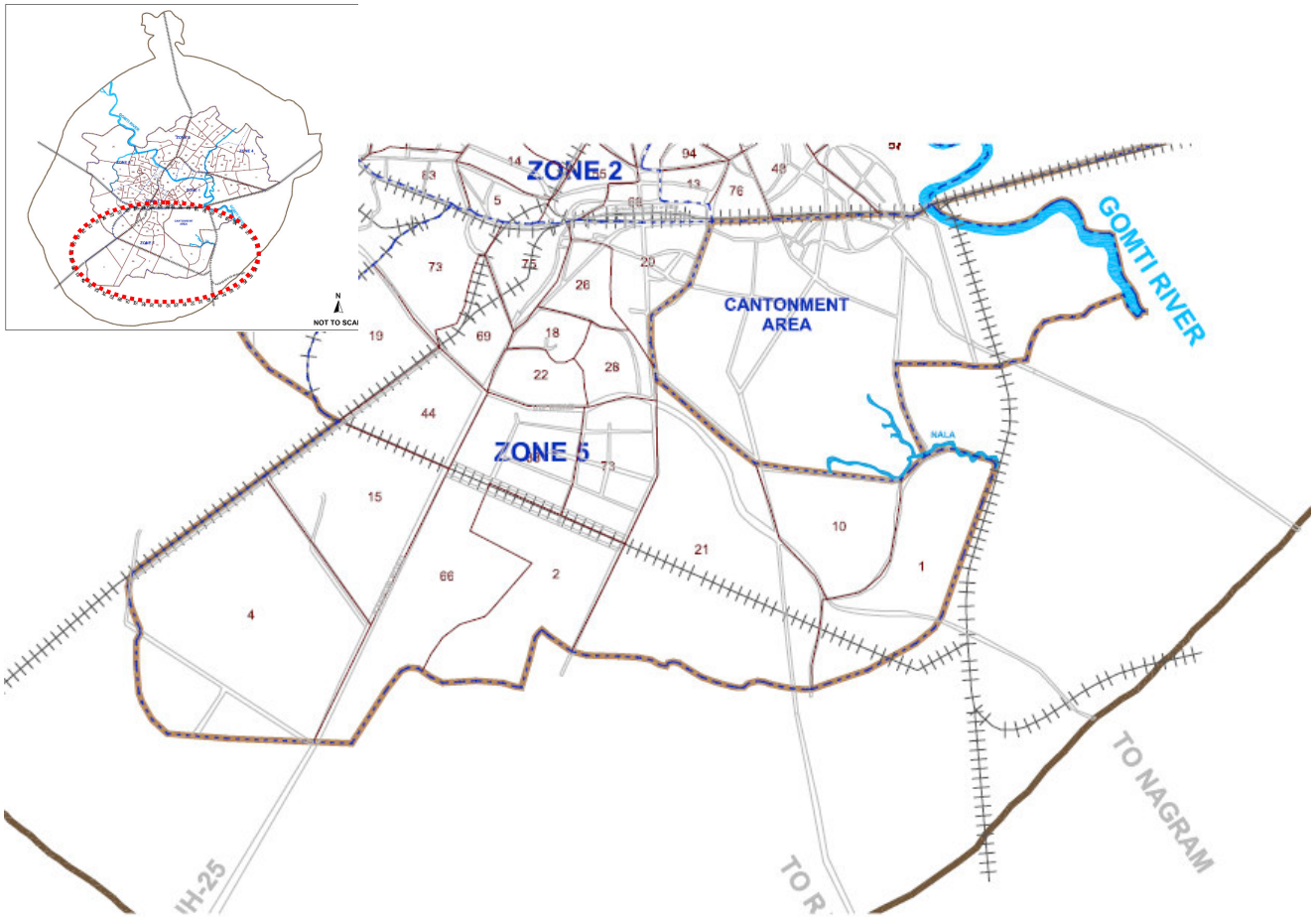
10.14.10 Map showing Zone 3



10.14.11 Map showing Zone 4



10.14.12 Map showing Zone 5



10.14.13 Map showing Zone 6

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