ANNEX C City Sanitation Plan for Varanasi, Draft City Sanitation Plan-City Level Strategy Document, August 2011

1 City Sanitation Plan（CSP）for Varanasi の概要

Varanasi の CSP の概要は以下のとおり。

正式名称	City Sanitation Plan (都市衛生計画)
策定の背景	2008 年に施行された、National Sanitation Policy（世銀の資金援助によって MOUD を CP として策定）に従い、州政府は State Sanitation Strategy を、規模の大きな自治体については、City Sanitation Plan を策定することとなった。 Varanasi 市は、GIZ の資金援助により、ローカルコンサルタントに委託して 2011 年に策定した。
CSP の構成	Ch1:Introduction of CSP in Varanasi Ch2:Access to Toilet Ch3:Sewage Management Ch4:Solid Waste Management Ch5:Storm Water Management Ch6:Water Supply Quality Ch7:Inclusive Sanitation Plan Ch8:Institutional Framework Ch9:Finanacial Framework
環境分野の課題	【上水道分野】 • 上水道給水ネットワークが、排水路などの下に埋設されており、配管の損傷部分から汚水がしみこむ危険性がある。 • 給水管のなかには、埋設後 100 年を超えるものがあり、地下深くに埋設されているため、その更新が困難である。 • Jal Nigam によると、給水ネットワークの線形に問題があり、その結果約 20%が配水中に漏水しているという報告がある。 • 維持管理職員の技術力がなく、不適切な維持管理作業となっている。 【下水道分野】 • 既存のセップティックタンク（腐敗槽）の設計、運営管理に不備がある。 • 汚泥の引き抜き、処理のためのインフラが不足している。 • 下水道への接続を拒否する家庭がある。 • 下水道システムの不備 • 下水道処理場の処理能力の不足により、処理されずに公共水域に放出されている汚水があり、河川の汚染の原因となっている。 • 雨季には、下水に雨水が進入し、ポンプの能力を超えるため、直接川に放流されている。 • 既存の下水道網、ポンプ施設を含む下水システムは古く、更新が必要。 • 汚水と雨水が合流しており、特に雨季にはごみが原因で下水道網の閉塞が頻繁に発生する。 【排水分野】 • 土を掘削しただけの土側溝が多く、地下水汚染の原因となっている。 • 腐敗槽からあふれた汚水が排水路に流れ込んでいる。 • 排水路に投棄されたごみが原因で、排水路の閉塞が頻繁に発生しており、ひいては非衛生的な状態をまねいている。 • 排水路の土砂の堆積が、排水能力の減少を招いており、閉塞の原因ともなっている。

	• 下水道網への負荷を減少する専用の排水路ネットワークが必要。 【廃棄物分野】 • 現在一次収集運搬は、完全に人力で、清掃人に対する労務衛生上の問題がある。 • バラナシ市は適切な数のごみ箱を設置していない。 • ごみ箱を設置していてもごみ箱の中にごみを捨てない人が多く、また一次集積所においては、ダブルハンドリング作業がみられ、効率が悪い。 • VMC は、廃棄物管理を改善するために、コンテナの設置を進めるべき。 • ごみ収集車の状態が悪く、適切な維持管理と更新が必要 • ごみ収集車の荷台にカバーがなく、ごみの飛散や異臭の原因となっている。 • ごみの分別が不足しており、コンポストの導入により最終処分量の削減を図る必要がある。 • 医療廃棄物が、都市廃棄物と一緒に処分されている。また処分場に管理人がおらず、搬入ゴミのモニタリングが行われていない。 • 正式な衛生埋立処分場がない。 • ごみが河や排水路に投棄されており、これが排水路の閉塞の原因となり、非衛生的な状況となっている。 • ごみの不法投棄が日常的に行われており、排水路の閉塞の原因となっている。 【衛生施設】 • 様々な形態のトイレが存在するが、巡礼者、観光客、地元の人々が利用するには、絶対的な数が不足している。 • 既存トイレの状態や衛生状況が悪い。
改善の目標	【2015 年までに野外排泄の撲滅】 • 各家庭レベルにおけるトイレの普及 • 都市部貧困層のためのコミュニティトイレの整備 • 適正な数の公衆トイレの整備 • 市民の意識改革 【2020 年までにしっかりとした廃棄物管理の確立】 • 各戸収集の実施率 100%の達成 • 十分な収集車の配備 • 公共エリアにおけるごみ箱の設置 • 廃棄物処理施設の建設 • 分解しないごみ用の処分場の整備 【2015 年までに腐敗槽と汚泥管理の改善】 • 汚泥の収集、運搬、処理、処分のための適切なインフラの整備 【2020 年までに排水管理の改善】 • 排水を適切に管理するための、適切な排水ネットワークの設計と整備

2 City Sanitation Plan for Varanasi

CITY SANITATION PLAN FOR VARANASI

August 2011

Draft City Sanitation Plan- City Level Strategy Document

Varanasi Municipal Corporation

Technical Assistance: GIZ ASEM

Prepared by:

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Introduction to CSP

1 Introduction to CSP Varanasi

1.1 National Urban Sanitation Policy

The Government of India (GoI) had identified 100% sanitation as a goal during the 11th Five Year Plan. The Ministry of Urban Development (MoUD) officially launched a country-wide National Urban Sanitation Policy (NUSP) on November 12, 2008 with an objective to call upon individual states to draft their own strategies based on the NUSP, while taking into account of their own specific requirements. These strategies are a part of the City Sanitation Plan. The NUSP defines the city sanitation plan as- "A comprehensive document which details out the short, medium and long term plans for the issues related to governance, technical, financial, capacity building, awareness and pro-poor interventions to ensure 100% access to safe sanitation."

1.1.1 Vision

The vision of urban sanitation as defines by the NUSP in India is

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

1.1.2 Policy Goals

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

The specific goals are:

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

1.1.3 Components of CSP supported by GoI

For the implementation of the various proposals under the NUSP GoI has identified the following components under which it shall extend support:

Awareness Generation

- Design and implementation of Information, Education and Communication (IEC) Strategy
- Dealing with socio-cultural biases against sanitation and sanitary work
- The public-good nature of urban sanitation and the requirement of collective action shall be highlighted to the stakeholders.

Institutional Roles

- Clear assignment of roles and responsibilities, resources and capacities and institutional incentives in relation to setting standards, planning and financing, implementation, knowledge development, capacity building and training, Monitoring & Evaluation (M&E), and regulatory arrangements.
- Ensuring sanitation as a core responsibility of Urban Local Bodies as envisaged in the Constitutional (Seventy fourth) Amendment Act, 1993.
- Reorganization of the NGOs and Community Based Organizations (CBOs) for mobilizing communities, raising awareness and in working with poor communities to
- Assistance in finding affordable, community-managed solutions to sanitation.

Reaching the Un-Served and Poor Households

- Aid in the development of community sanitation facilities where individual solution are not feasible
- Special slums and community sanitation plans shall be formulated

Knowledge Development

Recognizes the importance of developing and disseminating knowledge on:

- Institutional development
- Technology choices and management regimes
- Planning new developments and up-gradation,
- Sustainability issues.

Capacity Building

- Help in formulation and implementation of a National level strategy on capacity building and training
- Develop organizational systems for delivery of sanitation services.

Financing

- Ministry of Housing and Poverty Alleviation (HUPA) is administering a Centrally Sponsored Scheme for Integrated Low Cost Sanitation (ILCS). Under this scheme, central subsidy to the extent of 75%, state subsidy to the extent of 15% and beneficiary contribution to the extent of 10% is provided for. Funding of projects shall also be considered from the existing schemes like JnNURM and UIDSSMT.
- However, the emphasis will be on improving the efficiency of existing sanitation infrastructure and service delivery.

National Monitoring & Evaluation

- Periodic rating of cities by independent agencies for felicitation of cities achieving good practices on sanitation.

Coordination at the National Level

- National investments in urban infrastructure and housing shall accord high priority to sanitation.
- Sanitation will be mainstreamed into all relevant programmes of all the relevant sectoral ministries.

1.2 Varanasi- need for a City Sanitation Plan

Varanasi is one of the most sacred places in the Hindu religion. It has acquired the status of a million plus (UA) city in 1991 and recorded a population of 12.11 lacs in 2001 census. It is well connected by road, rail & air and is located on the golden quadrilateral of the National Highway. There are three national highways i.e. NH-2, NH-56 and NH-29 and four state highways i.e. SH-87, SH-73, SH-74 and SH-98 passing through the heart of the city.

Varanasi is a city of Ghats, temples, shrines the famous *saris* and the *benarasi paan*. The major landmarks are:

Ghats: 84 ghats spread over a length of 6.8 km. The most important ghats are Dasaswamedh Ghat, Harish Chandra Ghat, Manikarnika Ghat, PanchaGanges Ghat, and Assi ghat, amongst others.

Temples: around 2000 temples, important temples are *Kashi Vishwanath, the Sankat Mochan temple, The Tulsi Manas temple, the Durga temple, the Kal Bhairav temple and the Mritunjaya temple.*

Sacred Kunds: Durga Kund, Pischashmochan Kund, Laxmi Kund etc.

Pilgrimage Routes: Chaurassikosi yatra, Panchkroshi yatra, Nagar Pradakshina, Avimukta yatra and Antargraha Yatra etc. along the river front

Banaras Hindu University: New Vishwanath temple and the Bharat Kala Bhavan, which has a vast collection of Hindu and Buddhist Sculptures.



About one third of the population stays in the notified slums. There as many as 87,286 households with a population of 4, 62,701 people staying in these. The slums of Varanasi are organized under the Community development societies which are a total of 36 in number. There are total 90 wards under the municipal corporation spread in an area of 79.79 Sq. Kms

Tourism is one of the major economic activities of the city. Urban growth coupled with the large tourist inflow and floating population, has put sustained pressure on already stressed, city sanitary infrastructure. Lack of infrastructure has resulted in insanitary conditions through the city. The river and the *nalas* over time have become unofficial dustbins of the city. The various sanitation issues in the city have been discussed in the subsequent sections.

Considering the importance of Varanasi in the national landscape, the city has been selected amongst the initial pilot cities under the NUSP, where the CSP exercise is being taken up. CSP is expected to be a comprehensive document that shall convert Varanasi to a 100% sanitized city, through short medium and long term interventions.

GIZ-ASEM is currently supporting Shimla, Varanasi, Nashik, Raipur, Kochi and Tirupati in the preparation of City Sanitation Plans (CSPs) under the National Urban Sanitation Policy (NUSP) formulated by the MoUD, Govt of India.

Centre for Environment Planning & Technology (CEPT), along with Consortium of DEWATS Dissemination (CDD) and Alchemy has been entrusted with the work preparation of City Sanitation Plan for the city of Varanasi, Shimla and Raipur respectively.

1.2.1 Sanitation ranking of Varanasi

Out of the 423 cities being ranked for the levels of sanitation, Varanasi fares at 331. It is under the red category which means that it is on the brink of public health and environmental "emergency" and needs immediate remedial action

The process of ranking is broken down into the following subheads as indicated in the attached table

Table 1- Sanitation score of Varanasi according to the NUSP

	Attributes	Total points	Varanasi
Output related	Open defecation free cities Proportion of waste/waste water storm water safely treated	50	9.164 (18.38%)
Process related	All treatment plants are in place	30	10.60 (35.33 %/)
Outcome related	Improvement from baseline, water quality, disease pattern etc	20	7.3(36.5%)

The comparison with the NUSP indicators suggests that the city fares worst in the output related indicators. It can be inferred that the city does not have the systems of combating open defecation, solid waste management systems are not in place, and sewage is managed with obsolete technologies and without appropriate protective gears for the workers. The hypothesis was substantiated by the service level indicators and also by the primary site studies.

1.2.2 Field Investigations and Surveys

To understand the perspective of the people of Varanasi in terms of Sanitation, primary data collection was done through the medium of Questionnaire Surveys, Focused Group Discussions and interviews with prominent stakeholders for the City Sanitation Plan.

The Questionnaire Survey was carried out for the Households, Traders and Tourists. The Focused Group Discussions and Interview methodology was adopted for Temple Trusts, Boat Association, Industries Association, Hoteliers Association etc. The structure of primary data collection is shown in the figure below.

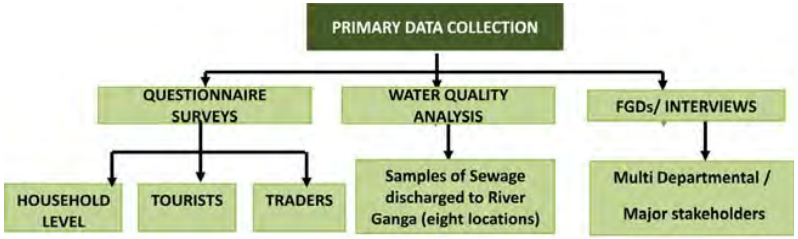


Figure 1- Primary data collection framework

Through the surveys it was ensured that the slum areas of the city were also covered in order to understand the sanitation gaps in these areas.

1.2.2.1 Data Gaps and information issues

During the entire process of the formulation of City Sanitation Plan, clear gaps and overlaps in sanitation related data were observed. They have been elucidated as follows:

- Soft copies of drawings for the existing infrastructure and the proposed under the DPR were not available
- Details of the sewage system, in terms of the operations and maintenance and the state of the septic tanks after connection to the centralized system were not available.
- The water quality surveillance information and maps, the recovery of user charges could not be obtained in the water supply segment.
- Existing land use classification was not available.

1.2.3 Sanitation issues in Varanasi

Access to toilets

- Open defecation has emerged as a major issue in Varanasi. This is an outcome of the lack of sanitation infrastructure in the city and also has some bearing on the behavioral aspects of the people.
- There is not only lack of toilets in the city, but also the existing are in poor state of maintenance. Furthermore they are not gender sensitive or requirement sensitive. Eg. The toilets at the Ghats do not have changing rooms or showers in them.

Solid waste management

- The city has no solid waste management system in place.
- Waste collection has been taken up in a pilot basis in certain wards in the city, however in absence of a "management system" they are just being dumped in empty plots.
- The waste collectors and handlers do have access to any protective gears. It is being handled manually at present.

Sewage management

- For a city which is heavily reliant in the septic tanks as a sewage management system, there is no Septage management system in place.
- At present it is being done manual with no protective gear for the septic tanks cleaners.

Built and natural heritage

- The natural resources in the form of Nalas and the Ganges are subject to abuse in the form of garbage and un-treated waste water being released into them.
- The built heritage in the form of Ghats and temples, in absence of waste management systems, has garbage strewn across them, making them unhygienic and marring their beauty.

Institutional system

- There are multiple institutional overlaps. Overlaps range from the jurisdictions, responsibility through the different hierarchal levels of the government.

- It has been observed that there are multiple institutions involved in the planning and design, actual construction, operation and maintenance and the monitoring of the sanitation infrastructure.

1.3 City Sanitation Plan- Varanasi

Having undertaken the primary investigations and discussions, the approach and the strategies for the CSP Varanasi were formulated. Varanasi is a special city, with special needs, complex and challenging issues. For a city which has already witnessed large scale interventions the likes of Ganga Action Plan, the need for evolving a very Varanasi specific strategy was felt. The following sections detail the same.

1.3.1 Approach

Upon the request of the MoUD, GoI, GIZ-ASEM is supporting the assessment of the City Sanitation Plans and the State Sanitation Strategies. It is offering technical cooperation to the selected cities in improving their sanitation scenario. The CSP has been developed on 5 pillars, which embraces the various aspects of a holistic city plan.

The sanitation plan is developed on the sector wise. It requires the identification of the city level goals, which shall be stratified into short medium and long term goals.

The key sectoral issues have to be identified. There should be a strong rationale behind the identification of these issues. The issues are to be dealt with relevant recommendations. The recommendations are to be based on the 5 pillars identified above.

The recommendation and the policies suggested under the CSP are suggestive in nature. It has been attempted to give various options for each recommendation such that the decision maker can choose from the gamut of options available, based on technological and financial feasibility.

Figure 2- 5 pillars of CSP

Figure 3- Approach for CSP recommendations

1.3.2 CEPT's Approach

CEPT has interlaced the GIZ approach with the special needs for the city, in structuring the sanitation plan. The site investigation was followed by the preparation of the maps and the base line

information. Based on these the future projections for both demand and supply were understood. This was followed by the gap assessment and the appraisal of the interventions proposed under the various detailed project reports. This was followed by the recommendations which were to address these gaps. Special attention has been given in including the component of pro poor policies and inclusive strategies. The methodology has been attached in the figure below

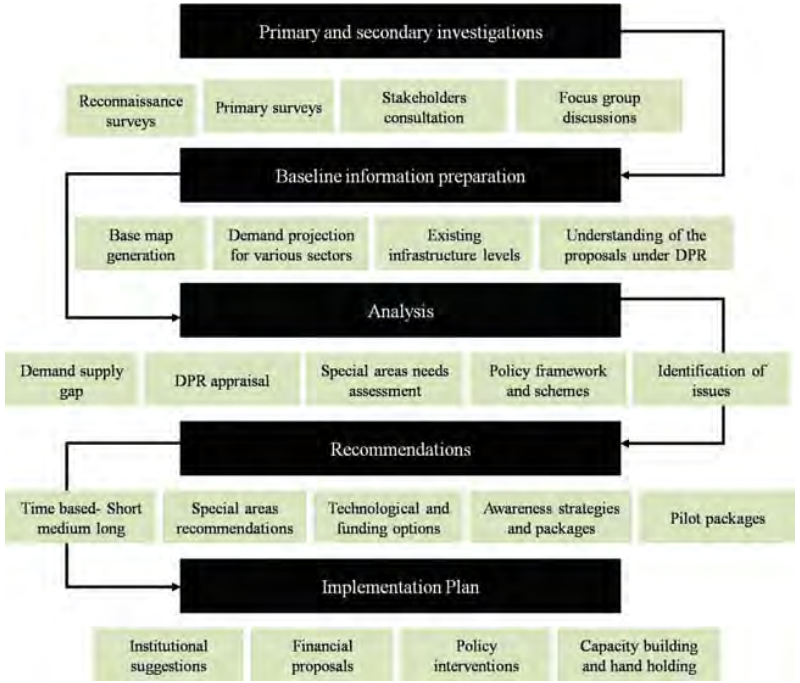


Figure 4- CEPT's methodology for CSP

CEPT's approach with respect to the 5 pillars	
Technological	Technological options have been given with respect to their suitability in Varanasi. Different options have been suggested, from which the corporation may chose the most relevant one.
Financial	The proposed investments have been backed with a financial plan, which explains financing option of the same. Sources of finances like CPF and grants have been suggested.
Institutional	Varanasi has a very fragmented institution for the sanitation services. Through this segment various options of institutional restructuring for a more responsible service delivery have been explained. Best practices from across the country have been discussed for possible

Inclusive approach	Sanitation for all has been the driving mantra for the CSP Varanasi. Inclusive aspects have been dealt with in terms of: Financial- for all economic sections in the city Gender- Women and children face the spoils f poor sanitation the most. Hence special attention has been given to Access- The facilities and the options have been suggested such that it becomes accessible for people in all parts of the city.
Capacity building	The knowledge needs assessment and the ways and means of knowledge and knowhow dissemination have been suggested. IT has been attempted to identify local knowledge partners such that the process of CB is a sustainable one.

1.3.3 Activities Conducted and NUSP guidelines

The attached table explains the various activities that were undertaken for the preparation of the city sanitation plan. These are compared with the NUSP guidelines which suggest some preparatory actions to be undertaken for the city sanitation plan. The activities have been in line with the suggestions of the NUSP.

Certain components like financing and service delivery systems have to be discussed with the CTF before finalization.

Step 1- Mobilization of stakeholders for

City Task Force (CTF) Formation- The identified CTF members include, officials of VNN, Varanasi Development Authority, District Urban Development Authority, UP Jal Nigam/Jal Sansthan, Ganga Pollution Control Unit etc, and representatives of major Civil Societies, NGOs, Media & Academicians from the city.

CTF Meetings were held, in June and August 2010, for discussion of the CSP status

Step 2- Baseline Data Collection and Creating Database/GIS

- Field surveys and investigations
- Primary data collection
- Secondary and qualitative data- FGD and stakeholders consultation
- Socio economic surveys
- Water quality testing
- Review of past and ongoing proposals and schemes
- Status survey

Step 3- **Specifying Legal and Regulatory Institutional Responsibilities**

Varanasi has a fragmented institutional structure regarding urban sanitation. The CSP suggests certain institutional restructuring for effective implementation of the proposals under CSP

The regulatory measures regarding the technological interventions or suggested bye-law amendments

have also been suggested

Step 4- Planning and Financing

- The financial plan has been suggested as a part of the CSP exercise.
- Various options for the public private partnership have also been discussed.
- These need to be refined upon consultation with the CTF and the implementation agency

Step 5- Technological options

Various technological option for waste management and design options for the public toilets have been discussed. The technology choices depend upon the site constraints and also the possibilities of operations and maintenance

Step 6-Reaching the Un-Served Populations and the Urban Poor

Pro poor strategies have been examined through

- Participatory approaches
- Cross subsidization of facilities
- Involvement of the NGO and the slum CDS active in Varanasi.

Step 7- Operation & Maintenance and Service Delivery Systems

Identification of the institutional structure for the operation and maintenance of the facilities created have been worked out

Options of community management involvement of private parties also has been discussed

Step 8- Capacity building and training

Identification of the target group for the capacity building and suggestion of the training needs have been made.

Step 9- Implementation Management and Monitoring & Evaluation

Identification of the monitoring processes and the parties responsible for the same have been undertaken sector and component wise.

1.3.4 Framework CSP Varanasi

As could be seen from the earlier discussions, the city sanitation challenges of Varanasi are complex. Furthermore, the city has a long history of combating with various levels of environmental degradations and pollution. For Varanasi, thus, to achieve 'Totally Sanitized City' target, as envisaged in NUSP, the city has to take a big leap from its present level (27.2[1]).

The subsequent sections detail the strategic approach undertaken for realizing the larger vision of 100% sanitized Varanasi

1.3.4.1 Sanitation Scenario in India

The Asia-Pacific is the world's most dynamic region. Owing to rapid urbanization the number of people in urban areas without improved sanitation is increasing.

The graph shows the access to sewerage system in major Asian cities. Only three out of the fourteen cities in Asia have complete sewerage access.

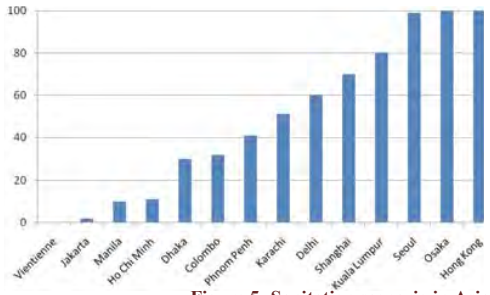


Figure 5- Sanitation scenario in Asia

The situation in India is also far from the ideal as suggested by the graph[2] below. An estimated 50 percent of the country lacks access to improved sanitation. Access to improved sanitation is higher in urban areas, where, about 40 percent of households are connected to sewerage systems, 29 percent are connected to a septic tank, and 17 percent use other onsite systems like pit or vault latrines. This suggests that in spite of the efforts directed at sanitation, the gap between the population and people with access to sanitation facilities remains and shall continue to remain for a while.

Hence, lies the fundamental question- ***Is 100% sanitation access possible in context of a city such as Varanasi when most of the major Asian cities have failed to achieve the same?***

The answer to this question is yes, with the right approach Varanasi can become a Totally Sanitized City, creating a model for development of the other cities. The sanitation options for Varanasi have to be strategically devised. While centralized underground sewage system is the ideal scenario, getting there from the present state is a challenge for the city. In identification of the technological options for sanitation, the site specific and appropriate solutions need to sought rather than the seemingly ideal ones.

[1] The figure represents the score of Varanasi City in the City Sanitation Rating exercise carried out by MOUD,2010.

[2] 1992 and 2002 estimates are from the 1991 and 2001 Census of India; 2007 to 2017 targets are from World Bank forecasts.

1.3.4.2 Strategic approach for CSP Varanasi

The overall goal of a strategic sanitation approach is to provide services to the town or city as a whole. The means of achieving the same are very case specific and has to be understood from similar initiatives that the city has been exposed in the past.

The graphic below is an indication of the present status of Sanitation Infrastructure availability in Varanasi. To become a complete sanitized city, the city has to achieve 100% targets in all the aspects related to the sanitation infrastructure.

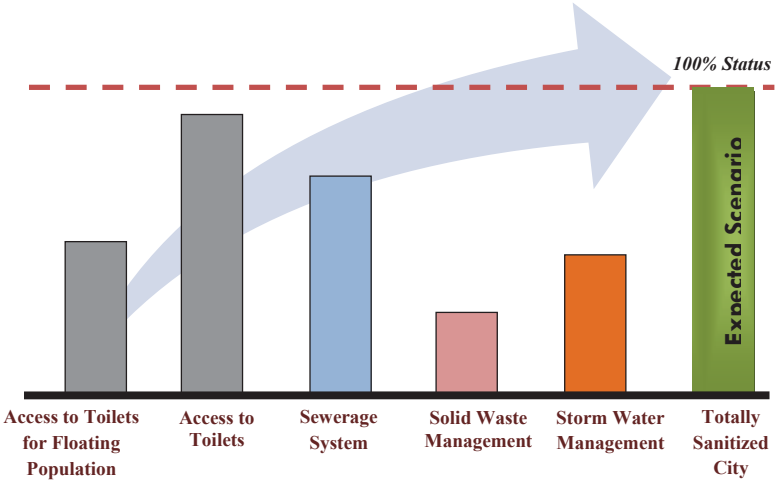


Figure 6- Proposed strategy for CSP Varanasi

As a tradition, the over optimistic approach of a "***Big Leap***" although popular have failed to bring out a substantial change in the overall scenario***. The present status of city is more than representative of this case wherein more than Rs.500 crores have been spent through Ganga Action Plan (GAP) phase I and II.***

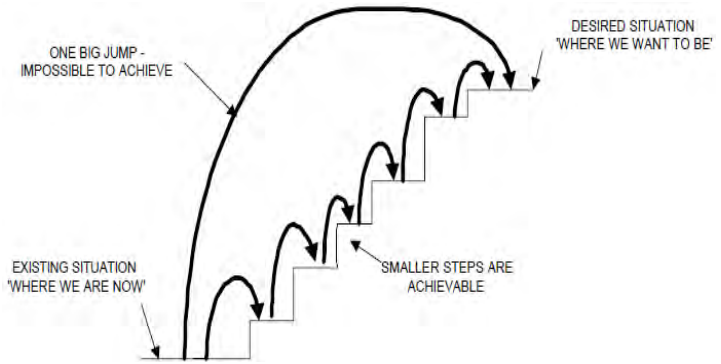


Figure 7: Several small steps are easier to achieve than one big jump

Hence the approach of taking small incremental steps is much more appropriate in context of the Varanasi. The concept here is to decide small targets which are specific, realistic and time-based. The figure below explains the approach adopted in the City Sanitation Plan.

1.3.4.3 Integrated Sanitation Solutions for Varanasi

The sanitation system in Varanasi requires integrated approaches to deal with the multi pronged problems. The road map should adhere to the visions, city growth patterns and the steps to bridge the gap between the current situation and the desired one.

The following steps have been suggested:

- Enhance **synergy among the actors in sanitation development**, including municipal government agencies, the private sector, NGOs, and others.
- Employ **appropriate technologies that are suitable to user needs** - differential technology choices based on location (core city, outer growth areas), slums etc
- Develop **sanitation in all parts of the city (city-wide)**, prioritizing the slums, which constitute a third of the whole city's population.
- Promote **awareness of health and hygiene behavior** which is important for Varanasi since the issues of open defecation have a strong bearing on the socio- cultural habits of the people.

1.3.5 City Sanitation Plan – Vision Varanasi

The city sanitation plan Varanasi is driven by the Vision of 100% sanitation in accordance to the NUSP guidelines. It is envisaged that by 2020, the city shall become have access to proper sanitation facilities for all its citizens.

Totally Sanitized Varanasi by 2020

Nirmal Kashi by 2020

निर्मल काशी
Nirmal Kashi

1.3.5.1 Objectives for Nirmal Kashi 2020

The various objectives to achieve the vision for 100% sanitized Varanasi are as under:

- To plan for an integrated city sanitation provision
- To ensure equitable and accessible sanitation to all
- To identify the demand of sanitation requirements for the future and plan for the same.
- To design and plan packages and policies to achieve the vision of *Nirmal Kashi* 2020
- To integrate sanitation awareness and behavioral change inducing policies and packages

1.3.5.2 Principles of Nirmal Kashi

The sanitation plan for Varanasi has been based on the following principals:

Figure 8: Principles of CSP Varanasi

1.3.6 Roadmap to a 100% sanitized Varanasi

CEPT has identified the road map for a 100% sanitized Varanasi. Through the interventions it has been attempted to improve on the sanitation ranking scale postulated in the NUSP guidelines. Varanasi at the moment fares at 27.084 out of a total of 100. CEPT believes that with the right interventions it can reach as much as 70 and can reach the likes of the cities of Chandigarh and Mysore.

In the initial stages of the intermediate and short term packages under the Parivartan, are directed at raising the awareness levels in the city and to set the scene for a better sanitation practices. The short term intervention reinforces the sanitation drive and aims at creation and up gradation of sanitation infrastructure specifically related to toilets. It is envisaged that the sanitation score can be improved from the existing levels to 37 by 2016.

The next levels of interventions are primarily creation, repair and up gradation of the sewage systems, Septage management and solid waste management. It is believed by 2027, Varanasi can become 100% open defecation free. The projected sanitation score for this period is 55.

In the long term, capacity building, technological handholding, better operations and maintenance mechanisms are suggested. Through the end of this period Varanasi can aim at a sanitation score of 70, hence reach the blue category, which at the moment only 4 cities have, that of- Chandigarh, Mysore, Surat and NDMC(New Delhi)

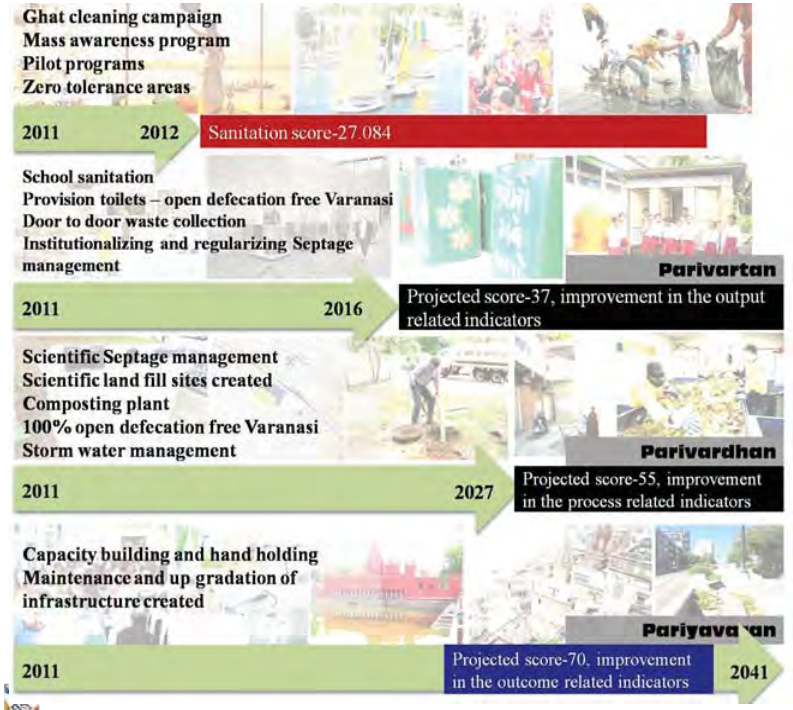


Figure 9- Roadmap to 100% sanitized Varanasi

The specific targets have been mentioned in the attached table

Table 2- Specific targets for CSP Varanasi

Objectives and Targets	Strategic Policies
Open Defecation Free City by 2015	Provision of Access to Toilets at HH Level
	Provision of Access to Community Toilets for urban poor
	Provision of Adequate number of public toilets
	Awareness Generation
Sound Solid Waste Management by 2020	100% Door to door collection
	Adequate Transportation Fleet Development
	Provision of Litter bins in Public Places
	Development of Waste Treatment Plant
	Development of Landfill for Inerts
Septic Tank and Septage Management 2015	By developing proper infrastructure for collection, transport, treatment and disposal of septage
Strom Water Drain Management in Varanasi by 2020	Design and development of a proper storm water management network to manage the storm water

Annexure I- Access to toilets

2 Access to Toilets

Access to toilets has been identified as one the major goals of the NUSP. Varanasi is deficient in the requisite number of toilets, as a result of which the citizens have to resort to open defecation.

This segment explains the current scenario of toilets in the city identifies the demand for additional toilets and also suggests ways and means to manage and optimize the demand for additional toilets in the city.

2.1 Overview

In India 50% of the population have access to mobile phones, however ironically the situation for toilets is rather dismal. In Varanasi the situation is no different than the other parts of the country. Primary surveys across the city have indicated that open defecation is one of the most crucial sanitation issues. This is rather ironic in a city which is of such religious significance and also one of the most frequented tourist destinations.

Varanasi does have number of public toilets, along the major tourist areas. They are in a shabby state hence not used, forcing people to defecate in the open. The studies and observations are an outcome of extensive site studies, discussions with the locals and the city managers.

The attached table indicates the distribution of the toilets in the city. They shall be discussed in detail in the subsequent sections of the chapter.

Table 3- Distribution of toilets in Varanasi

Sr. No.	Type of facility	Number
1	Community toilets	96 (Sulabh-72, Refrozen-6, ADS-6, NEDA-12)
2	Public toilets	12 (Around Ghats)
3	Public Urinals	75
4	Open Defection	15% of the city's population
5	Mobile toilets	3

2.2 Assessment

The access to toilets has been studied under the two heads

- Toilets for residential areas- provided either by individual toilets or community toilets
- Public toilets- toilets, urinals and mobile toilets.

2.2.1 Types of toilet

Public conveyence system may be broadly classified as **Community Toilets, Public Toilets, and Public Urinals.** The details of these are presented in the sections below.In Varanasi there are different service providers for each category of toilets. Sulabh International, NEDA, VNN, Advances sanitation welfare society and Refrogen Suvidha provide the facilities for toilets in the city.

While the pay and use toilets are charged on the basis of usage the community toilets usually operate on the basis of monthly user charges. The number if toilets in the city fall short of the requirement in Varanasi. Surprisingly even in the non slum areas of the city there is a shortage in the number of toilets required. Primary studies indicate that these areas are mostly in the peripheral low income areas of the city. The attached table indicates this gap.

Table 4- Gap in access to toilets

Total HHs in Varanasi MC Areas	HHs Non Slums	HHs in Slums	HHs Connected to Sewerage System	HHs without Toilets within their premises
243782 (2010)*	156496*(2010)	87286** (2010)	103743***	23496*** (Non-Slum) 13244*(Slums)

*CEPT Estimates, 2010,**DUDA, Varanasi, ***SLB Information based on 2009 data

The attached chart shows the different agencies involved in the provision of the public and community toilets in the city

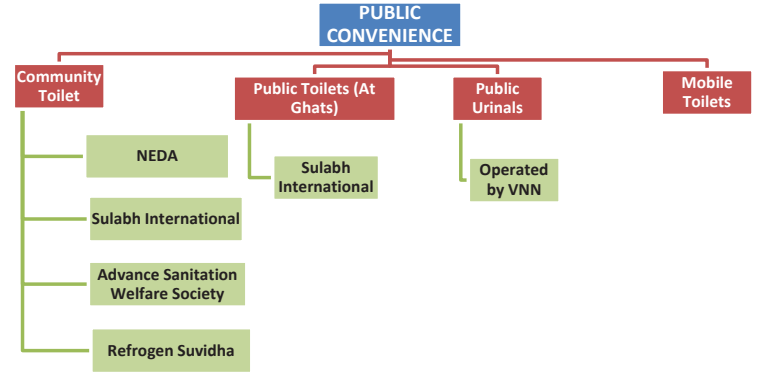


Figure 10- Agencies involved in public toilet provision

Figure 11- Agencies involved in public toilet provision

2.2.1.1 Community Toilets

Community toilets are the toilets which have been constructed in the city to provide access to toilets to the urban poor. These are provided in slums and areas inhabited by the economically weaker sections to provide access to toilets to these sections. Community toilets in Varanasi are operated by Sulabh International Ltd., NEDA, Advance Sanitation Welfare Society, Refrogen Suvidha, and DUDA. However, DUDA has handed 33 facilities to Sulabh and 4 to NEDA. A charge of Rs.30/HH is collected for the use of such community toilets. Condition of many of these toilets is not

satisfactory. Further, many of the CDS households are not willing to pay the charges for use of the toilet facilities.

Table 5: Service provider of Community Toilets

No.	Name of service provider	No of Toilets
1	Sulabh International	72
2	NEDA	12
3	Advance Sanitation welfare Society	6
4	Refrogen Suvidha	6
		96

(Source: Sulabh Internaltional)

2.2.1.2 Public Toilets

Public toilets are the toilets built in tourist and public areas. One of these places is the Ghats, where there are 12 toilets, each of which is operated by Sulabh International.

A charge of Rs. 2 is collected for the use of these toilets. The details of the public toilets are further elaborated in the table attached.

Table 6: Toilets along the Ghats

Sr. no	Location	Capacity (seat)
1	Assi Ghar	10
2	Chowki Ghat	10
3	Hanuman Ghat	10
4	Scindiya Ghat	10
5	Manikarnika GHat	10
6	Dashashwamedh ghat	20
7	Khrikiya Ghat	5
8	Malviya Bridge	10
9	Rajghat	10
10	Prahlad Ghat	10
11	Trilochan ghat	10
12	Gai Ghat	10

2.2.1.3 Public Urinals

Public Urinals have been constructed and operated by VMC. There are around 75 public urinals most of which have either location or maintenance issues. The designs of urinals are such that it is constructed directly on the road side drains without flush.

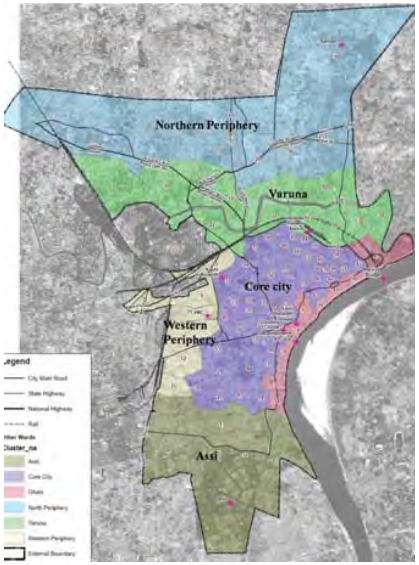
The design of these urinals are not at all gender sensitive and can't be used by the women.

2.2.1.4 Mobile Toilets

There are three mobile toilets in the Varanasi city. One of these toilets is permanently placed near the Dashaswamedh Ghat, which is onfof the most visited places in the city. All the toilets are owned and operated by Sulabh International. The mobile toilets become essential during the festive seasons when there is a large surge of tourist population.

2.2.2 Situation Analysis

The demand supply gap for present and future are detailed in this section. This is based on the primary surveys undertaken by CEPT, in the various clusters of the city. The attached map shows the various clusters identified for the same.



Map 1- Primary survey zones

2.2.2.1 Toilets for Residential Population

The tables below show the access to sanitation in different clusters. The analysis is segregated into two sections viz. Slums and Non-slums. The most critical cluster with respect to open defecation is the cluster of wards along the Assi Nalla (39.1%). These include ward no. 8, 10, 13, 28 and 32.

Table 7: Access to various types of toilets in Notified Slums from HH survey

	Census 2001		Access to Various Types of Toilet- Slums			
Cluster Name	HH	Population	% Septic Tank	% Sewerage Connection	% Open Defecation	% Community
Northern Periphery	17641	135210	49.7%	22.4%	**23.8%**	4.2%
Varuna	22619	161578	5.4%	71.4%	**23.2%**	0.0%
Assi	9587	75252	8.7%	32.6%	**39.1%**	19.6%
Western Periphery	11166	85825	0.0%	42.2%	**31.3%**	26.5%
Ghats	19175	135667	42.3%	38.5%	**7.7%**	11.5%
Core City	69745	498386	23.9%	60.2%	**2.7%**	13.3%

(Source: HH Survey Analysis)

The analysis of the data on non slums showed open defecation most prominent in the cluster of wards in the northern periphery (15.7%). This cluster includes ward no. 3, 5, 6, 19, 26,27,30,33, and 36. This may be due to the proliferation of urban squatters along the northern periphery of the city, that are, yet not classified as slums.

Table 8: Access to various types of toilets in non slums from HH survey

	Census 2001		Access to Various Types of Toilet- Non Slums			
Cluster Name	HH	Population	% Septic Tank	% Sewerage Connection	% Open Defecation	% Community
Northern Periphery	17641	135210	47.1%	33.9%	**15.7%**	3.3%
Varuna	22619	161578	6.5%	91.3%	**0.0%**	2.2%
Assi	9587	75252	25.0%	73.9%	**1.1%**	0.0%
Western Periphery	11166	85825	6.5%	88.6%	**2.4%**	2.4%
Ghats	19175	135667	0.4%	97.9%	**0.0%**	1.7%
Core City	69745	498386	0.5%	99.1%	**0.0%**	0.5%

(Source: HH Survey Analysis)

2.2.2.2 Public Conveniences

a. Community Toilets:

The demand supply gap of community toilets has been estimated for community toilets to reach the unserved slum households. The present additional requirement of 10 seater community toilets as per the High Access and National Norms scenarios is 109 and 244 respectively.

Two scenarios have been taken for calculating the toilet demand

High Access: 1 latrine seat can serve 25 people. In Varanasi house hold size is 7.2. Therefore one latrine seat can serve 3.5 households. Proposed community toilets 10 seater modules and that will serve 35 unserved households

National Norms: For estimation of community toilets, national level most documents and policy schemes suggest that 1 latrine seat can serve 50 people. In Varanasi house hold size is 7.2. Therefore one latrine seat can serve 7 households. Proposed community toilets 10 seater modules and that will serve 70 unserved households.

Table 9. Demand of Community Toilets

Sr. No.	Name of the CDS	Total HH	HH required community toilets	Existing CTCs		Additional CTCs required (10 seater)	
				No.	No. of Seater	High Access (1 latrine seat for 25 people)	National Norms (1 latrine seat for 50 people)
1	Bama	2241	256	1	10	6	2
2	Mangalam	1681	188	1	20	3	2
3	Cds -Adishakti	2490	25	0	0	1	0
4	Gyanbapi	2010	43	1	10	1	0
5	Alaknanda	552	63	1	10	0	0
6	Varanasi	3297	598	1	10	11	**5**
7	Maa Saraswati	2213	456	2	10	8	2
8	Sabla	2029	0	3	10	0	0

Sr. No.	Name of the CDS	Total HH	HH required community toilets	Existing CTCs		Additional CTCs required (10 seater)	
				No.	No. of Seater	High Access (1 latrine seat for 25 people)	National Norms (1 latrine seat for 50 people)
				1	5		
9	Shiwangi	2236	158	2	10	3	1
10	Maa Durga	2095	53	5	10	0	0
				1	20		
11	Lanka	2217	541	3	10	7	2
				1	20		
12	Ranilakshmibai	2596	60	3	10	1	0
13	Sarangtalab	2503	262	0	0	4	1
14	Bamangi	2486	146	0	0	2	0
15	Vishal	3970	1672	0	0	34	**17**
16	Gangotri	2240	58	1	10	1	0
				1	5		
17	Saranath	1919	486	2	10	9	4
18	Koniya	2288	959	0	0	20	**9**
19	Chaman	2561	14	1	20	0	0
20	Utthan	3125	1470	1	10	31	**15**
21	Akshay	2430	449	1	10	8	4
22	Aman	5010	2112	1	10	43	**23**
23	Kalyan	3286	307	1	5	6	2
24	Jagruti	2325	115	0	0	2	1
25	Narisewa	2987	10	0	0	0	0
26	Navjyoti	2733	46	1	20	1	0
				1	10		
27	Azad	2120	62	0	0	1	0
28	Sagar	1807	811	2	20	12	**5**
29	Kalbhairav	2097	165	1	10	3	2
30	Maa Ganga	2213	421	1	10	8	5
31	Vishwanath	2297	229	2	10	2	1
				1	20		
32	Bindhawasini	1811	122	0	0	2	1
33	Baba Shekh	2641	33	1	20	0	0
34	Maa Dhup Chandi	2480	474	3	10	8	2
				1	20		
35	Benajir	1439	320	1	20	6	3
36	Kashi	2861	60	1	10	0	0
		87286	**13244**			**109**	**244**

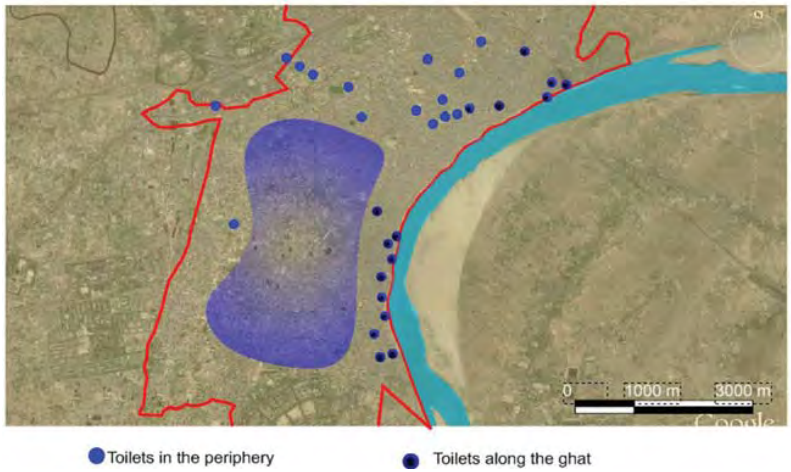
However the proposed number of community toilets may be split in multiple configurations such as to ensure higher accessibility.

2.2.2.3 Public Toilets

The city of Varanasi has only twelve public toilets. The condition of these toilets is far from usable. There are many areas requiring immediate provision of public toilets. The attached map shows the location of the existing public toilets in the city. The highlighted area, shows how a substantial part of the core city does not have any access to public toilets.

The land use in this area is a combination of commercial and residential uses. It can be seen that the Assi cluster (from the HH survey zones), which has been identified as one of the hot spots for open defecation in the city, is deficient in toilets.

It is recommended that these areas need to be covered with public toilets immediately.



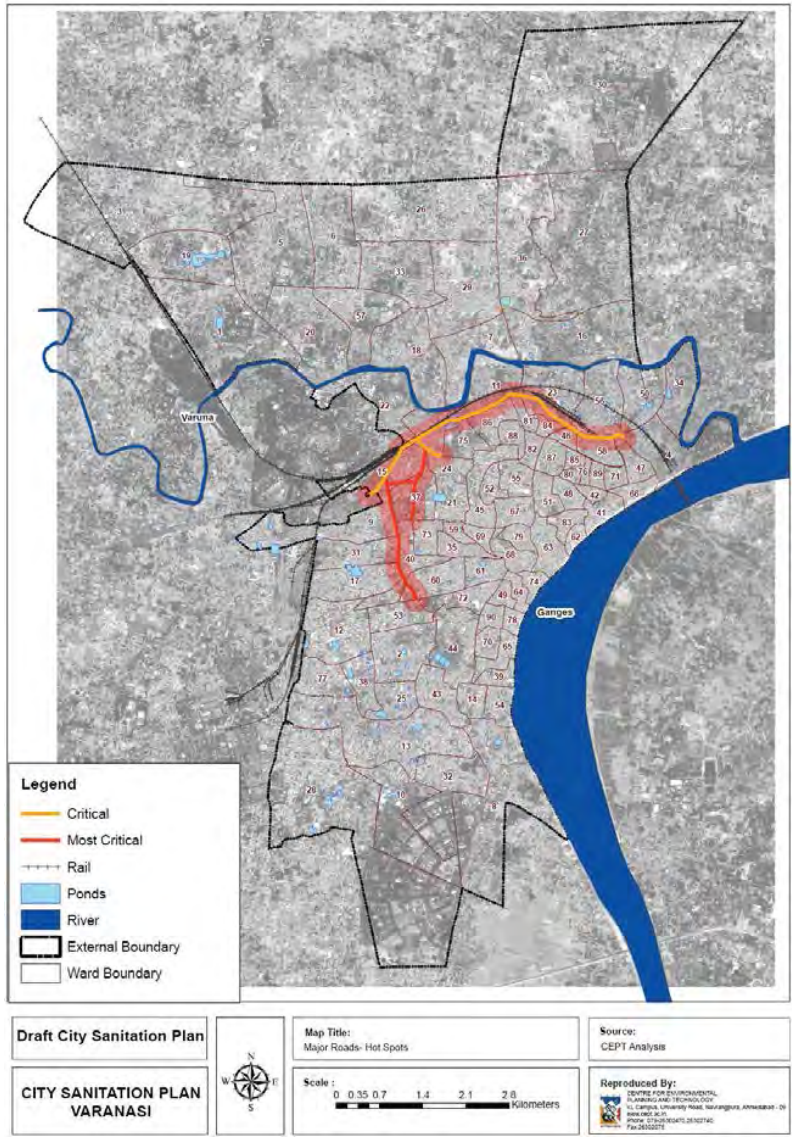
Map 2- Location of Public toilets

2.2.2.4 Public Urinals

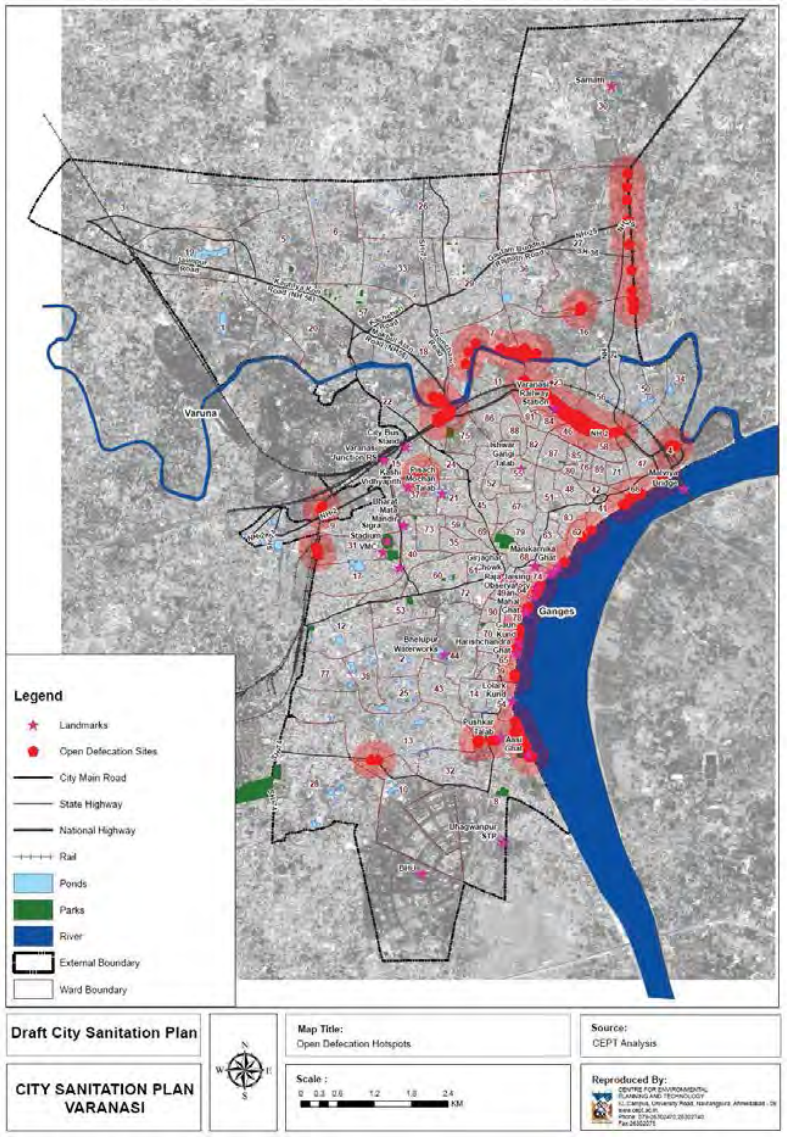
Open urination is another pressing sanitation issue in Varanasi. The visits indicate that open urination is most rampant in the stretches of Vidhyapith Road and the stretch between Railway station and Bus Stand. Both stretches have high frequency of commuters. The attached map gives an idea of the same. A lack of urinals at regular intervals combined with the poor status of present urinals creates conditions for open urination.

Having studied the existing levels and quality of infrastructure the maps with the areas which are critical from the sanitation specifically toilets point of view have been identified on the maps.

These shall assist in designing the spatial interventions in these areas. The gap in the number of toilets required is proposed to be substantiated by the community toilets and public toilets.



Map 3- Critical road stretches wrt open urination



Map 4- Open defecation hotspots

2.2.2.5 Institutional structure

The public toilets are maintained by private operators and are subject to cost recovery. Toilets unlike the other verticals of infrastructure require a much higher component of their capital cost as their operations and maintenance.

The community toilets are planned by DUDA and also VMC, while the public toilets have been provided by the VMC.

2.3 Key Issues

The key issues have been segmented in terms of the various attributes like open urination, open defecation and the various categories of toilets.

2.3.1 Open Urination

- Areas like Ghats, Railway tracks, bus stands, Sunder pur market area, some major road stretches (like Vidyapith road, IP mall road, Lahartara Road,etc.)
- Overall Cleanliness and Maintenance of grossly inadequate, causing unhygienic and aesthetic problems.
- The toilets are not gender sensitive

2.3.2 Open Defecation

- Areas like Ghats, Railway tracks, Assi nullah catchments, and other water bodies are major hotspots in the city
- The Open defecation in the city can be catagorized as under:
  - Slums HHs without Toilet Access/ Limited toilet access
  - Pilgrims/ Floating Populations
  - Cultural Habits of local residents

2.3.3 Household Toilets

- Septage management in the city is a major issue
- The present system is very informal and involves a great deal of human interface leading to exposure to health risks.

2.3.4 Community Toilets

- Cleanliness and Maintenance is substandard
- Water supply and disposal of these toilets is at times is not as per standards
- In case of family with more than 5 members, people have to spend more, as the card of Rs. 30 per month is for a family with 5 members only. This charge is a great hindrance for Slum CDS members, often resorting to open defecation

2.3.5 Public Toilets

- Number and location of these facilities are not adequate
- Lack of surveillance for the maintenance of public toilets
- The basic requirement for the maintenance of public toilets is water. In case of unavailability of regular water supply from VMC, the operator has to depend on either ground water or bulk water supply which adds to the cost of maintenance.

2.3.6 Public Urinals

- Overall cleanliness and maintenance is grossly inadequate
- The toilets are not gender sensitive.
- Open and cause unhygienic and aesthetic problems

2.4 Recommendations

The recommendations are oriented at achieving the overall vision of 100% sanitation in the city. CEPT has suggested some design options for the community and public toilets. These are based on the different area availability in the city. The aspect of gender sensitivity in the toilet design has also been dwelt into.

2.4.1 Design options -Toilets

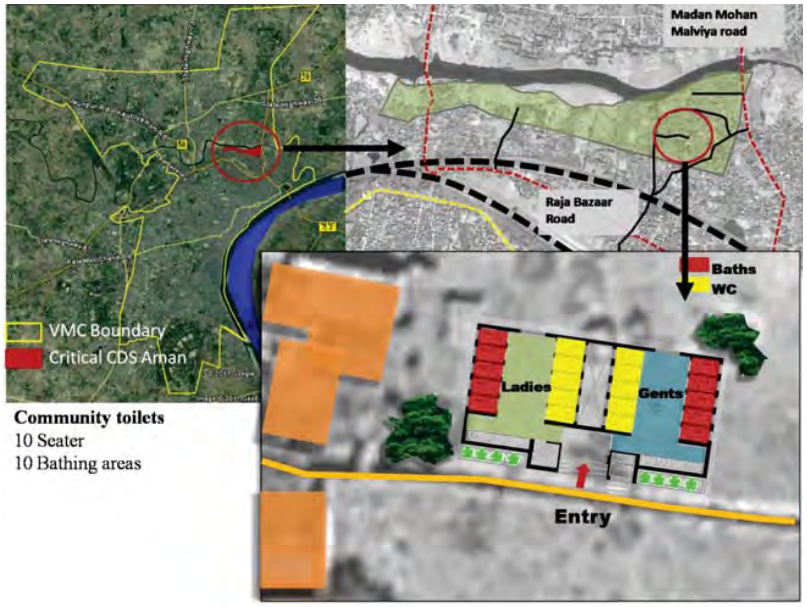
This section gives details of the various design options that may be used for provision of the deficits highlighted in the demand calculation. As suggested in the previous sections the deficits in the number of toilets required may be substantiated by Community toilets specifically operating in the

slum CDS, Public toilets located throughout the city and public urinals that shall be located along the major roads.

Since the major problems in the city are those of open defecation and open urination, it is expected that provision of the right amount of amenities in the right locations shall help in resolving these problems substantially. It has been observed that the number of facilities for women is lesser than those for men. Hence in the proposal it has been attempted to even out this difference.

2.4.1.1 Community toilets

The community toilets operate in the slum areas. They need to have bathing facilities in addition to the WC and urinals. The deficits for toilets required slum wise has been calculated. A sample simulation has been developed for the Aman CDS which has also been identified as a critical CDS owing to the problems of excessive open defecation.



Map 5- Location of community toilet in CDS

This ten seater community toilet complex can serve 35 HH (assuming one seat serves 25 people) and 70 HH in a low access scenario wherein one seat serves 50 people.

The toilet complex shall have the outer walls dedicated for advertisements. This shall help in generating revenue and contribute in the financial sustainability of the facility. The figures below indicate the possible design option for the community toilet block.

Figure 12- Community toilet design option

2.4.1.2 Public Toilets

The public toilets are to be located throughout the city such that it caters to the floating population and the major city streets, the tourist spots. The Public toilets in Varanasi are built in PPP mode, mainly by four operators - Sulabh International, NEDA, Advance Sanitation welfare Society, Refrogen Suvidha.

This strategy is conceived due to the current problems and lack of uniformity in public toilets. IT has been observed that people are averse to using the public toilets, as they are not maintained well and are in unhygienic conditions.

For public toilets there is a close relationship between design and management. Design choices should be made that allow for easy cleaning and management, resistance to vandalism, and low maintenance requirements. They should have multiple configurations to suit the different space requirements in the existing urban structure. Depending on the space constraint in the given area each one of the two modules would be constructed. Two are modules developed are:

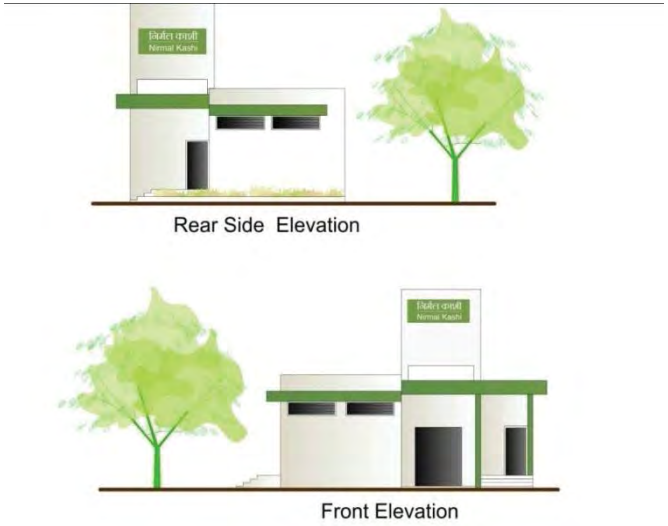


Figure 13- Public toilet design option

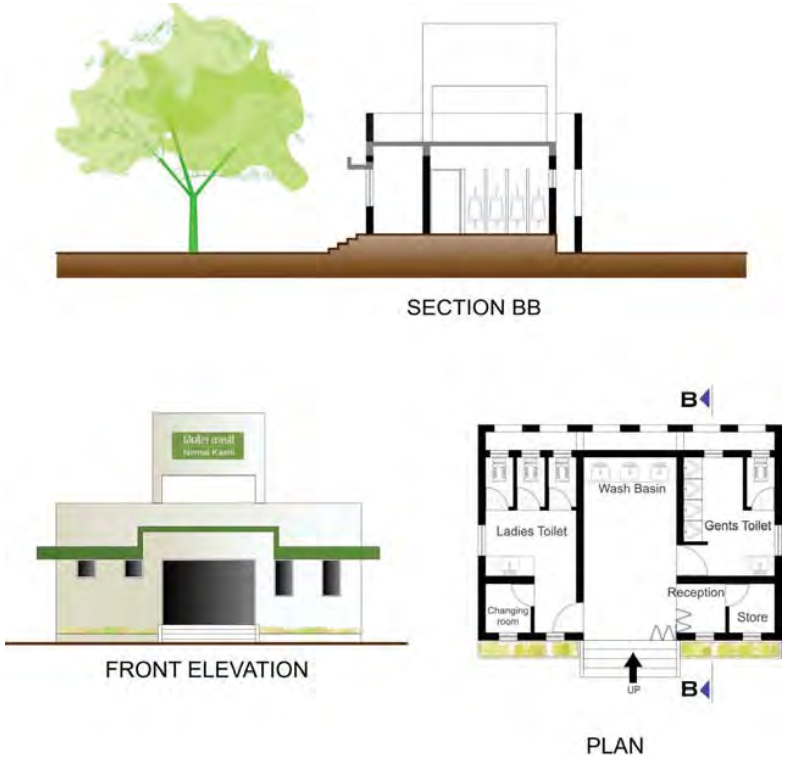


Figure 14- Design option for public toilet

The existing Kudaghars in the city have been proposed to be converted into the public toilets. The attached image gives an idea of such a transformation.

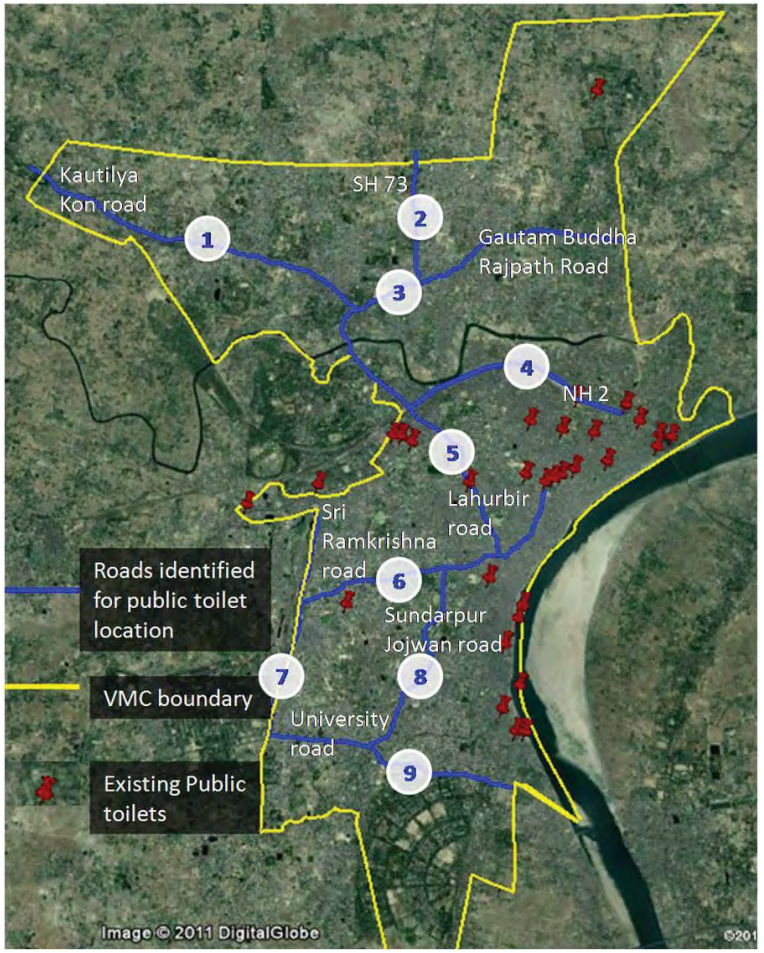
Figure 15- Conversion of *kudaghar* to public toilet -artist's impression

After mapping the existing facilities for public toilets in the city, the unserved areas have been identified. It has been proposed to construct public toilets in these locations. The public toilets have been suggested under three categories:

1. Along the Major roads
2. At the kunds

The following section details the suggested locations and configuration of the public toilets in the city.

1. Along the Major roads



Map 6- Identified road stretches for provision of public toilets

CEPT has proposed the following locations that need to be served by provision of public toilets

The total numbers of public toilets are to be spread through the major tourist locations and the major roads in the city. The map showing the need of public toilets have been proposed, considering the location of the existing amenities. This is estimate to serve the total city.

Table 10: Location of public toilets along major roads

Sr No	Name of Road	Approx Road length	Areas to be Served	Proposed Public Toilets		Remarks	
				Nos.	Type		
1	Kautilya kon road, Jaunpur road NH56	4.53	Narayanpur Bhagatpur,	2	2	This is located on the out skirts of the city. The densities are less yet toilets provided can serve the future densification	
				2	1		
2	SH 73	2.20	Sikraul	2	1		
3	SH 36, Raja Bazaar road,	6.5	Jagatganj, Adampura	2	1	This area is located along the railway track, following the NH 2. This patch has also been identified as a city level hotspot.	
				3	2		
4	Bari Bazar	1.75 km	Adampura Chavi mahal Labour and Bunkar colony	2	2	Two type 2 toilets are proposed on the Bari Bazar Road due to high density and existing LIG and Squatter settlement	
5	Lahurabir road	4	Chaitganj Chawk,	3	2	The type 2 toilets are proposed on the collector roads.	
6	Sri Ramkrishna road, Guru Nanak road,	3.25	Maulvibagh, Sidhgiribag, Gurubagh,	3	1	This is one of the dense areas of the city. The main market places and temples are located here.	
7	SH 74 , Maduadih road,	5		3	2	This is the periphery of the VMC,	

Sr No	Name of Road	Approx Road length	Areas to be Served	Proposed Public Toilets		Remarks	
				Nos.	Type		
				2	1		
8	Sundarpur jojwan road, Swami vivekanda road	3.4	Nagwa, Bhelupura, Kamchchha, Gurubagh,	3	2	The area is highly dense and is the core city area. The major market places and temples of Varanasi are located here	
9	University Road	4	Gandhinagar	2	1	Number of institutions are present The area is also developed as a commercial hub	
TOTAL				• 13 Nos. of Type 1 • 16 Nos. of Type 2			

2. Location of Public toilets along the Kunds

It has been realized that the kunds of Varanasi, need an up gradation in the Public Amenities as they attract considerable number of tourists. The table shows the suggested number and location of public toilets in the Kund areas.

Table 11: Possible location of public toilets around the Kunds

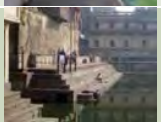
Sr. no.	Kund	Proposed Public Toilets			Image
		Nos.	Seater	Location	
1	Pishach Mochan Kund	1	10	Periphery of the Kund	
2	Duga Kund	1	10	Periphery of the Kund	
3	Laxmi Kund	1	10	Periphery of the Kund	

Figure 16: Proposed public toilet at Assi Ghat

4	Pushkar Talab	1	10	Periphery of the Kund	
	TOTAL	***4 Numbers for 10 seater***			

2.4.1.3 VIP Public toilets

Ghats are the most frequented tourist locations in the city. These are also the possible locations where the chances of private party interventions are high being commercially well located. These shall have higher footfall and also chances of cost recovery from selling advertisement rights is high.

CEPT suggests that the toilets along the Ghats should be with additional facilities, changing rooms, and plush interiors. They may have higher user charges and better level of amenities that the conventional public toilets in the city.

The attached images show the design options that may be considered.

Smart signage


Better interiors




Better Design

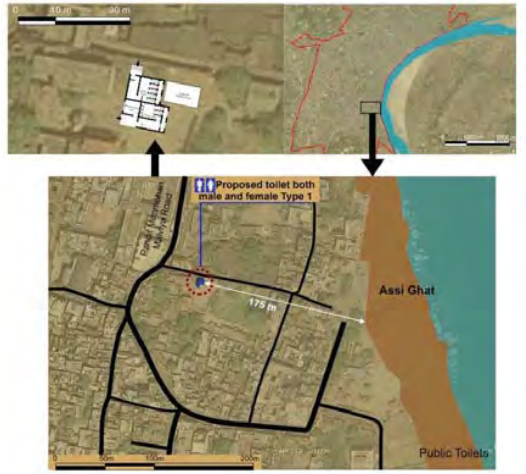


The Ghats are the stamp image for Varanasi. It has been proposed to substantiate the quality and quantity of the public amenities along the Ghats. Ghat areas are frequented by the tourists and local people. There are 12 existing public toilets on the ghats. At some of the ghats, due to the space constraints, toilets are proposed along the approach road within a radius of 100 m. Toilets are proposed along the ghats where sanitation is an issue. The table below shows the location, numbers and type of proposed public toilets.

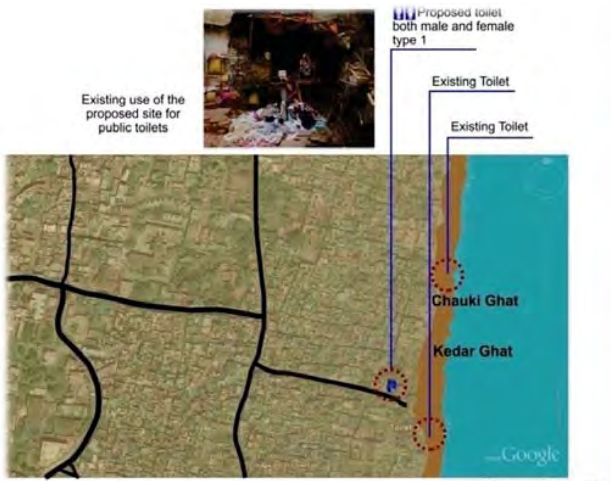
Table 12: Estimated Requirement of public toilets on the approach road of Ghats

Sr. no.	Location	Proposed Public Toilets		
		Nos.	Type	Location
1	Assi Ghat	1	Type-1	On the approach Road
2	Harishchandra Ghat	1	Type-2	Along the Ghat
3	Kedar Ghat	1	Type-1	On the approach Road
4	Manikarnika Ghat	1	Type-1	On the approach Road
5	Scindiya Ghat	1	Type-2	Along the Ghat
6	Rajghat	1	Type-2	Along the Ghat
7	Malviya Bridge	1	Type-1	On the approach Road
8	Prahalad Ghat	1	Type-1	On the approach Road
9	Chowki Ghat	1	Type-1	On the approach Road
	TOTAL	***6 Nos. of Type-1 and 3 Nos. of Type-2***		

Along Assi ghat and Kedar ghat, there are existing public toilet facilities. Since Ganga Aarti takes place on Kedar ghat the influx of tourist and local people is higher. Assi Ghat is frequented majorly by foreign tourist. Therefore additional public toilet has been proposed along the approach road of both the ghats.



Map 7- Location of public toilets at Ghats

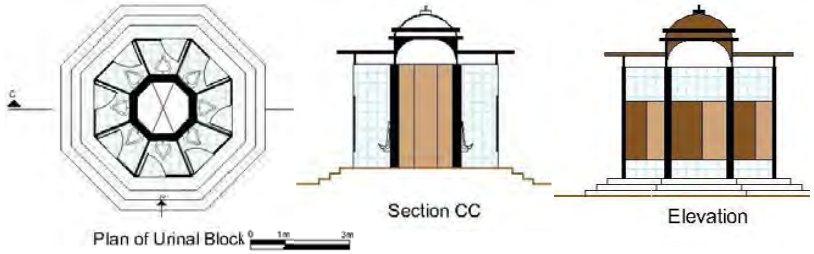


Map 8- Proposed public toilet at Kedar Ghat

2.4.1.4 Urinals

Public Urinals is another facility grossly missing in the city. CEPT has developed some simulations of the different urinal blocks. The images below give an idea of the same. Suggested urinals are located based on the existing hotspots i.e. critical road stretches, commercial areas, etc. to easy access of sanitation facility.

Two different configurations have been proposed for the Public urinals. Following types are proposed for public urinals. Type-1 of 8 blocks (4 for males and 4 for women) and type 2 of 2 blocks (either male or female). Type-1 can be proposed on the existing waste dump sites or transfer stations. Type-2 occupies less space than type-1. Since it has linear design it can be proposed along the roads that have high densities.



Type 1 Block

Type 2 Block

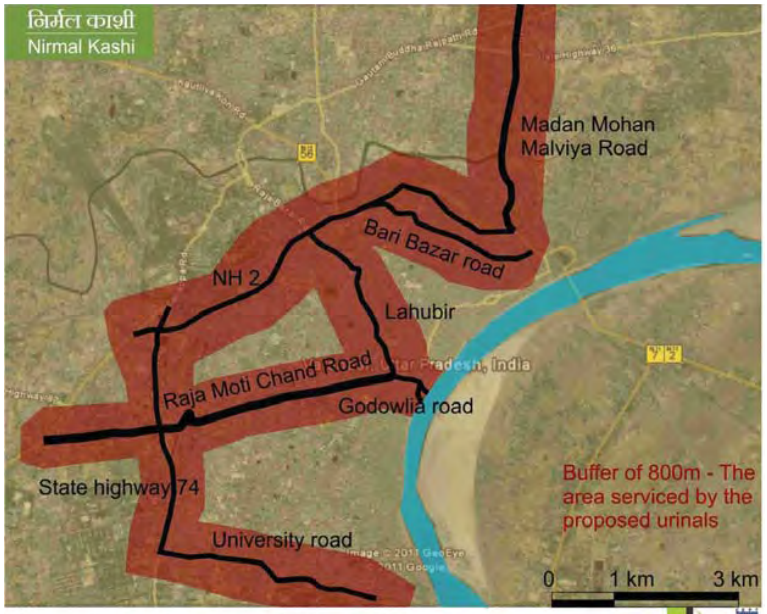
Figure 17 - Design options for urinals

The simulation below gives a glimpse of a urinal block located in a busy market area in Varanasi

Figure 18- Artists' impression of public urinal

Public urinals has been proposed on the road stretches like Raja Moti Chand, University, SH-74, Bari Bazar , Madan Mohan Malviya and Godowlia which is envisaged to serve a distance of 800 m on both the sides. The attached table shows the number and location of the public urinals along the major road stretches in Varanasi. The estimated public urinals for city of Varanasi are 8 numbers of type-1 and 19 numbers of type-2. The attached map shows the area served by the proposed public urinals located in

core city.

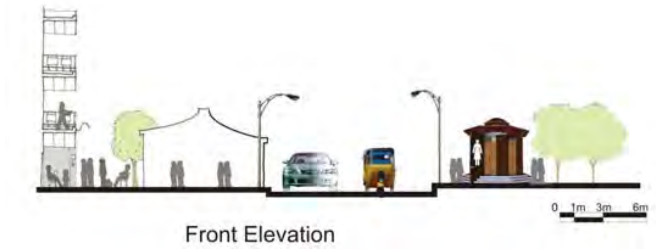


Map 9- Identified road stretches for location of Public urinals

Table 13: Estimated requirement of Public toilets in Varanasi area

Sr. No	Name of the Road	Approximate road length	No. of Public Urinals	
			Type-1	Type-2
1	Raja Moti Chand Road	6 km	2	4
2	University road	2 km	1	2
3	State highway 74	8.3 km	3	4
4	Lahubir	3.05 km	1	2
5	Bari Bazar road	1.75 km	0	2
6	Madan Mohan Malviya Road	3.7 km	1	2
7	Godowlia road	0.6 km	0	3
	Total		**8**	**19**

The attached image shows the typical elevations of the toilets and urinals placed over Varanasi streets. It has been attempted to design the options such that they may blend into the Varanasi urban form.



2.4.1.5 Comparison between the suggested design options

The suggested modules have been compared on similar parameters such that it becomes easy for the decision maker to choose from the multiple options.

Table 14- Comparison of the toilet options

Type	Specifications	Area	Disposal methods	Suitability	Ownership
Urinals (Type 1 Block of 8 Urinals)	In-situ, masonry and some precast elements	31.43 sq m and 54.98 sq m (built up + access)	Connects to the main sewer line	Near road junctions or where the influx of people is more	A contract to be given to private organization for management
Urinals (Type 2 Block of 2 Urinals)	In-situ	8.58 sq m and 11.51 sq m	Connects to the main sewer line	In area with high density at 100m centre to centre where space is the major constraint	A contract to be given to private organization for management
Type 1: Public Toilets with WC & Urinals both male(2 WC and 4 urinals) and female (5 WC)	In-situ	96.66 sq m and 101.35 sq m	Anaerobic baffled reactor	Heritage areas and areas where the floating population is high and the connection to the	The organization that maintains the heritage building or the site should maintain these

				sewage mains is absent	toilets
Type 2: Public Toilets with WC and Urinals both male(1 WC & 4 urinals) and female (3 WC)	In-situ	68 sq m and 77 sq m	To sewerage mains	Linear therefore can be on the road side where space is a constraint	A contract to be given to private organization for management
Community Toilets (5 WC and 5 baths both male and female)	In-situ	122 sq m and 138 sq m	To sewerage mains	In slums for households that do not have access to sanitation facilities	A contract to be given to private organization for management

2.4.2 Policy interventions

2.4.2.1 Adoption of community toilets by the public toilets

Toilets demand more operations and maintenance than the other sanitation infrastructure. The community toilets are lesser lucrative as a business model than the public toilets owing to

- Their location- in the CDS
- The user group with lesser paying capacity

The income from the community toilets in residential low income settlements can be lower than the requisite O&M costs. Hence O&M costs of a community toilet which is not self supporting can be cross subsidized by toilets in the commercial areas, if a single agency is assigned the responsibility to maintain a group of toilets.

The community toilets and the public toilets can be given as a package to the private entity for operations and maintenance. The income from the advertisements and the surplus if any from the O&M of the public toilets shall be used to maintain the community toilets.

Thus the public toilets shall in a way adopt the community toilets. The attached image illustrates the same.

It is also recommended that the private operators should collect the user charge for the community toilet based on the number of users in the family. Individual cards may be provide for a monthly fee to avoid mal practices and ensure sanitation for all. The VNN should mandate the same and ensure the enforceability.

Figure 19- Community and public toilet package

2.4.2.2 Public Toilet Map

The tourist locations can have a map of the location of the nearest toilet. The other toilets may also be mapped. Many cities have adopted such practices of linking toilets with the various tourist attractions. The attached visuals give a glimpse of the same. These are the locations of public toilets in the various locations in the city of Melbourne.

Map 10- Public toilet map of Melbourne

Australia has developed an online map for the locating toilets in the city. Area wise details are entered for each part of the city. The type and the exact location can be found. Varanasi can also develop on similar lines. This shall also ensure a proper computerized sanitation management database for the city.

2.4.2.3 Specifications for toilet design

It has been observed that the public toilets are of poor workmanship, use sub standard materials and are ill located. CEPT believes that the design and construction of the public toilets should adhere to basic minimum technical standards. A guideline for the same had been postulated by the Ministry of Urban Affairs and Employment. It specifies the

- Detailed toilet specifications
- Certain suggested design options
- Lighting standards
- Technical specifications
- Process of identifying the right location for the toilets based on
  - Access
  - Safety
  - Inclusivity
- Right signage
- Operation and maintenance schedule and standards
- Suggested treatment systems
- Suggested business models for public toilets
- PQ for selection of the private parties

These guidelines were drafted during 1995. This should be revised and then institutionalized by the corporation, such that all new toilet design and construction should comply with the manual.

2.4.2.4 Design and construction of toilets to be taken as DPR

Public toilet as a facility, the experience in India, shows are victims of poor maintenance and workmanship. CEPT recommends that the design and construction of public toilets be taken up through the DPR approach such that the private party is aware of the standards to adhere to. Gradually the city corporation should look to develop an ideal DPR which has the design as well and the operations and maintenance specifications, which can become a model for public/community toilet design.

The DPR should also carry a detailed study of the number of toilet seats required for the different categories like public and community. An estimation of the same has been provided earlier. However the exact location and the choice of design need to be undertaken through the DPR.

The DPR can be further split in two phases such that the

2.4.2.5 Monitoring systems

Public toilets in the country announce their existence more by the foul smell they are associated with than signage in the country. This indicates that the facilities are often not maintained well. The huge investment in construction of toilets becomes redundant when the facility is not used owing to the lack of maintenance. CEPT suggests a tri partite system of monitoring the maintenance of the public toilets. The details have been explained in the attached table.

Table 15- Monitoring system for Public toilets

Who	Mode	Frequency	Remarks
Users	User report card	Weekly	The operator shall have to maintain the URC for at least 1% of the users.
Operator	Cleaning schedule	Daily	They will have to maintain a log and should be able to produce when asked for.
VMC	Flying checks	Bi- monthly	They shall verify the URC and the operator's log.

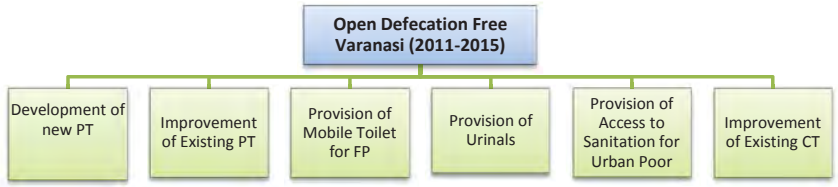
2.5 Action Plan

Open defecation free city is one of the major goals of city sanitation plan. Hence the actions suggested are mostly short term interventions.

	Short Term	Medium Term	Long Term
Community Toilets			
	Provision of community toilets and Renovation of existing Toilets. Creation of 1in 50 shared toilet seats Develop participatory models- identification of private operator Public Awareness campaigns	Creation of 1in 25 shared toilet seats. Public Awareness Campaigns	100% individual toilets Community owned maintained and created.
Public Toilets			
	Maintenance of existing public toilets. Proper end disposal, creation of new facilities. Identification of Private operator	100% demand driven supply, with 100% coverage of all tourist areas. Public Awareness.	100% demand driven supply , with 100% coverage of all tourist areas. Public Awareness.
Mobile Toilets			
	Provision of Adequate number of mobile toilets for Tourist Population.		
Public Urinals			
	Provision of Public Urinals along major roads at regular.		

2.6 Capital and O/M Costs

Under the larger vision of Open Defecation free Varansi, various sub packages have been discussed. The time frame for the implementation of the current package would be immediate from 2011 to 2015. The details of each sub package are discussed in subsequent sections.



1. Development of new Public Toilets

The table below presents the indicative capital and maintenance costs for public toilets. It is proposed that premium toilets would be provided in Ghats and Kunds and non premium toilets would be provided along the roads.

Table 16: Summary of estimated cost for the sub package

Sr. No.	Details		Estimated Unit	Unit Rate Rs in Million per block	Cost (Rs in millions)
A.	**Capital Costs**				
1	Provision of Public Toilet (10 seats)	Non Premium	13	1	13
2		Premium	10	1.75	17.5
3	Provision of Public Toilet (5 seats)	Non Premium	3	0.5	1.5
4		Premium	16	0.75	12
	Total Capital Cost				**44**
B	**O & M**				
1	O & M Cost (for all toilets)			-	**6.5 per year**

2. Improvement of Existing Public Toilets

The table below presents the indicative investments and yearly O&M for renovation of existing public toilets. It is proposed that the existing toilets would be upgraded to premium toilets since most of them are located near the Ghats.

Table 17: Summary of Estimate cost for the sub package

Sr. No.	Details	Unit	Unit Rate Rs in Million per block	Cost (Rs in millions)
A	**Capital Costs**			
1	Improvement of the Existing Public	12	0.1	**1.2**

	Toilet			
B	**O & M**			
1	O & M Cost for all toilets/year	12		**1.73 per year**

3. Provision of Mobile Toilets

In Varanasi, mobile toilets become very important during the festive seasons due to a sudden inflow of tourists in the city. Mobile toilets hence are proposed to take care of such situations. The table below presents the indicative capital costs and yearly O&M for mobile toilets.

Table 18: Summary of estimated cost for the sub package

Sr. No.	Details	Unit	Unit Rate Rs in Million per block	Cost (Rs in millions)
A	**Capital Cost**			
1	Estimated Capital Cost for Mobile Toilets	10	0.9	**9**
B	**O & M**			
1	O & M for all toilets/year	10	0.09 (per unit/year)	**0.9**

4. Provision of Public Urinals

It is proposed to provide public urinals along major roads. These toilets would include facilities for both male and female citizens.

Table 19: Summary of estimated cost for the sub package

Sr. No.	Details	Estimate Unit	Unit Rate Rs in Million per block	Cost (Rs in millions)
A	**Capital Costs**			
1	Estimated capital cost for public urinals (8 Seats)	8	0.18	1.4
2	Estimated capital cost for public urinals (2 Seats)	19	0.1	1.9
	Total			**3.3**
B	**O & M**			
1	O & M Cost for all urinals	-		**0.33 (per year)**

5. Provision of Access to Sanitation for Urban Poor

The access to sanitation for urban poor may be provided by means of community toilets. The community toilets here are estimated based on 50 users/ seats for all the slums.

Table 20: Summary of estimated cost for the sub package

Sr. No.	Details	Estimated Unit	Unit Rate Rs in Million per block	Cost (Rs in millions)
A	**Capital Costs**			
1	Community Toilets (10 Seats)	109	1.0	**19**
B	**O & M**			
1	O & M Cost for All Community Toilets	109	0.096	**10.5 (per year)**

6. Improvement of Existing Community Toilets

This table below presents indicative capital costs for improvement of existing community toilets.

Table 21: Summary of estimated cost for the sub package

Sr. No.	Details	UnitS	Unit Rate Rs in Million per block	Cost (Rs in millions)
A	**Capital Costs**			
1	Improvement of the Existing Community Toilet	96	0.1	**9.6**
B	**O & M**			
2	O & M Cost all community toilets	96	0.096 (per year)	**9.2 (per year)**

7. Total Costs

The table below summarizes the capital and O/M costs for the projects.

Project Description	Year wise Work Progress				
	2012	**2013**	**2014**	**2015**	**2016**
	40%	60%	80%	90%	100%
Capital					
Development of New Public Toilets	16.6	8.3	8.3	4.2	4.2
Improvement of the Existing Toilet	1.2	0.0	0.0	0.0	0.0
Mobile Toilets for Floating Population	3.6	1.8	1.8	0.9	0.9
Provision of public urinals	1.3	0.7	0.7	0.3	0.3
Provision of Access to Sanitation to Urban Poor	43.6	21.8	21.8	10.9	10.9
Improvement of the Existing Community Toilet	9.6	0.0	0.0	0.0	0.0
Sub Total	**75.9**	**32.6**	**32.6**	**16.3**	**16.3**
O/M					
Development of New Public Toilets	1.6	2.4	3.2	3.6	4.0
Improvement of the Existing Toilet	1.7	1.7	1.7	1.7	1.7
Mobile Toilets for Floating Population	0.4	0.5	0.7	0.8	0.9
Provision of public urinals	0.1	0.2	0.3	0.3	0.3
Provision of Access to Sanitation to Urban Poor	4.2	6.3	8.4	9.4	10.5
Improvement of the Existing Community Toilet	9.2	9.2	9.2	9.2	9.2
Sub Total	**17.2**	**20.4**	**23.5**	**25.1**	**26.6**
Total	**93.1**	**52.9**	**56.0**	**41.3**	**42.9**

(All figures in Rs. Millions)

Annexure II- Sewage Management

3 Sewage Management

The safe confinement, collection and safe disposal of the sewage generated is one of the preliminary goals of the NUSP. This chapter deals with the present status of generation, conveyance and safe disposal of sewage and recommendations to improve the present system.

3.1 Overview

In Varanasi, to understand the status of service levels in different sectors a Service Level Benchmarking was carried out. The results of Service Level Benchmarking for sewerage system are shown below:

Table 22. SLB indicators for Sewerage System

Performance Indicator	Benchmark	Status	Reliability Scale	Remarks
Coverage of Toilets	100%	100%	NA	Does not include the slum areas
Coverage of wastewater network services	100%	77.87%	C	Does not include the slum areas
Collection efficiency of wastewater networks	100%	27.67%	D	No records for wastewater generated available
Adequacy of wastewater treatment capacity	100%	0.00%	NA	No secondary treatment available
Quality of wastewater treatment	20%	NA	NA	No reuse or recycling carried out
Extent of reuse and recycling of treated wastewater	100%	NA	NA	No secondary treatment available
Extent of cost recovery in wastewater management	80%	44.31%	B	4 months data available
Efficiency in redressal of customer complaints	90%	88.60%	B	Financial data
Efficiency in collection of sewerage charges		56.51%	B	Financial data

(Service Level Benchmarking Data)

It can be inferred from SLB data that the overall conditions of sanitation situation in the city looks bleak. The coverage of network is only 78% and hence a large chunk of population depends on onsite disposal of sewage. This is essentially true along the periphery of the municipal corporation.

3.2 Assessment

3.2.1 Sewage Generation

Total sewage generated in the city is 233 MLD (assuming 80% of the water supplied[3]). The present ward-wise generation of sewage and the expected sewage generation for future are shown in the table below. The water supply here has been estimated separately for slums and non slums and includes water losses.

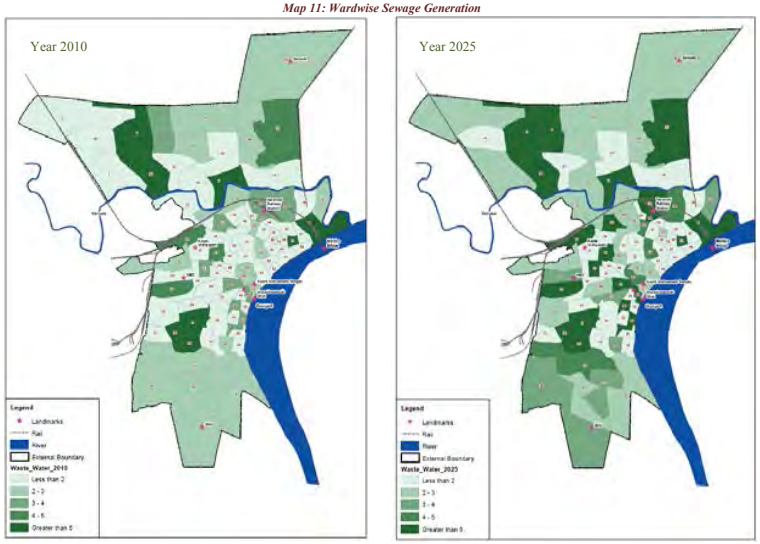
Table 23. Ward-wise Sewage Generation

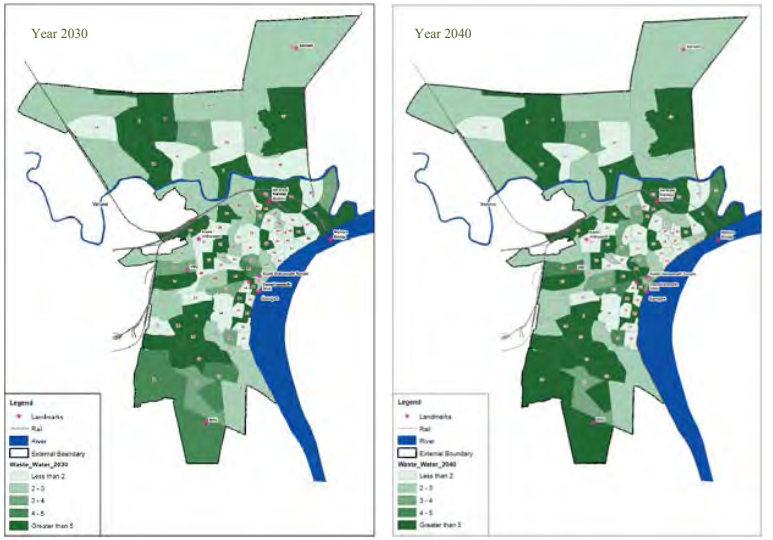
Ward No.	Sewage Generation (TPD)				Ward No.	Sewage Generation (TPD)			
	2010	2025	2030	2040		2010	2025	2030	2040
1	2	2	2	2	46	2	2	2	2
2	5	9	10	13	47	1	2	2	2
3	2	2	2	3	48	2	2	2	2
4	5	10	11	16	49	1	2	2	2
5	6	14	17	23	50	1	2	2	2
6	3	5	6	8	51	2	4	5	6
7	5	9	10	12	52	2	2	2	2
8	2	2	3	3	53	1	1	1	1
9	2	2	2	3	54	1	1	2	2
10	2	3	3	3	55	1	1	1	1
11	2	3	3	3	56	3	4	5	5
12	2	2	3	3	57	1	1	1	1
13	3	4	5	6	58	2	2	2	2
14	2	3	3	4	59	2	2	2	2
15	4	7	8	9	60	2	2	3	3
16	2	2	2	2	61	4	6	7	9
17	4	6	6	7	62	2	2	2	2
18	2	2	3	3	63	2	2	2	2
19	1	1	2	2	64	3	5	5	6
20	6	13	16	21	65	3	5	6	7
21	4	7	8	10	66	2	2	2	2
22	2	2	2	3	67	1	1	1	1
23	3	6	6	8	68	3	4	4	5
24	1	1	1	2	69	1	1	2	2
25	5	12	15	21	70	1	1	1	1
26	2	3	3	3	71	6	10	11	14
27	4	11	14	19	72	2	3	4	4
28	3	4	4	5	73	4	6	7	8
29	1	2	2	2	74	2	3	3	3
30	2	2	3	3	75	4	5	6	7
31	2	3	3	4	76	1	1	1	1
32	3	4	4	5	77	2	2	2	2
33	2	3	3	3	78	1	2	2	2
34	3	4	4	4	79	2	3	3	4
35	1	2	2	2	80	1	2	2	2
36	2	2	2	3	81	1	1	1	2
37	2	2	2	2	82	2	4	4	6
38	5	8	9	11	83	1	1	1	1
39	2	2	2	2	84	3	6	7	8
40	2	2	2	2	85	2	2	2	3
41	1	2	2	2	86	2	2	2	3
42	2	2	2	2	87	1	1	1	1
43	2	2	2	2	88	1	2	3	3
44	1	2	2	2	89	1	1	1	1
45	2	3	3	3	90	3	6	7	8
Floating Population						6	6	6	6
Total						***233***	***323***	***359***	***431***

(Source: CEPT Analysis)

[3]The water demand has been calculated separately for slums and non-slums. For non-slums the water demand has been calculated at the rate of 150lpcd and for slums at 40 lpcd

Map 11: Wardwise Sewage Generation

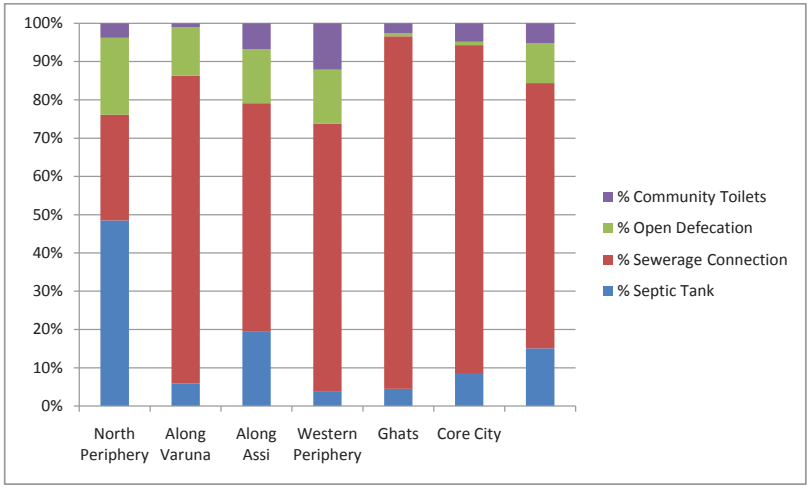




3.2.2 Coverage of Sewerage Network

The table below shows the coverage of sewerage system and septic tanks in the Varanasi Municipal Corporation both in slums and non slums. The data is based on household survey carried by CEPT University.

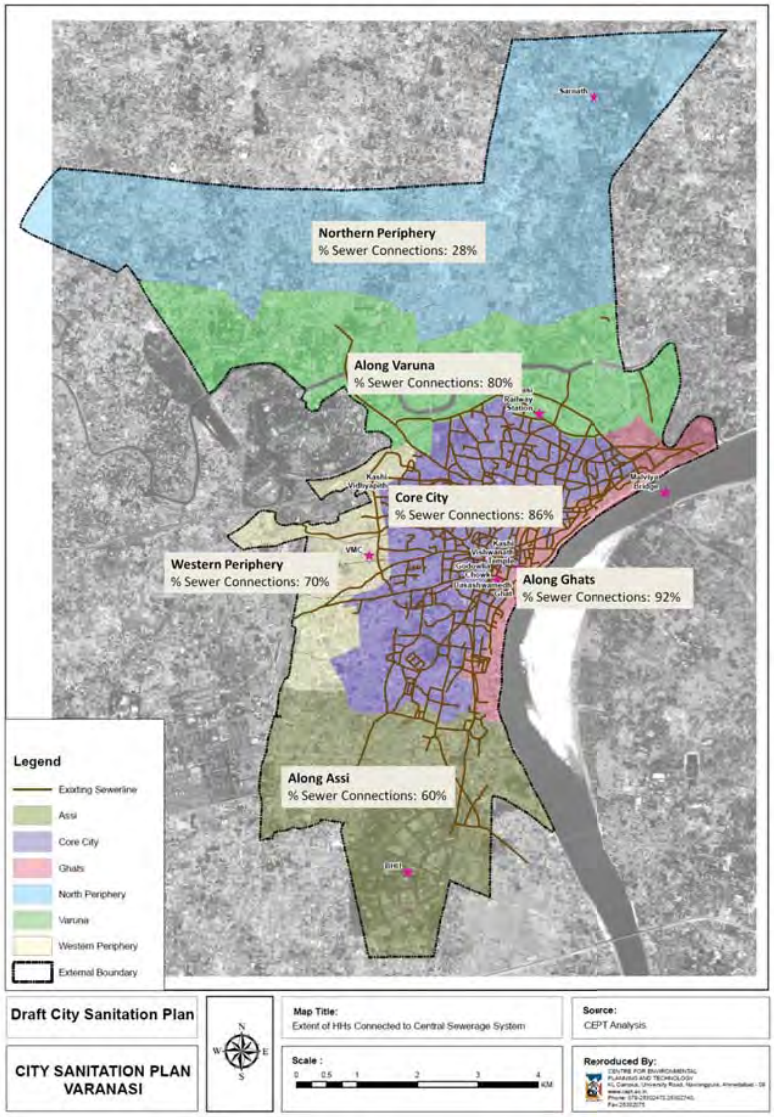
Figure 20. Distribution Of Various HH Sanitation Systems



(Source: HH survey)

It is evident from the table that the peripheral areas of the city mostly lack access to sewerage system and depend heavily on onsite disposal mechanism like septic tanks. The map below shows different clusters and existing sewerage network in the Varanasi Municipal Corporation.

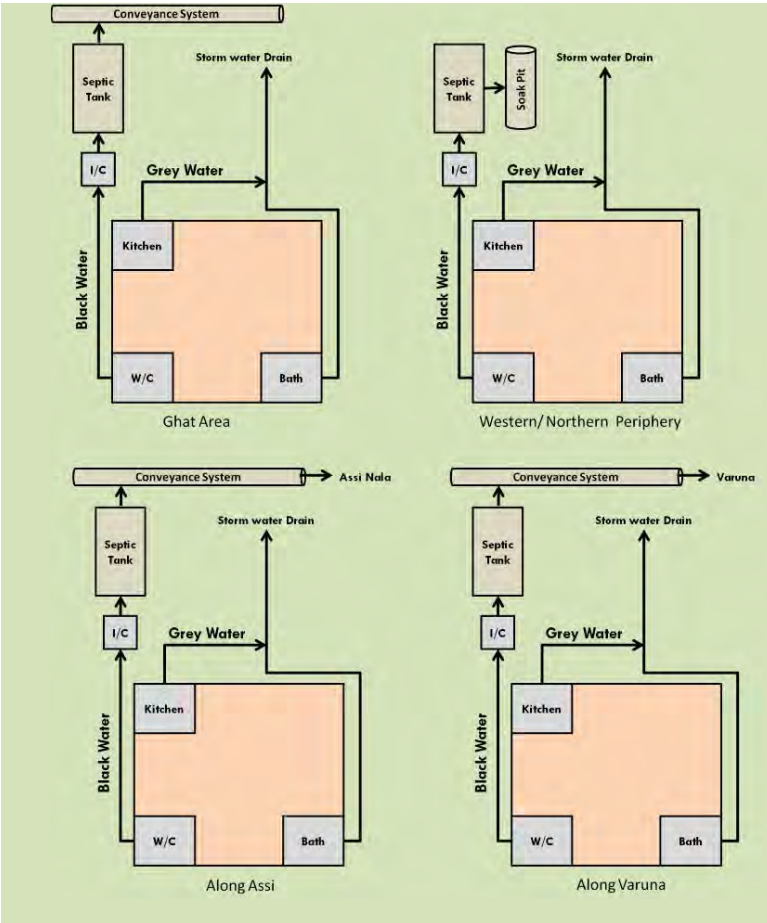
Map 12. Sewerage System Coverage



3.2.3 Conveyance

3.2.3.1 On Site

The onsite disposal system in Varanasi is mainly septic tanks and it is present mainly in the periphery of the city. The disposal mechanism through septic tanks in various clusters is depicted in the box below. As exhibited, the overflows of these septic tanks are often connected to storm drains or disposed off to nearby fields, leading to serious surface or land pollution. With the expansion of the sewer network in the city, it is reported that, in 2009, about 103743 Households were connected to the existing sewerage system. CEPT field observations indicate that in spite of having access to sewer lines, many of these households continue to use their septic tanks.



Household septic tanks, in most households, are not cleaned at regular intervals, leading to poor treatment of the sewage. At present, the septage generated is cleaned by sweepers manually with spades and shovels and collected in tractor trolleys. The septage, is then disposed off , arbitrarily, on city outskirts. The whole practice of septage management hence, at present, poses a great ***risk to human health*** as well as to water and land environment. The present practice of septage management invloves a lot of human inteface. The practice is almost similar to manual scavanging.

Interview with Mr. Ramesh, Contract Labour, VMC

Ramesh works as a sweeper with VMC on contract basis. His monyhly salary is around Rs.2000. Sweepers like Ramesh also clean the septic tanks for a sum of Rs.2000-3000. The cleaning of the septic tanks is done through spades and showels manually.

The Employment of Manual Scavengers and Construction of Dry Latrines (Prohibition) Act, 1993
prohibits manual scavengers.

As per the act-
"manual scavenger"- means a person engaged in or employed for manually carrying human excreta and the expression "manual scavenging" shall be construed accordingly;

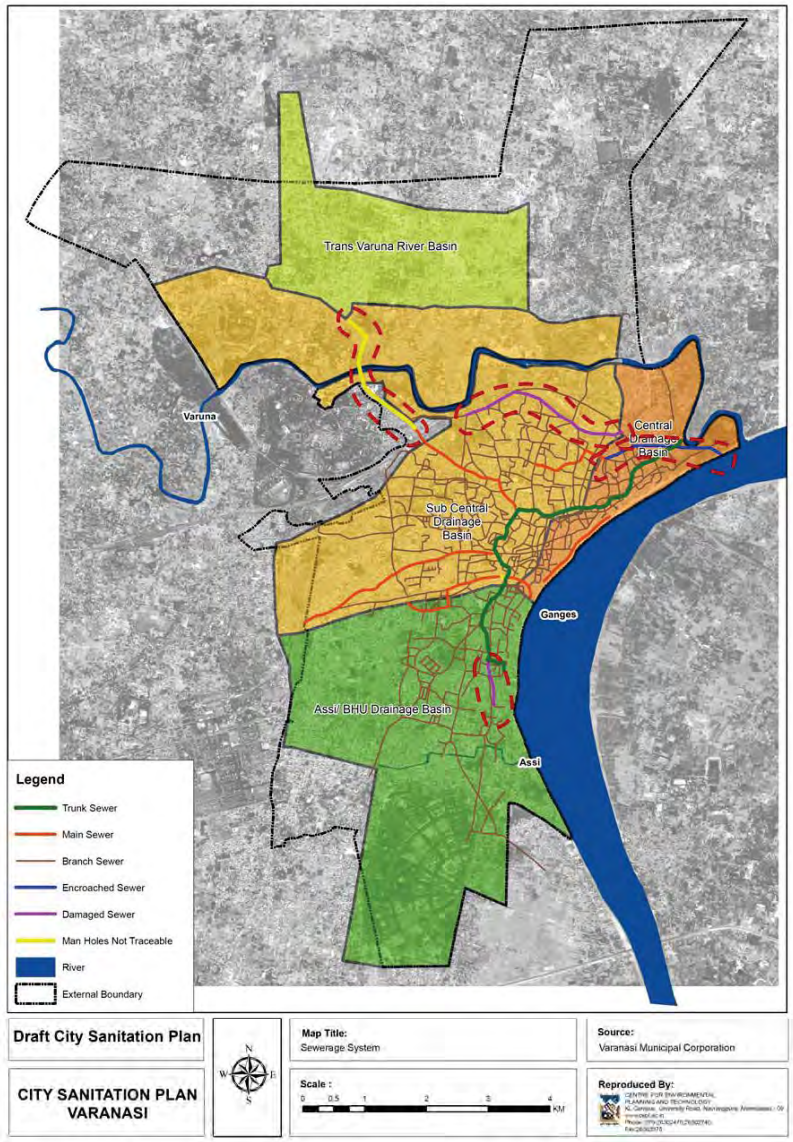
Figure 21: Discharge of Grey Water in Drains

3.2.3.2 Off Site

The VMC area is divided into 4 zones for the purpose of sewerage system. The existing sewer network in Varanasi is almost 400km long and covers primarily the old city, comprising mainly of the Ghat area. Entire trans Varuna and nearly 50% part of Cis -Varuna area is un-sewered. The map below shows the coverage of sewerage network in the Varanasi Municipal Corporation. The map also shows the ***damaged, encroached and links in which manholes are not traceable***. These are the sections which require immediate attention and revival and are highlighted by red dashed lines in the map.

The existing sewer lines in the city are more than 100 years old and are prone to choking and leakages. Due to presence of silt and garbage in the sewer lines, the carrying capacity gets drastically reduced resulting in choking and the overflowing of sewage on the roads. The natural water bodies and the river Ganges in the city are in a critical state due to the quantum of untreated sewage and waste entering the rivers on a daily basis.

Map 13. Sewerage System in Varanasi



3.2.3.3 Proposals under JnnURM, JICA and GAP for Conveyance[4]

In Varanasi the work of sewerage system (sewer lines) at present are being carried out under three different schemes viz. JnNURM, Japan International Co-operation agency. The proposals under these schemes are given below:

Under JnNURM

a. A main branch sewer passing from Shivepur railway crossing to Lalpur of 6.674 km.of sizes 800 mm. to 2400mm. dia.

b. A main branch sewer passing from Ashapur Chauraha to Pandeypur Charkha of 3.793 km.of sizes 800mm. to 1600mm. dia.

c. A main branch sewer passing from Lalpur to Natiniyadai Tiraha of 47.54 km.of sizes 150mm. to 1000mm. dia.

d. A main branch sewer passing from Bhojubir Chauraha to Sudhipur of 37.31 km.of sizes 150mm. to 900 mm. dia.

e. A main branch sewer of 15.02 km.of sizes 350mm. to 800 mm. dia.

f. IPS near central Jail Nala shall consist of 12m x 6.2 m x 10.45 m rectangular sump well for submersible pumping plant with 12m x 3.5m x 6.5m valve chamber along with inlet, screen channel, and allied building works.

g. IPS near Narokhar Nala shall consist of 12m x 5.9 m x 12.15 m rectangular sump well for submersible pumping plant with 12m x 3.5m x 7.5m valve chamber along with inlet, screen channel, and allied building works.

h. MPS near Sathawa STP shall consist of dry/wet well of size 28m x 44m along with screen channel, MEP and Generator set chamber etc.

Under JICA

Japan International Cooperation Agency took over some of the projects under Ganga Action Plan. At present a relieving sewer line is sanctioned under JICA (see map below)

Under Gap-II

Under Ganga Action Plan phase-2 main sewers are being laid (see map below).

The Summary of Proposals is given in the table below:

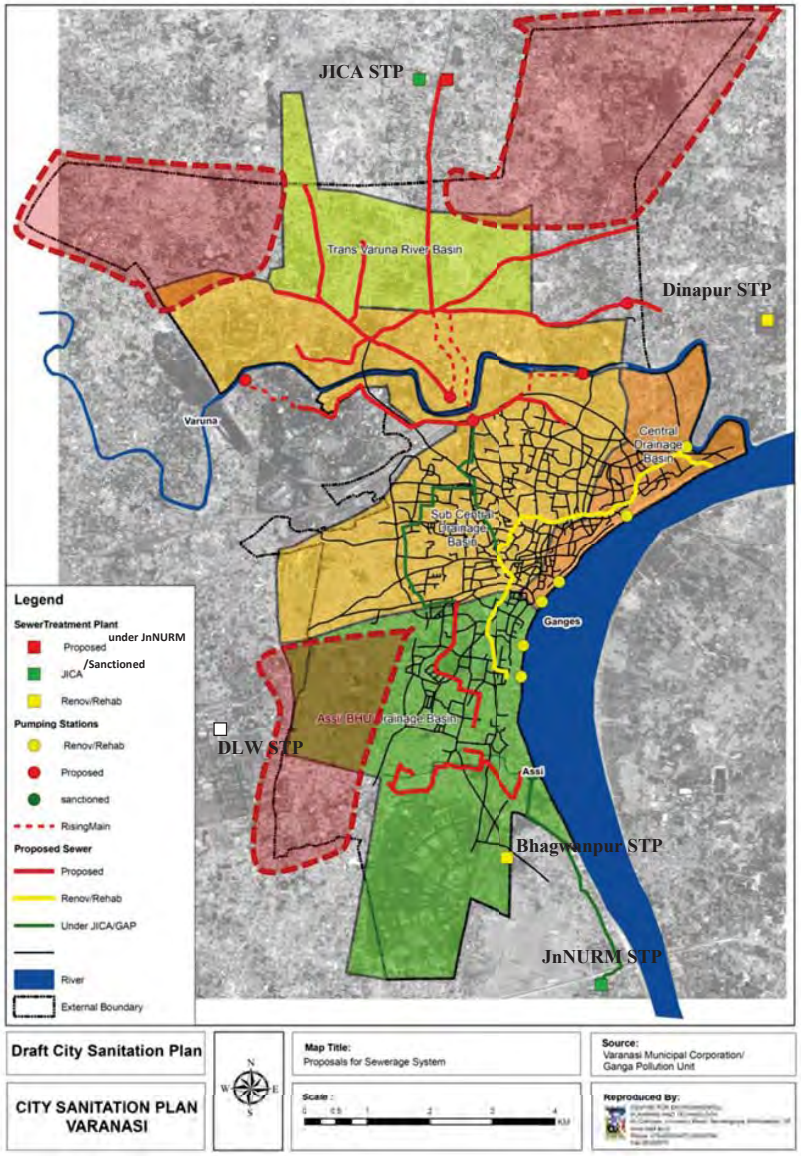
Table 24: Summary of Proposals Sanctioned for Sewer Lines

Under JnNURM	Under JICA	Under GAP-II
1. Main Branch Sewers of total 110 Km 2. Pumping Stations (3 intermediate, 1 Main)	Relieving Sewer sanctioned	Main Sewer- Work under Progress

The map attached below shows the proposals and sanctions under various schemes as mentioned above. Here, it should be noted that even after the implementation of the schemes there would be some ***areas which would still lack sewerage system***. These areas are highlighted in the map below. These areas are located along the periphery of the municipal corporation.

[4] Due to non accessibility of Sewerage Master Plan document prepared by JICA in 2004, the recommendation provided in this document needs to be cross checked with JICA master plan report.

Map 14. Proposed Improvements in Sewerage System



3.2.4 Treatment

There are three sewage treatment plants at present located at Bhagwanpur, Dinapur and Diesel Locomotive Works (Railways). The Bhagwanpur and Dinapur STPs are operated by Ganga Pollution Unit while the DLW STP is operated by railways.The total capacity is that of 102 MLD (3 STPs). The facility at Bhagwanpur handles 9.8MLD.

Bhagwanpur STP was commissioned under GAP and receives sewage from two pumping stations within BHU campus and from Assi pumping station. The present wastewater treatment capacity of the plant is 9.8 MLD and the process consists of three overall process stages: preliminary treatment, primary treatment, and secondary treatment.

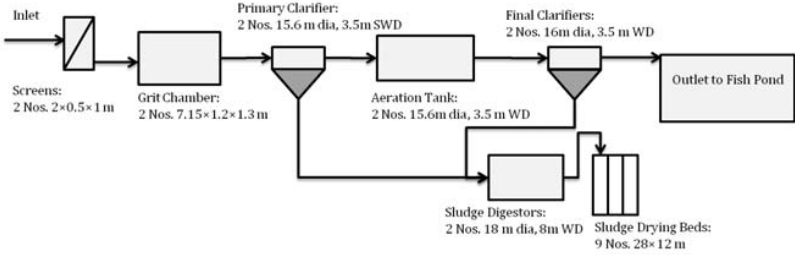


Figure 22: Flow Diagram of STP Bhagwanpur

Dinapur STP is located in Trans Varuna zone. It gets the sewage from the central part of city and pumping stations along the river Ganges. The present wastewater treatment process consists of three overall process stages: preliminary treatment, primary treatment, and secondary treatment.

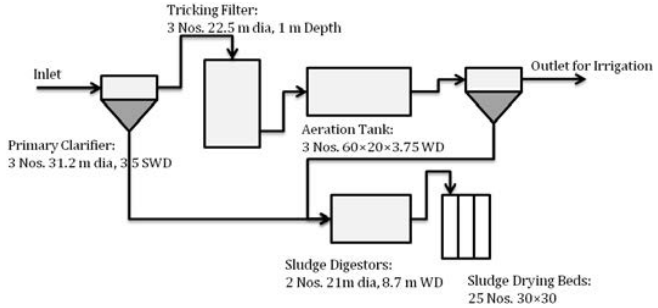


Figure 23: Flow Diagram of STP at Dinapur

STP at DLW- 12 MLD: The DLW STP is operated by Railway Department. It takes sewage from the DLW colony.

The table below shows the total treatment capacity present with Varanasi Municipal Corporation for Treatment of Sewage.

Table 25: Summary of Present Treatment Capacity

SR. No	STP Location	Capacity (MLD)
1	Dinapur	80
2	Bhagwanpur	9.8
3	DLW	12
Total Capcity		101.8 (102)

The influent sewage quality has low BOD and TSS values. The inlet BODs in both the cases is very low and may make the whole activated sludge process dysfunctional. For efficient operation of ASP the minimum Volumetric organic loading requirements are 0.3 kg BOD/m3.d. The low inlet BOD maybe due to several reasons. One of the most common reasons found in Varanasi is that, ***the HHs are connected with Septic Tanks and the septic tank overflow flows into the sewer. This system provides onsite treatment and reduces the BOD by almost 50-60%*** thus making the sewage dilute in the process. For efficient functioning of STPs thus the HHs need to be connected from inspection chambers directly to the sewer lines.

Table 26: Present Volumetric Organic Loading and Hydraulic Retention Time

STP	Flow (MLD)	Inlet BOD (mg/l)	Volumetric Organic Loading (kg BOD/m3d)	Typical Organic Loading (kg BOD/m3d)[5]	HRT in Aeration Tank (Actual) (d)	Typical HRT (d)[1]
Bhagwanpur	9.8	52.71	**0.39**	0.3-1.6	**0.14**	0.2-0.6
Dinapur	80	79.06	**0.47**	0.3-1.6	**0.17**	0.2-0.6

The comparison of volumetric organic loading and hydraulic retention time suggests that the plants have typically low hydraulic retention implying high volumetric loading and low volumetric organic loading suggesting very dilute input organic loads.

3.2.4.1 Proposals under JnnURM, JICA and GAP[6]

To enhance the capacity of treatment of sewage two Sewage Treatment Plants are proposed. The details of these plants are given below:

[5] Tchobanoglous, G., Burton, F., & Stensel, D. H. (2003). Wastewater Engineering: Treatment and Reuse. New Delhi: Tata McGraw-Hill Publishing Company Limited.

[6] Due to non accessibility of Sewerage Master Plan document prepared by JICA in 2004, the recommendation provided in this document needs to be cross checked with JICA master plan report.

Table 27. Proposals under Various Schemes

SR. No.	Scheme	Treatment Capacity (MLD)	Treatment Technology
1	JnNURM	120	UASB
2	JICA	140	-

The total treatment capacity for the Varanasi Municipal Corporation thus would be enhanced to 340 MLD. However, this capacity would fall short ***by 5.5% and 26% of the total sewage generation by 2030 and 2040 respectively.***

The treatment technology suggested for the STP under JnNURM DPR is Up-flow Anaerobic Sludge Blanket. This technology is generally suited for high strength sewage**.** ***Hence, with the strength of sewage (Inlet BOD: 50-80) received in Varanasi STPs this technology needs to be re-visited.***

3.2.5 Disposal

Out of the total sewage generated 101.8 MLD (43%) gets treated in the STPs. The remaining sewage is directly discharged into open drains leading to the River Ganges.

At present the treated sewage from Dinapur and Bhagwanpur STPs is used for irrigation. However, since the treatment capacity is not adequate a large fraction of generated sewage remains untreated and is discharged directly in river Ganges.

Table 28: Quality of Influent & Effluent at Dinapur & Bhagwanpur STPs

Parameter	Standards for Discharge	Dinapur		Bhagwanpur	
	Effluent	**Raw Sewage**	**Effluent**	**Raw Sewage**	**Effluent**
TSS mg/L	**10**	117.77	8.59	67.48	7.16
BOD mg/L	**30**	**79.06**	6.15	**52.71**	5.13
COD mg/L	**250**	**200.59**	63.77	**167.16**	53.74

At present the treated water from both Dinapur and Bhagwanpur STPs is used for irrigation. The farmers using the effluent and villages residing nearby complained of mosquito breeding.

3.2.6 Institutional Mechanism

At present sewerage system has four institutional stakeholders. The roles and responsibilities of these organizations are given in chart below. In case of sewerage system the case becomes typical since the system design is in purview of Jal Nigam and operation and maintenance is purview of Jal Kal. The operation and maintenance of the treatment plants, however, is under purview Ganga Pollution Unit.

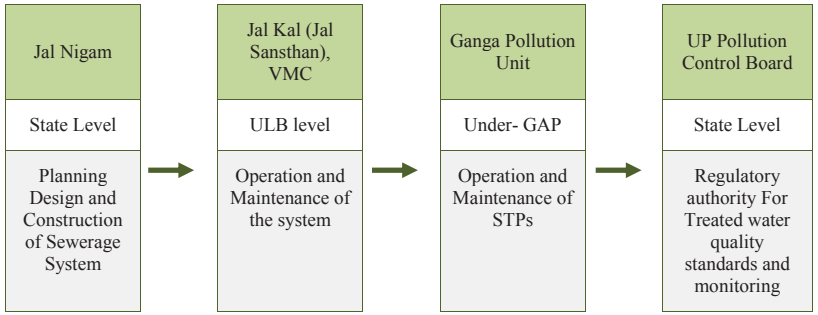


Figure 24. The Institutional responsibilities for management of Sewerage System

3.3 Key Issues

Sr. No.	Component	Key Issues
1	Coverage of Sewer Network	The sewerage system does not cover the peripheral areas
2	Conveyance	
	Onsite	1. The septic tank and septage management is informal. 2. A lot of human interface is involved with septage management posing a health risk. 3. The grey water is often directly discharged without any treatment. 4. The septic tank overflows in most cases flows to open plots, nallas and often leading to the river Ganga. 5. In some cases, the black water is also discharged directly in open plots.
	Offsite	1. The sewerage system is very old and dilapidated 2. There are stretches which require urgent rehabilitation (refer Map no.3) 3. There are some portions of sewer network at present encroached illegally 4. In certain sewer lines man holes are not traceable 5. Due to dumping of garbage in the sewer lines, the carrying capacity gets drastically reduced resulting in overflow of sewage on roads. 6. The proposed sewerage network under different schemes does not cover peripheral areas in north and south western parts of the city (refer Map.4)
3	Treatment	1. Treatment capacity at present is only 43% at present 2. Volumetric organic loading in the septic tanks is low and hydraulic loading is higher than typical values for ASP. 3. Even after proposed enhancement in treatment capacity, it would fall short by 5.5% and 26% of the total sewage generation by 2030 and 2040 respectively. 4. A large portion of sewage (in tune of approx. 30%) is discharged directly into drains leading to river Ganges.
4	Institutional Mechanism	1. The management of sewerage system is done by four different institutions. These institutions again are National, State and City level. Co-ordination between these hence becomes an issue. 2. The Jal Nigam (responsible for O/M of sewerage system) has shortage of 188 staff members (at all levels) as against the sanctioned 826 posts.

3.4 Recommendations

3.4.1 Approach

The approach in dealing with the solid waste management of the city has been worked out with the understanding that the Varanasi Municipal Corporation has already forwarded certain proposals in dealing with the same under JnNURM. CEPT's approach has been to

- Identify the areas/sectors left out by the DPR (if any)
- Activities and methods to strengthen the performance and enforcement of the DPR
- Incorporate pro poor strategies for in solid waste management.
- Planning and design of awareness generation and community participation activities, to substantiate the DPR

3.4.2 Recommendations

3.4.2.1 Septage Management Infrastucture- Intermediate Option

At present Varanasi has approximately 15% of the HHs dependent on Septage Management. This dependency is further anticipated to grow even with the planning of expansion of sewerage network. In absence of any formal septage management infrastructure the present system poses risk to both environment and human health. A formal steup would ensure regular cleaning and revenue generation along with occupational safety to workers handling septage.

Septage Management Infrastructure

This would initially require a good data compilation on present level of septic tanks. During the CSP an effort was made to capture the data however, this was only through a sample survey. This data would eventually help to organize and arrange the septage management infrastructure.

A policy level intervention here is required to regularize the septic tanks. This may be done through linking of the data on HH sanitation availability with property tax data. Through this the information about the septic tanks cleaning can also be captured in property tax data. The cleaning of septic tanks needs to be ensured by combing it with property tax and inserting punitive/incentive clauses for regular cleaning of septic tanks.

a. Mechanism Of Cleaning Of Septic Tanks

Depending on the design of septic tanks they are to be cleaned at a regular interval of 2-3 years. The cleaning should be done through vacuum pumps and as much as possible human interface needs to be minimized.

Figure 25: Septic Tank Cleaning Mechanism

The septage management infrastructure has to include vacuum pump mounted auto rickshaws and trucks. The rickshaws would ensure wide reach in narrow lanes. Manual handling of septage should altogether be banned. The treatment of septage may be done by drying and a centralized facility may be provided for this purpose. The dried sludge has good manure quality and may be sold to farmers. The whole septage management may be privately operated and the cleaning fees can be charged to the HHs. These private operators should be however, registered with the Municipal Corporation.

b. Estimation of Septage Infrastructure

Based on the present number of HHs dependent on septic tanks and assuming that the same proportion would remain atleast for another fifteen years, the requirement of septage infrastructure has been estimated below.

Table 29. Requirement of septage management Infrastructure

Sr. No.	Details	2010	2025
1	No of Septic tanks cleared per year (1/3 of Tanks cleared every year)	11443	16990
2	No. of Tanks cleaned Daily	35	51
3	Septage volume (Based on Septic tank Dimensions (1.5 m3/tank))	52	77
4	**Vehicles Required**	7	3
A	Autos	3	1
B	Trucks	4	2
5	Single Drying bed area (sqm)	15x15	15x15
A	Single Drying bed area (sqm)	225	225
B	Max Septage depth (m)	0.3	0.3
C	Capacity per bed	67.5	67.5
D	Daily requirement of beds (Nos)	1	1

6	Indicative Site Area- Land Area (Total Site Area = SD bed area (15 days) +10% of SD bed area+ area for office and dried sludge storage + area for ancilliary units)- **Additional**	4291	1387

The capital and operation & maintenance costs have been worked out on the basis of demand in and cost assumptions as per the annexure attached to the report.

Table 30: Summary of cost for the package of septic tank and septage management

Sr. No	Sub Package		Number of Unit	Unit Rate	Cost Rs in Mn	Cost of Maintenance per year (Rs in Mn)	Project Term
1	Establishment of City Septage Management Infrastructure	Auto Mounted	3	Rs 0.45 million	1.4	0.3	2011-2016
2		Truck Mounted	4	Rs 0.7 million	2.8	0.6	
3		Other Infrastructure[7]			5.7	0.6	
		Total			**9.8**	**1.4**	
1	Establishment of City Septage Management Infrastructure	Auto Mounted	6	Rs 0.45 million	0.5	0.1	2016-2025
2		Truck Mounted	9	Rs 0.7 million	1.4	0.3	
3		Other Infrastructure (Additional)			0.0	0.0	
		Total			**1.9**	**0.4**	

An effort here is made to sustain the investment in the infrastructure through ***levying user charges*** for cleaning of septic tanks. The total investment on septage management is given in the table below:

Year	Capital Investment (Rs. Lacs)
2011	9.8
2017	1.9
Total Investments	-

[7] The other infrastructure components are land requirement for septage bed, site office etc.

The assumptions made for working out the cash flows and the indicators for investment:

- Cost of Capital is 10%
- Equity Debt ratio: 70:30
- At present (2010) the number HHs with septic tanks in Varanasi are 15%.
- The HHs with septic tanks would remain 15% of the total HHs in Varanasi upto the year 2025.
- The HHs would be charged for cleaning septic tanks at the rate of Rs.300/septic tank upto year 2016 and then with the rate of Rs. 500/septic tank.
- The frequency of cleaning of septic tanks would be once in three years.

With these assumptions the cash flows have been worked out for the period 2011-2025. The table below presents the cash-flows as estimated.

Table 31. Cash flow for Septage Management

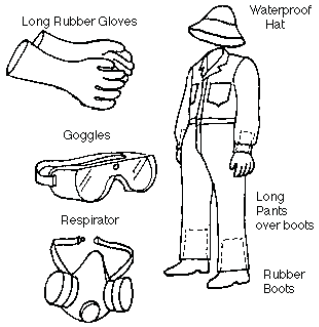
Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total HHs with Septic Tanks	34329	35518	36706	37895	39083	40272	41460	42649	43838	45026	46215	47403	48592	49780	50969
Septic Tanks Cleaned	11443	11443	11443	12632	12632	12632	13820	13820	13820	15009	15009	15009	16197	16197	16197
Capital Investment	9.8						3.3								
O/M Expenditure	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Revenue Expenditure	1.4	1.5	1.7	1.9	2.0	2.3	2.5	3.1	3.4	3.8	4.2	4.6	5.0	5.5	6.1
Charges for Cleaning per HH	300	300	300	300	300	300	300	500	500	500	500	500	500	500	500
Revenue income	3.4	3.4	3.4	3.8	3.8	3.8	4.1	6.9	6.9	7.5	7.5	7.5	8.1	8.1	8.1
Debt	2.9	2.7	2.4	2.1	1.8	1.5	2.2	1.8	1.4	1.0	0.5	0.4	0.3	0.2	0.1
Interest on Debt	0.3	0.3	0.2	0.2	0.2	0.1	0.2	0.2	0.1	0.1	0.1	0.04	0.03	0.02	0.01
Installments	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.1	0.1	0.1	0.1	0.1
Revenue Surplus	**1.4**	**1.3**	**1.2**	**1.4**	**1.3**	**1.1**	**1.0**	**3.2**	**2.9**	**3.2**	**3.2**	**2.8**	**2.9**	**2.4**	**1.9**

Based on the cash flows the net present value of the investments is estimated at the cost of capital of 10%. The ***Net Present Value for the investment is 0.7 lacs***. It can be inferred that with the above cash flows the investment is self sustainable and profit making venture.

However, for the above investment to be sustainable it has to be ensured that the septic tank cleaning is linked to the property tax evaluation and the cleaning frequency of septic tanks is once in three years. Private operators can be brought in since the investment is profit making venture. The private operators, however, need to be empanelled with the Municipal Corporation. Safe cleaning and disposal of septage and worker safety should be the duty of the operator.

c. PPE for Septage Management Workers

Occupational safety is an issue with septage management. Septage generally contains harmful micro-organisms and methane and hydrogen sulphide are present in the septic tanks. Hence, use of personal protective equipments is essential while cleaning the septic tanks. Training should be imparted to all workers regarding the use of personal protective equipments while cleaning septic tanks. It should be the responsibility of the registered private player involved in septage management to provide all PPEs to the workers.



d. Policy Regulations for New septic tanks

The septic tank is the alternative for decentralized method of treatment of waste water for the area which do not have access to the sewerage. In India, the 1983 National Building Code of India governs the design, installation and maintenance of toilets, septic tanks, and sewers. Part IX, Chapter VI, Section A on "Drainage and Sewerage" specifies the sizing and design of septic tanks, sewers, toilets, and other sanitation devices. The 1985 Code of Practice for the Installation of Septic Tanks (IS 2470) applies more specifically to the construction of septic tanks.

In practice, local governments lack the capacity to enforce these Codes' requirements concerning design or placement, and the quality and size of the finished system is based entirely on the owner's ability to pay and the mason's skill. Enforcement of the proper design regulations hence poses a challenge for using the septic tank mechanism as an intermediate approach.

To ensure the proper design of septic tanks there can be only two mechanisms: Policy and Awareness. Policy mechanisms under the building bye laws and development control regulations would provide a legal framework for incentive and punitive action for ensuring a standard design of septic tank.

Awareness of the concerned stakeholders would also be essential to ensure the bye laws are followed by them. The stakeholders in this case would be the ULB personnel, Architects, Contractors and the citizens. Easy to use manuals could be developed in vernacular language which could be used by all stakeholders.

3.4.2.2 Ensuring Proper Functioning of STPs

The low volumetric organic loading can have serious consequences on the functioning of the STPs. At low organic loadings usually impacts the sludge volume index (SVI) and causes filamentous growth in the sludge or bulking sludge conditions. The sludge in such a case does not settle and results in high suspended solids in the effluent.

In Varanasi, one of the causes of low strength (organic) influent is that the septic tanks are connected prior to connections with sewer-lines. This usually reduces the organic content by 30-50%. To ensure that a good strength of influent reaches the STPs for their proper functioning is essential. The sewer-lines should ideally be connected to the inspection chamber of the households. Ensuring this would require the present septic tank connections to be made dysfunctional. However, ensuring this would require proactive approaches from the municipal corporation.

The property tax data and the linkage of septage management data (section- 3.4.2.1) would enable identification of the properties which are in the zones with functional sewer lines and still having functional septic tanks. A property tax based punitive approach can be adopted to ensure the septic tanks are demolished. The property owner needs to produce a certificate of dysfunctional septic tanks from the empanelled septic tank cleaning agencies.

3.4.2.3 Rehabilitation of present Sewerage System/ Maintenance of Sewer Lines

The present sewerage network is very old and dilapidated. Some of the sewer lines are damaged, some encroached and in some cases even not traceable. The leakages in these lines pose a risk of contamination to water supply and ground water. The rehabilitation of the lines is proposed under the DPR of sewerage system. However, a preventive maintenance mechanism should be adopted for sewer lines to prevent contamination to water supply or natural water bodies. Leak detection should be carried out for all the lines and then a preventive maintenance regime may be established and practiced to prevent any leakages in the system.

Figure 26. Leak Detection Equipments

3.4.2.4 Reaching the Un-served Peripheral Areas

Policy Level Interventions

Usually, the peripheral areas are not connected to centralized sewerage system. The peripheral areas thus depend on site treatment systems such as septic tanks for treatment of sewage (usually black water and grey water is directly discharged).By the time the provision of services in such areas is planned, the city limits grow and the periphery expands leading to development of new areas and hence the vicious trap goes on.

In such a case policy level interventions to avoid piece meal approaches become essential. The policy level interventions need to be incorporated for new townships and housing projects. The policy should clearly emphasize on alternative systems for provision of sanitation infrastructure like exploring the option of decentralized wastewater systems wherever possible.

The policy mechanism should define and make it mandatory for the housing colonies to have a system of treatment of sewage. The **"Draft New Integrated Township Policy"** is a forward step in this direction for integrated township schemes. However, such policy should also other housing projects in its purview.

Technological Options

An effective way of reaching the peripheral areas is through exploring decentralized yet of site treatment technologies like DEWATS. Such technologies are cost effective and a better process control is achieved as the volume handled is less and the network is less complicated. Such technologies may be looked upon as intermediate options till the time the centralized sewerage system is planned and operational. The DEWATS networks are also very simple. The sewerage networks in DEWATS are either shallow or small bore systems and as compared to the centralized sewers they are relatively very cheap. Other than DEWATS many other technologies may be incorporated and explored for treatment of sewage and the same small bore or shallow conveyance system may be used. Such technologies include Submerged Immobilized Bio-filters (SIBF), Skid mounted Activated Sludge Plants etc.

3.4.3 Action Plan

The table below shows the action plan for short, medium and long term interventions in centralized system. The action plan also includes setting up of septage management system to take care of on-site treatment systems (septic tanks).

	SHORT TERM	MEDIUM TERM	LONG TERM
SEPTAGE MANAGEMENT- ***INTERMEDIATE OPTION***			
	• Avoid manual cleaning • Provide personal protective equipments to prevent health hazards. Phased implementation of Septage Management. • Regulation for proper construction and maintenance of septic tanks	Phased provision of infrastructure for Septage Management. Decentralized septage compost sites.	
ENSURING PROPER FUNCTIONING OF STPS			
	• Redundant septic tanks after connection of sewer lines to me made dysfunctional • Reuse management of the treated sewage.		
REHABILITATION OF PRESENT SEWERAGE SYSTEM			
	Renovation / Rehabilitation of present sewer infrastructure including sewer network (branch /main/trunk sewers).	Preventive Maintenance of Sewerage system. Integrated planning of sewerage system along with peripheral areas of the city.	
REACHING THE UN-SERVED PERIPHERAL AREAS			
	Policy and technology level intervention to provide sanitation services in peripheral areas	Inclusive planning of peripheral areas	

Annexure III- Solid Waste Management

4 Solid Waste Management

4.1 Overview

Solid waste management is among the basic essential services provided by municipal authorities in the country to keep urban centres clean. However, it is also one of the most poorly rendered services. The systems applied are unscientific, outdated and inefficient; population coverage is low; and the poor are often marginalized.

Varanasi also known as *Kashi*- is a city of high religious significance and has similar problems of solid waste, like our other Indian cities. However its special nature also burdens it with some typical issues. Several types of religious ceremonies performed at the Ghats generate a variety of wastes, from flower and *pooja* wastes to human ashes. Apart from these, the municipal solid waste of the city is mainly comprised of waste generated from household, markets, commercial establishments, hotels, hospitals, and small scale industries in the town.

In Varanasi the system of door to door collection of wastes is not practiced in all parts of the city. People throw their wastes into the streets which are then collected by the *safai karamacharis*. The total waste generated in the city is to the tune of 600 MT of at the rate of 0.46 Kg per capita per day.

Scientific waste disposal methods are also not practiced in the Varanasi and this aspect has been reiterated by the SLB studies. The waste is simply dumped into non complying waste dumps and is not treated in any way. A total of 9084MT[8] of waste is being dumped in these dumps per month.

4.2 Assessment

4.2.1 Situation Analysis

The following sections shall give an idea of the solid waste scenarios in the city. From estimations of the solid waste generated to the collection, transportation and end disposal shall be explained.

4.2.1.1 Solid waste generation

The estimates of solid waste generation have been taken from the Detailed Project Report. They have weighed the waste generated across 7 consecutive days to calculate the quantity of waste generated. This exercise revealed that the total waste collected in the city is 480 MT/Day. It is estimated that 25% of waste generated in the city is not collected for various reasons. Thus the total waste generated is to the tune of 600 MT/day which needs to be taken into consideration for planning the systems of SWM. The increase in waste generated in the city over the years has been calculated under two aspects[9]:

[8] Service Level Benchmarking data

[9] Solid waste DPR

- Population growth
- Per capita increase in waste generation due to change in life style and increased use of packing materials. The per capita rate of solid waste generation has been assumed to increase at 1.5% per year. (However when calculating the same in the DPR, the rate of solid waste generation has been increased 1.5% decennially. In the graph below a third series has been added considering the rate of increase of solid waste 1.5% annually. In the further analysis thus CEPTs estimation of solid waste generation has been used).
- The land use variation in the city. Eg. Market/commercial areas generate more waste than the residential areas.

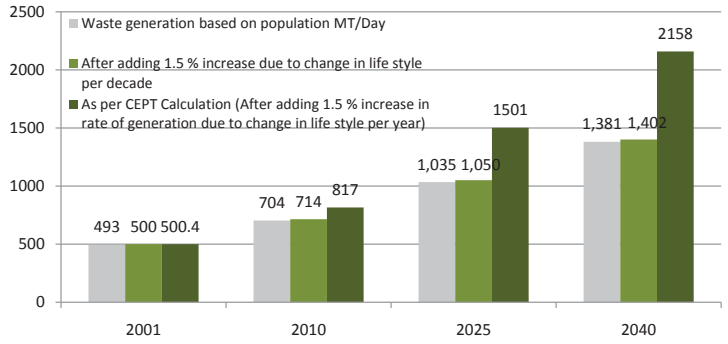


Figure 27- Solid waste generation in the horizon years

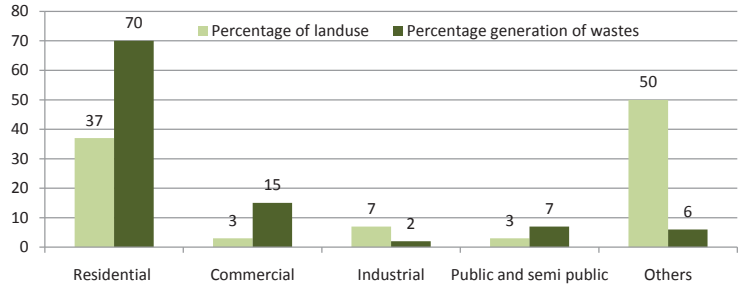


Figure 28- Waste generation wrt land use

The waste generations for the different landuse categories have been elucidated in the chart below. This indicates that the commercial land use generated almost 5 times of waste when compared with its land use share followed by the residential and the public and semi public areas, which from waste point of view may be understood as the institutions, offices and the corporate commercial.

The table[10] underneath shows the detailed ward wise generation of solid waste generated in the city along the horizon years.

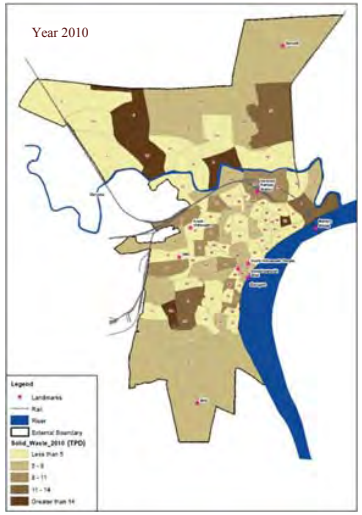
Table 32- Ward wise Solid Waste Generation

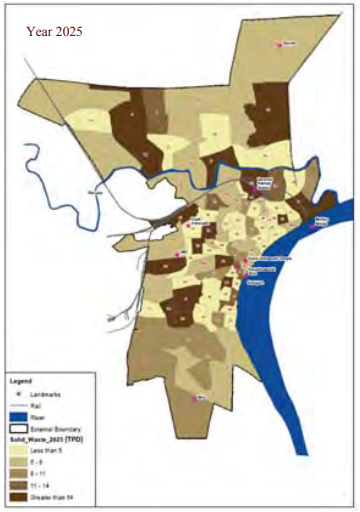
Ward No.	Solid waste Generation (TPD)				Ward No.	Solid waste Generation (TPD)			
	2010	2025	2030	2040		2010	2025	2030	2040
1	7	10	12	12	46	7	10	11	12
2	18	41	51	64	47	5	8	9	10
3	7	10	12	13	48	6	9	10	10
4	18	47	57	78	49	6	8	9	10
5	21	64	84	115	50	5	8	9	9
6	11	24	30	38	51	9	20	24	30
7	20	40	49	60	52	6	8	9	10
8	9	12	13	13	53	3	4	5	5
9	8	11	12	13	54	5	7	8	8
10	9	14	16	17	55	4	6	7	7
11	9	12	13	14	56	12	20	23	27
12	8	11	13	13	57	4	6	6	7
13	11	20	24	28	58	7	9	10	11
14	9	15	17	19	59	7	9	11	11
15	15	31	38	46	60	8	11	14	15
16	7	9	10	11	61	14	29	36	45
17	15	27	32	37	62	6	9	10	10
18	7	11	13	14	63	7	10	11	12
19	3	6	8	10	64	11	23	27	33
20	22	61	79	106	65	12	23	28	34
21	15	33	40	50	66	7	10	11	11
22	7	10	12	13	67	3	5	5	6
23	13	26	32	40	68	11	19	22	25
24	4	6	7	8	69	5	7	8	8
25	17	56	76	106	70	5	6	7	7
26	9	12	13	14	71	21	46	55	68
27	16	52	70	98	72	8	15	18	23
28	9	17	20	24	73	13	27	33	40
29	6	8	9	9	74	9	13	15	16
30	8	12	13	13	75	13	24	29	35
31	7	14	17	20	76	4	5	6	6
32	9	17	21	24	77	6	9	10	11

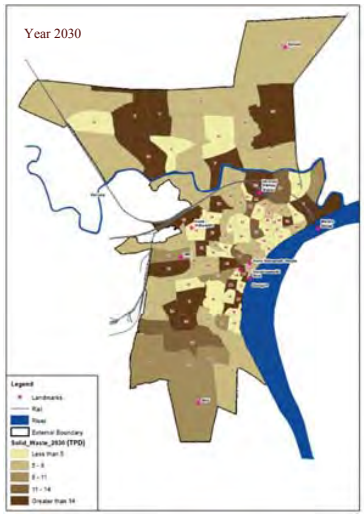
[10] Calculated from the ward wise population and land use

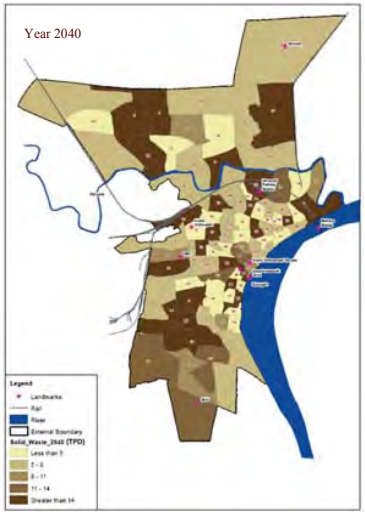
33	8	13	15	17	**78**	5	8	9	9
34	10	16	19	21	**79**	8	13	16	18
35	5	7	8	9	**80**	5	7	8	9
36	8	11	12	13	**81**	5	7	7	8
37	6	7	8	8	**82**	8	18	22	28
38	20	37	44	53	**83**	4	5	6	7
39	6	8	8	9	**84**	12	27	33	42
40	7	9	10	11	**85**	7	10	12	13
41	5	7	8	8	**86**	7	10	12	13
42	6	8	9	10	**87**	5	6	7	7
43	7	9	11	12	**88**	5	11	13	16
44	5	8	8	9	**89**	5	6	7	7
45	8	12	14	16	**90**	13	28	33	40
Floating Population						29	36	39	45
Total						***822***	***1508***	***1806***	***2172***

The quantum of solid waste generated in each ward of the city has been mapped. This gives an idea of the spatial location of the wards which generate the maximum solid waste and hence can be dealt with in terms of the priority of action.









4.2.1.2 Composition of Waste

Most of the waste generated comprises of biodegradable, compostable and recyclable materials in Varanasi. This is due to the high quantum of religious and vegetable waste along with the high amount of plastic waste. The composition of waste has been shown in the charts attached below. [11]

It has been estimated that the flower wastes in the city per day is to the tune of 4.3 MT per day. It should also be noted that most of the flower wastes are thrown into the river as offerings and do not reach the municipal bins. So it is difficult to assess the actual quantum of flower waste that is

Figure 29- Waste composition

generated. The visuals below give an idea of the amount of wastes that are being thrown into the streets, in absence of a door to door collection system.

Cities which are tourist destinations often have higher generation of wastes that their counterparts.. However it should be noted that not all waste generated is accounted for. The river acts as city level dustbin for most of the flower and *puja* wastes generated in the city. This is a potential threat for the city and the river alike. The religious sentiments associated with this activity makes it all the more difficult to address.

[11] Solid Waste DPR

4.2.1.3 Waste Collection

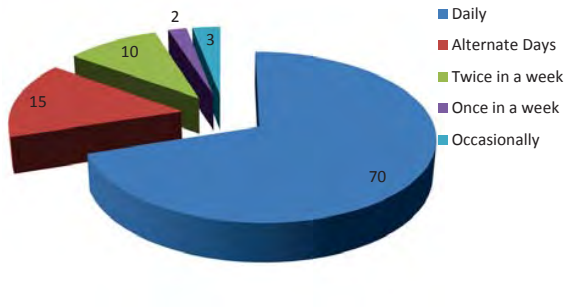


Figure 30- Street sweeping frequency

In Varanasi the share of road sweepings in the total waste in the city is as high as 75%[12]. The reason for this can be attributed to the fact that only a fraction of the city's population store their wastes at source and dispose in the municipal bins. Rest of the households, shops and establishments throw the waste on the streets and, therefore, the streets continue to remain dirty and littered.

The system of door to door collection has been initiated on pilot basis by Municipal Corporation in a PPP mode along with a private player A2Z Waste Management Private Limited. Six wards have been covered so far namely Nariya- Ward no. 32, Nagwan- Ward no. 8, Nawab Ganj Ward no. 14, Khojwan Ward no. 43, Birdopur Ward no. 53 and Bhadaini Ward no. 54.The population served in the city is only 7% of the total population and the area coverage is 4%, which alo indicates that these are the relatively denser wards of the city.

In the other wards the waste collected from the roads is put in dustbins on streets, and transported to secondary collection depots. Varanasi has a total of twenty six secondary collection depots for the solid waste. These are way below capacity and the waste remain strewn all along them. The city at present has 211 waste bins. Incidences of open buring of wastes are also visible, throughout the city. This activity becomes more predominant in the winters, when waste is burnt for warmth.

4.2.1.4 Storage

There are two types of waste storage at source, one of which is waste storage house known as "*Kuda Ghar*" in local language and the other is storage containers. There are 26 waste storage houses and

[12] Solid waste DPR

smaller containers with volumes of 4.5m^3 placed at 211 spots. These Kuda ghars poise great cleanliness challenge as majority of the waste lie outside them as indicated by the images. The DPR for SWM has recommended removal of these Kuda-ghars from the main city locations.

4.2.1.5 Transportation

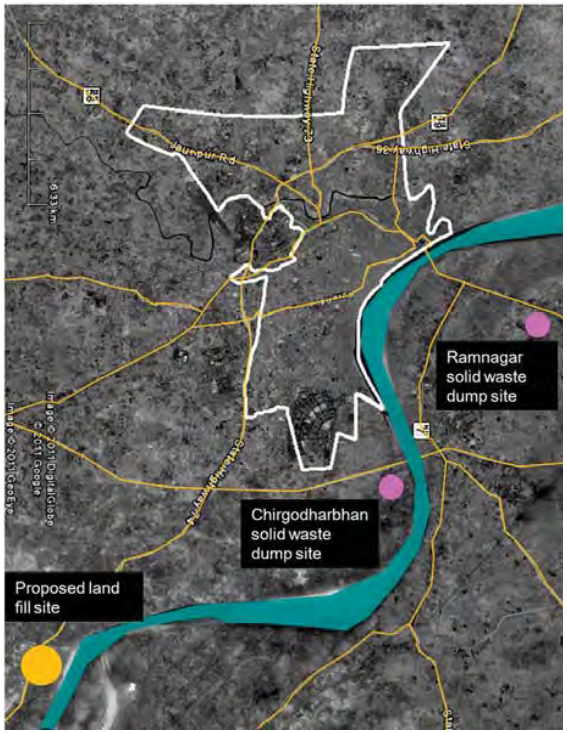
The waste from secondary collection depots and containers is loaded into dumper trucks by various shovel loaders or manually, and transported to final disposal sites. Arm system container trailers are used for the loading of containers. Most of the present machinery is very old. The loaded waste is transported to final disposal sites by open dumper trucks. Since many trucks have no plates or sheets covering the back, some part of the garbage keeps spilling en route.

4.2.1.6 Disposal

At present there are two dumping sites near Ramnager and Chirgobardhan at the eastern and southern periphery respectively of the Varanasi Municipal Corporation. In both the sites only open dumping of waste is practiced.

There were three final disposal sites, which are now abandoned. These sites were located in Palang Shahid (10 acre), Nakki ghat (2 acre) and Kabir Math (1 acre). The landfill system was open dumping system with gentle slopes.

The map below shows the locations of two existing waste dumps and the proposed solid waste management site. The proximity of these waste dump sites to the water body may be seen from these images.



Map 15- Location of solid waste dumps

4.2.2 Institutional structure

Solid waste management is perhaps only sanitation service in the city which is being solely owned operated and maintained by the municipal corporation. It has been deputed under the health and sanitation head of the corporation, handled by the sanitary inspector, sanitary supervisor and the Safai Karamcharis.

Figure 31- Institutional structure- SWM

However not all the sanctioned posts are occupied currently, out of 3200 sanctioned sanitary workers only 2800 are employed. In the category of the sanitary supervisors there are a total of 140 sanctioned posts. The number of vacant posts is 55.

The Municipal Corporation Varanasi does not have a specific department dedicated for environmental management; and the function has traditionally been performed by various departments in an adhoc manner. Environment management has a very important role to play in solid waste management in a city. The absence of this aspect of understanding has negative bearing not only on the natural resources of the city but also on public health.

4.2.3 Existing proposals

For SWM, under the CDP a DPR was prepared to address the issues of solid waste management in Varanasi. The Varanasi Municipal Corporation has collaborated with A2Z Waste Management Private Limited for Solid Waste Management on PPP mode.

4.2.3.1 Proposals under the DPR

The detailed project report for Solid waste has forwarded the following proposals:

- Ensuring source segregation of waste at household level. The citizens are also to be made aware of the household hazardous wastes generated, and should be prohibited to mix them with the general waste. The corporation may work in tandem with a local NGO to organize the rag-pickers who shall collect the recyclable wastes from the households. They may be allowed to charge a nominal fee on monthly basis. In addition to this the corporation shall engage in door to door collection. Each ward may be broken down into sub zones consisting of 200 household wherein one worker may be deployed. It has been calculated that 200 households may be covered in 4 hours. The worker shall be equipped with the 6 compartment garbage collecting containers, in compliance with the MSW.
- Insightful education and awareness programs for sensitizing the citizens and tourists about the hazards of throwing the puja and religious ceremony wastes into the river would be made. The provision of Pushpa Patra for throwing the flower wastes at the temples, which can be used for generating compost.
- Provision of community bins in the city. These bins may be provided for a typical cluster of 20-25 households.
- Regularizing the waste storage at location for the hotels and office areas.

Bins in vegetable market

- The vegetable and the fruit markets of the city shall be provided with dustbins for collection of waste which can be treated through compositing since the waste from vegetable markets is primarily bio-degradable.
- The slaughterhouse shall also be directed to throw their wastes into the designated bins.
- The bio medical waste shall also be not allowed to be mixed with the municipal wastes.
- The transportation system of wastes shall be regularized to meet the MSW rules. The vehicles needed for the same have also been estimated in the DPR.
- The DPR has proposed a compost plant with the capacity of 375 TPD. This has to be spread over an area of 5 acres, which shall be given by the government in a convenient location.
- The DPR has also indicated the proposal for a landfill. Out of the total waste generated in the city, after the bio-degradable waste has been separated the quantum of waste that is left behind is to the tune of 240MT/day. It has been estimated that the total area requirement for the same shall be about 250 acres. This shall suffice for the needs of next 20-25 years. The MC has indicated that the land availability with them is only 38 acres due to which the landfill has been phased. They have proposed a landfill and compost plant in an area of 12 acres which shall serve for the next 6 years.

4.2.3.2 Ongoing activities under A2Z

A2Z waste Management Private Limited is appointed on a PPP mode for Solid Waste Management, by the VMC. As per the contractual agreement, A2Z waste management is responsible for overall Integrated Municipal Solid Waste Management. The major scope of work includes door to door collection of solid waste, primary storage of collected waste, secondary collection and transportation and disposal of waste. The company is also responsible for collection of user charges for which a collection charge of Rs. 30/HH has also been initiated.

In absence of landfill site which is still udner construction, A2Z is focusing on collection of waste from the HHs which is being taken by the auto tippers andcompactor to the existing disposal site only (Ramnagar and Chirgobarghan waste site).

Land acquisition has been done and at present 38 acres of land has been acquired near Karsada village approximately 20 kms from the city limits. A2Z Waste Management Private Limited has been handed over this land by Municipal Corporation for development of waste management facility. The waste management facility is to include RDF plant, composting plant, inert processing plant and an engineered landfill site.

4.3 Key Issues

The key issues of waste management can be summed up from the service level benchmarking itself. The attached table indicates the status of waste management in the city.

Table 33- Service level benchmarking SWM

Performance indicators	Benchmarks	Result	Reliability scale
Household level coverage of solid waste management services	100%	10.31	A
Efficiency of collection of municipal solid waste	100%	54.07	D
Extent of segregation of municipal solid waste	100%	0.00	NA
Extent of municipal solid waste recovered	80%	0.00	NA
Extent of scientific disposal of municipal solid waste	100%	NA	NA
Extent of cost recovery in solid waste management services	100%	0.00	NA
Efficiency in collection of solid waste management charges	80%	NA	NA
Efficiency in redressal of customer complaints	90%	66.27	A

- An unaccounted amount of garbage consisting of flower and *pooja* waste being thrown into the river is a pressing issue. Also the human ashes at the ghats do not have any determined disposal methods. The religious sentiments associated with these activities make any kind of interventions complicated.
- There is no waste "management" practice in the city as such. The private operators A2Z who have started the door to door collection in as a pilot in certain wards at the moment are merely

collecting the wastes and depositing to the intermediate transfer stations in the absence of scientific waste management practices.

- These intermediate transfer stations are the eye sores in the city. They are under capacity and the waste is not taken from them regularly. They emit obnoxious odor and also the area is strewn with the over flowing wastes.
- The compliance to the MSW rules is painfully low in the city. The attached chart suggests the same.[13]

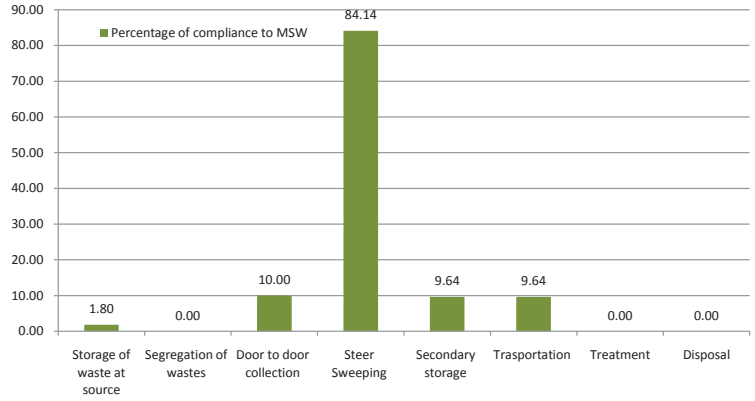


Figure 32- MSW compliance in Varanasi

- In absence of door to door collection the corporation has tried to maintain the street sweeping. However the waste transfer from these to the final disposal site is with a fleet of dilapidated fleet.
- There is no scientific waste disposal site in the city, and they are being duped in the open areas and along the nalas in the city, contaminating them and the river in turn. The visuals give an idea of the situation that prevails in the city.

[13] Solid waste DPR

- The management of solid waste is being handled by the Municipal Corporation. However there is a shortage of staff in the system. There are total 55 vacant spots out of 85 for the sanitary supervisors and there is a shortage of 400 sanitary workers, out of the total of 2800 required in the city.
- The Detailed Project Report the A2Z interventions have not really been capable of addressing the waste management woes of the city. Waste collection from the narrow lanes in the city can't be realized by the mechanized means.
- The waste handling by the workers is done without any protective gear.

4.4 Recommendations

4.4.1 Approach

The approach in dealing with the solid waste management of the city has been worked out with the understanding that the Varanasi Municipal Corporation has already forwarded certain proposals in dealing with the same under JnNURM. CEPT's approach has been to

- Identify the areas/sectors left out by the DPR (if any)
- Activities and methods to strengthen the performance and enforcement of the DPR
- Incorporate pro poor strategies in solid waste management.
- Planning and design of awareness generation and community participation activities, to substantiate the DPR

4.4.2 Better waste management practices

Varanasi needs better waste management practices, right from the stage of waste collection to the end disposal. Site sensitive waste collection systems, waste segregation, and waste transfer to its end disposal have to be regulated and maintained.

4.4.2.1 Removing Waste Transfer Stations

There are twenty six waste transfer depots (stations) in Varanasi. The transfer stations are critical hot spots from the context of solid waste. Solid waste depots create unhygienic environment in their vicinity and pose a threat to the overall public health.

As an alternative approach, direct vehicle to vehicle transfer may be adopted. In Ahmedabad, specially designed compactors are used to directly transfer waste from tippers to these compactors. This practice in case of VMC would not only abolish the transfer stations, but would also release physical asset in form of land in prominent locations.The existing *Kudaghars* have been suggested to be converted into public toilets. The details have been given in the chapter on access to public toilets.

Waste Tipper and Dumper that can transfer waste directly waste directly from dumpers

4.4.2.2 Site specific waste collection systems

Varanasi is a city with tremendous variation in the urban morphology. Hence a standard waste collection practice may not be sufficient for ensuring 100% waste collection. It needs specialized area specific waste collection system. Varanasi can be broken down into four broad categories of urban structure:

	Types	Satellite image	Site photographs
1	Ghat area		
2	Core inner city – low rise high density		
3	Peripheral areas- low rise low density		

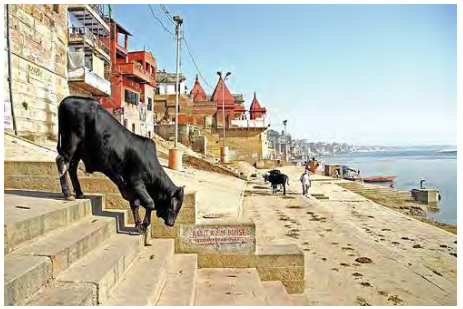
4	High rise new developments		

The waste collection systems also have to be sensitively deigned to ensure that the vision of 100% door to door collection gets realized.

Waste collection in the Ghat areas

The Ghats composed of two components,

- The river itself
- The built form.



Unlike conventional belief that only the steps leading to the water are the Ghats, the river also is an equally important component of the same.

The waste management at the Ghats thus would include the waste management along the steps and also involve cleaning of the river. Solid waste collection along the steps of the Ghats is tricky as the mechanized means of waste collection cannot be used due to the level variations.

The types of wastes at the Ghats are those of

- Flower offerings
- Coconuts, fruits and other food materials
- Plastics and papers

The typical nature of wastes is that they have high salvage value and are non hazardous in nature. The waste management may be organized by the help of rag pickers. This may be regulated under the purview of A2Z who can employ salaried staff for the same. The attached table suggests the possible end disposal techniques for the wastes generated at the Ghats.

Table 34- Possible end disposal suggestions

Type of Waste	Possible end disposal methods
Flower Wastes	Reusing Composting Household processing
Food wastes	Reusing

	Tie up with the dairy owners who breed cattle or Composting
Paper and cloth	Recycling Resale

The shop keepers may also be suggested to use organic packaging instead of plastics. The key to waste management at the Ghats is to mobilize the right people, someone who might be interested in salvaging the "wastes."The shopkeepers should accept the left-overs of the *pooja samagri* back, which can be repackaged and resold. This shall not only reduce the total quantum of wastes but also help the gatherers in earning a living.

The cleaning of the river has to be taken up with equal fervor. Post *aarti*, a large quantity of wastes are being thrown into the river as offerings. These have to be collected only after the din and clamour has settled down. The river cleaning can be taken up in the late nights to early morning, through the help of customized boats, with nets that will trap the floating wastes. These may be in turn recycled or disposed depending on the condition.

The process of waste management has been elucidated in the attached chart.

Figure 33- Ghat cleaning proposal

There are total of 84 Ghats in the city of Varanasi. Ghat cleanliness should rightfully have a separate cell in VMC, since the management, collection and the disposal of the waste generated at the Ghats is a specialized task.

Each Ghat should have a dedicated safai karamchari, who will be responsible for the maintenance of cleanliness in the Ghats. He should work in close tandem with the Ghat samiti and the shop keepers association. The process has been elucidated in the attached chart.

Declaring plastic free zones in an area of the 100m from the river shall also have an impact. The attached map gives an idea of the same.

Advertising and campaigning should be associated with this for higher acceptance. Surprise audits should be organized for higher enforceability. The team should be empowered with the penalization powers / chalan for polluting the surroundings.

In addition to these efforts the tourists groups, local clubs and NGO's Rotract clubs could and institutions may be involved awareness campaigns. This shall give the required impetus to the Ghat cleanliness drives. Such activities should be organized periodically, preferably after festivals during which the garbage levels at the ghats invariably swell up

Map 16- Plastic free zone

Waste collection in the core city

The core city areas have a typical housing typology. The mechanized means of waste collection cannot permeate into these lanes because

- Road widths range from 2-3m
- Are encroached with parking, hawkers etc
- Average height is G+2

- Ownership varies across floors

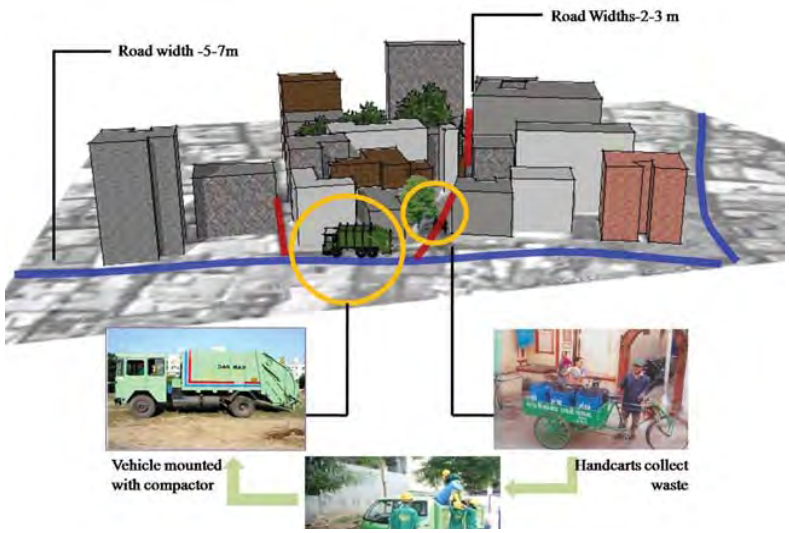
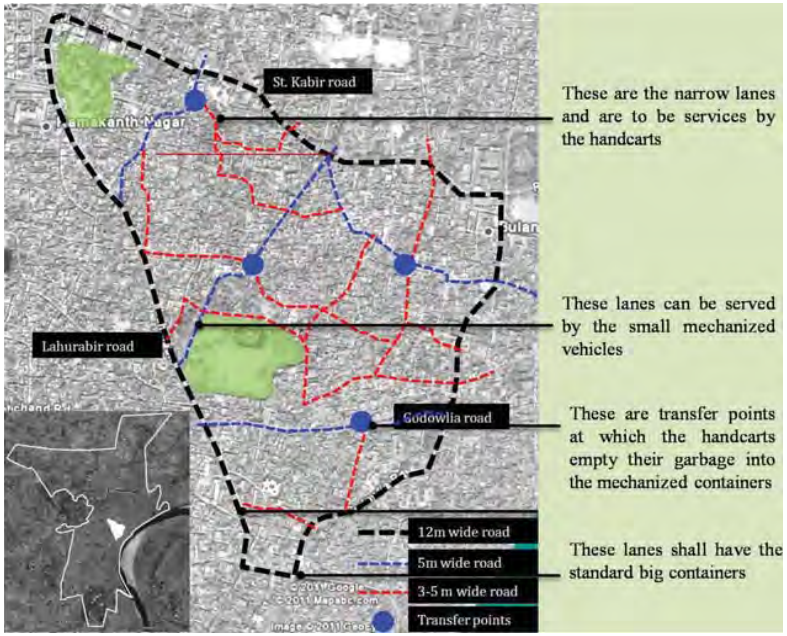


Figure 34- Solid waste collection from narrow lanes

CEPT suggests that if these areas are to have door to door collection then they will have to depend on non mechanized means like handcarts, cycle mounted collection systems or workers carrying the containers and collecting wastes from each household

The attached image shows the area bounded by the Lahurabir road, Godowlia road and the St. Kabir road. The total area is approximately 95Ha. This is one of the densest areas of the city. The colored lines indicate the roads of different widths and the possibilities of door to door collection have been examined.

The key to having this system in place is the right synchronization between the handcart pullers and the truck drivers such that the wastes may be transferred. This may be set with the help of drills, specifying time and location wherein the handcart puller can empty the waste into the mechanized vehicles.



Map 17- Identified cluster for waste collection system

The waste collection strategy is summarized as follows.

Area	Waste collection	Remarks
Narrow lanes	Handcarts and cycle rickshaws	The waste from the handcarts may be thrown into the larger vehicles as shown in the image. The timings are to be regulated through drills
Collector roads	Small tempos	These shall ply from neighborhood to neighborhood, wherein people can throw their wastes at fixed times of the day.
Major roads	Large trucks cum compactors	These ply on the major roads and collect the wastes from the interiors. They also reduce the volume of the wastes en route.

Figure 35- Waste collection stages

Waste Collection in townships/multistory apartments

Waste collection in gated communities is often beyond the purview of the municipal authorities. This activity has to be organized by the community itself. The waste collection and deposition into the municipal containers should be spelt out in the building regulation itself. The door to door waste collection should be organized by the community; the township level sweepers should be involved.

These sweepers may collect the wastes from each doorstep and in turn deposit the waste at the municipal bins. These shall then be emptied by the municipal workers.

The building bye laws should have the component of solid waste management plan. Provision of refuse chutes and door to door collection and intermediate storage locations of the garbage should be examined. Options of decentralized composting should be examined such as to reduce the garbage quantum for end disposal. Clearances should be granted accordingly. Further to this a defined monitoring guidelines must also be forwarded. The new township policy of Uttar Pardesh should be directed to include these provisions.

4.4.2.3 Cleaning of the Nalas

The *nalas* in Varanasi have become the unofficial dustbins of the city. The solid wastes are dumped along the *nalas* and also the sewers have their discharge points along them. The open spaces along the *nalas* become invariable waste dump sites. In the monsoon these flow into the river and obstruct the

flow creating unsanitary conditions in the city. These *nalas* need to be periodically cleaned with the help of scrapers.

The present condition demands that a pilot project for *nala* cleaning needs to be taken up in the city. This shall form an exemplary in the city. CEPT suggests the following activities that can be taken up as a part of Nala cleaning drive

Step	Activity	
Selection of the *Nala* and the partnering organizations	This has to be initiated by the VMC, NGO's and the institutions. The total number of people participating in the campaign shall have to be identified and registered.	
Procurement of necessary gear	Machines, protective gears have to be procured depending on the number of participants	
Division of the stretch	The total nala stretch should be divided and manpower deployed accordingly. The VMC and the NGOs should take this up	
Division of work	The nala has to be cleaned with the help of specialized machines, operated by trained operators.	
	The volunteers can take up the cleaning of the banks of the nala	
Awareness generation		

The street side storm water drains and open *nalas* also need to be cleaned regularly. This would avoid the clogging of drains and also help in better rain water disposal.

The cleaning arm can be mounted over rickshaws to facilitate cleaning the *nalas* over the narrow lanes.

4.4.2.4 Waste management in Slums

Slums are often the most neglected areas in the city regarding solid waste management. They often have to face the spoils of waste from the communities in the vicinities dumped in addition to their own wastes. The per-capita waste generation in the slums is much lower than the other parts of the city. The different reasons for this are:

- Absence of the component of recyclable in the waste
- Lower standards of living

The waste collection from slums has always been weak in the cities, although examples from across the world have shown that participative models have worked extremely well in these contexts.

CEPT believes that waste management in slums can be effectively undertaken through community participation. The following steps for better waste management have been identified:

Step	Activity	
Organization the task force	The target group for each slum has to be identified who shall be involved in the waste management. They might be the members of the CDS, *sakhi mandals* and the youth.	
Observation of sanitation week	This shall include mass awareness programs, followed by mass cleanliness drive. The NGO and the youth association of the city have to take initiatives. This shall be a kind of induction program for the slum dwellers.	
Deployment of community dustbins	The tilt and dump dustbins at community levels may be used in cases of extremely narrow wand congested areas of the slums. The attached image shows the community dustbins, which are low cost and simple in design & operations.	
Distribution of HH dustbins	The simple tins may be used as dustbins. These should be advocated as sanitation symbols, and each threshold shall have a dustbin. This shall have a symbolic significance. This may be regulated in association with A2Z.	
Organizing door to door collection	Door to door collection should then be organized by the group identified above. A minimal user fees may be collected per household at the range of Rs. 5-10 per month. A user fee ensures higher ownership and enforceability.	

These activities may be taken as pilot programs, based on CDS constituting of a few slums. Then activities of ICE have to be pursued strongly. The schools become important sources of information

dissemination. Free dustbins may be distributed as a part of the awareness programs to children and the message may be passed on to their parents. The processes of publicizing these initiatives have to be taken up strongly, for other slums to derive inspiration from.


दूसरे मोहल्लों के लिए आदर्श बना नुरई का भट्ठा

4.4.2.5 Waste management along roads

In absence of proper solid waste infrastructure, the roads of the city and strewn with garbage. The intermediate waste storage depots are short of the demand and also the collection system is irregular, hence the waste is strewn across the roads.

It is important to ensure proper night sweeping to maintain clean roads. The workers should be given long handled brooms for comfortable road sweepings. The DPR has suggested the various combinations that can be worked out for the same. It suggests a more comprehensive cleaning of the streets of Varanasi.

CEPT suggests substantiating measures for the same. Some major streets may be identified as Zero waste streets. These will have strong monitoring, with incentives and punitive measures that ensure higher enforceability.

Certain roads have been already identified for the provision of public facilities in the city. This has been discussed in the chapter for access to public toilets. Similar road stretches may be taken such as

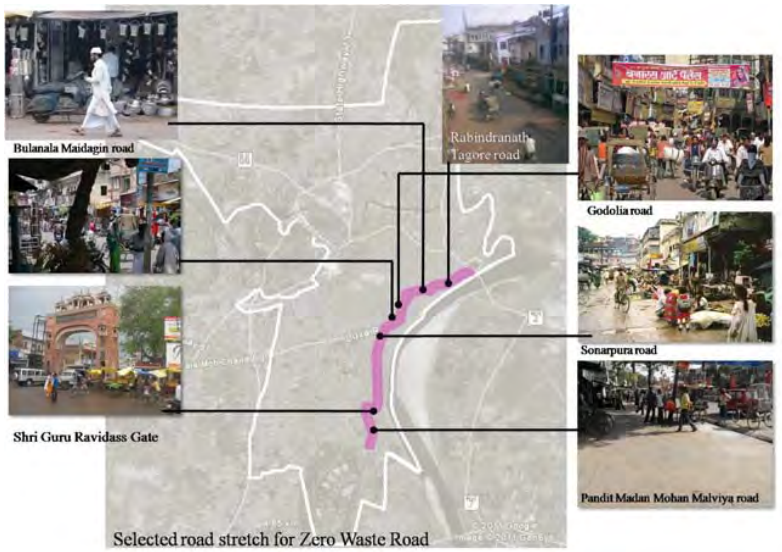


Figure 36- Zero waste street

to ensure model city level examples.

The selected road stretch runs parallel along the Ghats and is one of the most important roads in the city. The road width varies from 18metres to even 9 meter in places. The attached image shows the varying urban scape along the stretch. It acts as the collector roads for all the lanes that lead to the Ghats. The total length of the selected road is 7kms.

Street cleaning marathons should be organized to rope in all sections of the city. The Godowlia Chowk, which is a celebrated intersection in the city, near the Dashashwamedh Ghat, is almost the centre of this road stretch. Two groups may run the marathon from the both ends of the city, and meet at the Godowlia Chowk.

4.4.2.6 Achieving scientific waste management practices

The current waste management practices are not scientific, right from the waste storage at household level, which is not segregated, to the final dumping sites which are just waste dumps,

The attached chart shows the existing system with the images from the city, to show the existing situation. The proposed system has also been explained, with the desired interventions. The attached chart elucidates the improved waste management practices, vis a vis the existing. These are to be achieved both through policy and physical interventions. Mobilization, awareness and sanitation campaigns have an equivalently important role to play in this regard.

These should be taken up time and again to refresh public memory which is often short lived.

4.4.2.7 Practicing safe waste handling practices

The waste handling rules should be complied with. For people working as dumpsite waste pickers in most developing countries, incomes are so low that many make insufficient money to meet daily subsistence needs—an issue which complicates enforceability of using protective gear for handling wastes.

The susceptibility of the workers of being affected by diseases like Diarrhea is very high. Furthermore Tuberculosis, bronchitis, asthma, pneumonia, dysentery, parasites, and malnutrition are the most commonly experienced diseases among waste pickers based on health studies of waste pickers conducted in Bangalore and New Delhi in India.

The following measures on workers health should be taken under the short term measures:

- Provide solid waste workers and waste pickers with clean drinking water and sanitation facilities.
- Vaccinate solid waste workers for hepatitis A and B, tetanus, diphtheria, polio, typhoid, and in endemic areas against encephalitis. For workers at open dumps and landfills, consider rabies vaccination.
- Develop medical surveillance standards and protocols, including baseline and follow-up medical examinations (e.g., overall fitness and strength, heart condition, pulmonary function, allergies/asthma, vision, auditory acuity, hepatic and renal function, standard clinical laboratory tests (e.g., CBC, SMA-22 biochem profile),vaccination and disease history, surgical history, musculoskeletal condition, sensitivity to heights or claustrophobia, vertigo/dizziness, incidence of seizures, etc.), routine survey of workers about job tasks performed and their physiological responses to their job tasks.
- Provide solid waste workers and waste pickers with protective clothing, shoes/boots and gloves. Solid waste workers should wear highly visible colors to help collection vehicle and other equipment drivers visually locate workers' positions during reversing, loading and unloading.
- Develop training materials on occupational and environmental health and injury issues relating to solid waste management for staff at all levels.

There has to be suitable monitoring mechanisms for the compliance of the health and handling standards in the city:

- Ensure that private sector participation through contractual or licensing arrangements in developing countries requires private operators to provide health and safety protection for their workers;
- Establish mechanisms of financial and technical support for municipalities to provide health and safety protection for their workers and encourage national governments to develop a policy framework;
- Finance improved disposal systems, closure of open dumps, provision of health and safety gear, and education on health and safety.

4.4.2.8 Biomedical Waste Management

Since 2005, Varanasi Municipal Corporation has signed a MoU with a local NGO, Centre for Pollution Control (CPC), for managing the bio-medical waste generated in the city. CPC offers their services to the municipal corporation on a PPP mode

Centre for Pollution Control has been assigned to collect, treat and dispose of the bio-medical waste generated from government as well as private units. They collect the waste from hospitals, pathological laboratories, x-ray laboratories, nursing homes, clinics and medical research units. There are in all 700 such units out of which only 50% are served under this mechanism. About 500 grams of waste is collected per bed and approximately 1750 kg waste is collected per day. CPC's treatment plant is located 14 kilometers away from the city at Mohan Sarai on NH2.

Issues Identified:

- Waste segregation Training has been given several times to the staff working in hospitals but still there is lack of awareness
- Non-served hospitals throw away their wastes in municipal bins along with the municipal solid wastes.

As per the Municipal Solid Wastes (Management and Handling) Rules, 2000 biomedical waste should be collected, handled and treated separately. At each facility generating bio-medical waste, the waste should be segregated and collected in earmarked and colour coded bins. The colour coding of the bins should be in accordance of the Bio Medical Waste (Management & Handling) Rules, 1998. The transportation and disposal of the biomedical waste should be accordance to the category of the waste in accordance with the rules.

4.4.2.9 Creation of Waste Management Site

A scientific waste management facility has been proposed for solid waste processing, treatment and disposal at Karsara Village about 20 km from the VMC. For this purpose 38 acres of land has been acquired. The proposed facility would consist of a compost plant, RDF plant, inert processing unit and landfill facility.

However, an estimate by CEPT University based on solid waste generation shown above and assuming that the landfill waste would be 30% of the total waste it was estimated that the land required for land filling would be much more than as anticipated at this stage. Hence waste minimization at the production end through policy level interventions should be considered.

4.4.3 Typical waste Management

4.4.3.1 Dealing with flower wastes

The flower wastes which are a large component of the total waste generated in city can be effectively used for income generating activities. The experiences from the other cities have shown the ways of involving the locals, hence creating awareness and cleaner Varanasi, but also helping them generate income from waste. In a small village near Lukhnow, incense sticks are being manufactured from the flower wastes. The details of the same have been discussed in the box. Flower composting has been successfully operating in the Mahakaal Temple Ujjain. Similar initiatives have been explored in the Kashi Vishwanath temple Varanasi as well.

Incense sticks from Flower Waste- Kathwara, near Lukhnow

In Kathwara located 30kms away from Lukhnow, are using the flowers offered to the deity at the famous Chandrika Devi temple near their village to support their families. The womenfolk from villages around the Chandrika Devi temple have been manufacturing incense sticks from the flowers and sell them to smalltime retailers in the village markets and the shops selling 'puja' materials around different temples.

These women learnt the art of converting the flowers into incense sticks from the scientists of the Central Institute of Medicinal an Aromatic Plants (CIMAP), a prestigious CSIR laboratory. The flowers are dried under the sun and then crushed to turn them into a paste. A little quantity of wood powder is mixed with the paste. Coal powder is used as a coating on the sticks. A fragrant oil is also used at times.

Thus the lager quantum of flower waste that is generated in the temple is used for better purposes than being thrown into the river Gomti and polluting it as was earlier done.

The idea is to organize composting in a decentralized process wherein temples or group of temples can opt for composting, which can be used as a bio fertilizer. This shall also reduce the large chunk of area required for the compost plant to be set up, on a centralized basis.

4.4.3.2 Tourism and Hotel Waste Management

The attached map shows the location of the hotels and the guest houses in the city. The waste generated by the tourism industry (per capita) is more than that of the residential population.

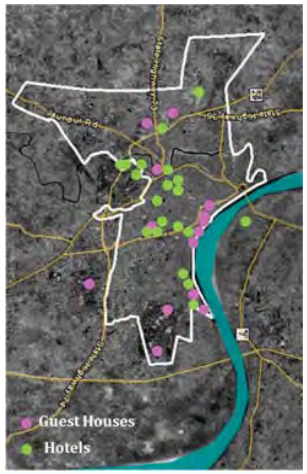


Figure 37- Location of hotels and guesthouses in Varanasi

In Varanasi tourism is major economic activity. There are more than 200 hotels and guest houses in the city. The city reports an average tourist in flow of 50,000 per year. Hence this sector is important in terms of the interventions required for better waste management practices in the city.

CEPT has proposed some waste reduction strategies for the tourism industry in Varanasi.

Managing food wastes – Food wastes are important constituent of the wastes generated in the hotels and restaurants. These are at the moment being thrown as garbage. These can be handled better. Instead of throwing them, they can be used to feed the poor. Many big hotels have taken this step, and have been successfully dealing with a large quantum of wastes in a better and humane manner.

Zero Waste Hotels- Becoming a zero-waste hotel does not necessarily mean the elimination of all by-products. It means

using resources efficiently, using renewable resources, and when generation of byproducts is unavoidable, using those by-products as the raw material for other processes. The biological by-products of hotel activities should be able to be safely assimilated into natural systems by bacterial processes in soil or water.

Water-efficient practices use improved technologies that deliver equal or better service using less water. Water conservation encourages hotels to better manage how and when water is being used, addressing both the technical and human side of water management issues. Solid waste in hotels has many components, including paper, food, various metals, plastics, aluminum, and glass. The average composition of wastes is shown in the attached chart.

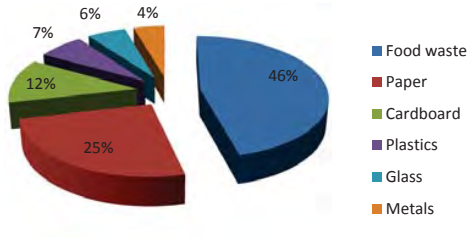


Figure 38- Composition of hotel wastes

When looked under the light of waste minimization strategies these figure suggest the possibility of recover from them.

The hotels that successfully reduce their wastes may be given special recognition by the government and promoted such that they become exemplary for the other similar entities in the city.

Eco labeling is an important tool for applauding green initiatives and can be used effectively to promote the cause.

4.4.4 Better enforceability

4.4.4.1 Monitoring and evaluation

In order to achieve an effective implementation of any programme it is important to have an effective Monitoring and Evaluation Tools. There should be a proper institutional arrangement for conducting regular monitoring and evaluation of the implementation of CSP. The National Urban Sanitation Policy (NUSP) states that the City Sanitation Task Force and the Implementing Agency should collectively plan for the M&E of the implementation, an integral part of the City Sanitation Plan (CSP).

- M&E is most effective when it involves stakeholders in a creative process of learning how to improve projects on a continual basis.
- Making M&E participatory calls for careful attention to how different stakeholders can be involved in the most constructive way.

M&E must be understood as a complete system within a given project and should be planned, managed and funded. There are four key parts to a M&E system:

- Setting up (or designing) the system, a institutional monitoring and evaluation plan
- Gathering and managing information through ICT tools
- Using experience and information more effectively to improve action; and

- Communicating and reporting results through participatory methods like community score cards, motivational tools like rewards etc.

To ensure that the targets are achieved and the programme achieves expected results, review and monitoring shall be done on a fortnightly, monthly and quarterly basis at city, district and state level respectively. It also states that in order to have strong public participation in the process of implementation of CSP, various public committees (apart from above mentioned committees) must take the lead in monitoring and evaluating the programme, it will ultimately develop the feeling of ownership among the community.

Development of the citizen's report card

The existence of a DPR does not ensure the systematic delivery and uplifting the quality of services. This has to be ensured by effective community participation and also a system or monitoring such that the services of the desired level are being provided and maintained.

Citizen report cards are a useful approach for setting into motion a public dialogue with service providers. By activating the media in order to highlight the findings the citizens are gradually given the confidence to demand improvements in the provision of public services. Citizen report cards identifies the key constraints that citizens face in accessing public services, their appraisals of the quality and adequacy of public services, and the treatment they receive in their interactions with service providers, especially government officials.

The information may be analyzed under the following sub heads

- Demographic and socio-economic data
- Availability, access and use of services
- Satisfaction with services and priorities for improvement
- User charges
- Interactions/communication with the service agencies
- Staff behavior
- Problem resolution- Time required and quality of services rendered
- Transparency of service delivery

The report card shall give an idea of the extent of enforceability of the services and the citizen's level of satisfaction with the same. The total urban area may be stratified into the different income groups to get an idea of the levels of satisfaction at all stratas of the society and the inclusivity aspects of the services.

The format of the Citizens Report Card shall have to be prepared by the VNN in association with A2Z. Pilot studies need to conducted such that an un-biased and holistic format may be developed. This should serve the needs of all the segments of the society, especially the poor. Since in Varanasi one third of the population lives in slums, this is an important initiative on the part of the urban local body.

4.4.4.2 Formation of river police

To regularize the cremation processes and maintenance of the ghats the river police force may be constituted. There is already a proposal for this force formation under the GAP. This may be constituted from the existing police force, ghat committees, local citizens and volunteers. This shall ensure representation from all sections of the society.

They shall patrol the ghats and help in the maintenance of these ghats. They shall keep a check on the wastes being thrown into the river through these ghats. The presence of the ghat committees shall help in maintaining the sanctity of these ghats yet help in cleaning and maintaining the ghats.

The Ghat Police should be empowered to award punitive actions for the defaulters. They can maintain a score card with the sanitation rating of the Ghats. This can be mutually done and awards and recognition like "Cleanest Ghat" can be initiated.

4.4.4.3 Waste minimization policies

The total quantum of wastes generated in the city should be attempted to be reduced as medium term interventions. The numerous hotels and dharamashalas should reduce their resource consumption and also waste generation.

Green packaging systems may be introduced. The core city area may be declared plastic free by the municipal corporation. This shall reduce a large quantum of the wastes that are dumped into the river. The flower and puja wastes are primarily bio degradable in nature and are lesser lethal than the non biodegradable alternatives.

4.5 Action Plan

4.5.1 Waste Management practices

Short term	Removal of transfer stations – conversion into public toilets Immediate provision of community bins and provision of bins at household level Management of food wastes in Hotels and restaurants
Medium term	Achieving 100% door to door collection
Long term	Creation of waste management sites

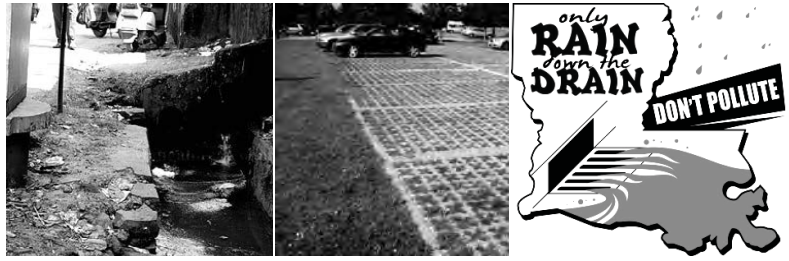
4.5.2 Technological options for waste management

Short term	Setting up of composting at temples and market areas. Waste recycling and reuse options Procurement of equipment for Nala cleaning Provision of waste handling equipments to Safai karamcharis
Medium term	Identification of wealth out of waste options
Long term	Greener cremation alternatives

4.5.3 Awareness and Institutional options

Short term	Filling of vacant posts Creation of Ghat committee in health and sanitation cell Organization of the Ghat cleaning karamcharis- Municipal, citizens and NGO's Organizing and mobilizing community participation in waste management Identification and enforcement of zero waste zones. Identification of PPP partners for composting at market places. Plastic free zones at 100m buffer from Ghats. Pilot interventions- Nala cleaning, Zero waste streets.
Medium term	Formation of river police
Long term	Eco-labeling Waste minimization policies

Annexure IV- Strom Water Management



5 Storm water management

5.1 Overview

Varanasi town lies between the 25°15' to 25°22' North latitude and 82° 57' to 83° 01' East longitude. The river Ganga flows from South to North having the world famous ghats on its left bank. A ridge runs almost 200m to 400m away from the western bank of Ganga and the area between the river and the ridge slopes towards the river Ganga. Most of the area beyond the ridge slopes towards the river Assi in the South and towards river Varuna in the North. The highest flood level of river Ganga is 73.90 meters (1978), and lowest river water level is approximately 58.00 meters. The general ground level varies from R.L. 71.0m to 80.0m.

Few parts of Varanasi are susceptible to flooding in the monsoons. The rain water drains are in a dilapidated condition. Furthermore the grey water and the garbage which is dumped indiscriminately into the storm water drains deteriorate the conditions further. The subsequent sections detail the issues of the storm water management and propose strategies to deal with the same.

5.2 Assessment

5.2.1 Situation Analysis

Initially the effluent carried by the sewers used to be discharged in the Ganga at Rajghat and rain water flowed through the underground drains to the river. In the later stages, with the increase in population, the sewers were connected to Nalas such as Ghora Ghat drain and Trilochan Old Drain etc. The following sections give an overview of the different storm water drainage components in Varanasi.

5.2.1.1 Storm water drains

Storm water is being drained off in Varanasi, through very old and incomplete underground and Kachcha open drainage system. Most of the drains have been connected to branch sewers mixing sewage with storm water hence increasing the load on the sewage pumps and STPs especially during monsoons.

Most of the old drains are named after the Ghats where they discharge eg. Mansarovar Ghat drain, Harischandra Ghat drain etc.

5.2.1.2 Natural drainage

The Assi nala and the river Varuna are the two tributaries of Ganges and also aid in the natural drainage of the city. However there are waste dumps along them and the waste disposed into these on a daily basis is to the tune of 10 tonnes per day, polluting them and Ganges in the end.

There are other distributaries of these nalas which are often linked with the numerous water bodies in the city.

5.2.1.3 Ponds and kunds

There are large number of ponds & kunds of religious significance in the city. These acted as receivers of storm water. However they are in shabby state due to the pressures of urbanization. Paving and concreting has affected the natural absorbing capacity of the soil, hence the water does not reach these ponds and kunds. These ponds lack the connectivity with the storm water drainage network so that in the situation of excess rainfall they create water logging in their surroundings.

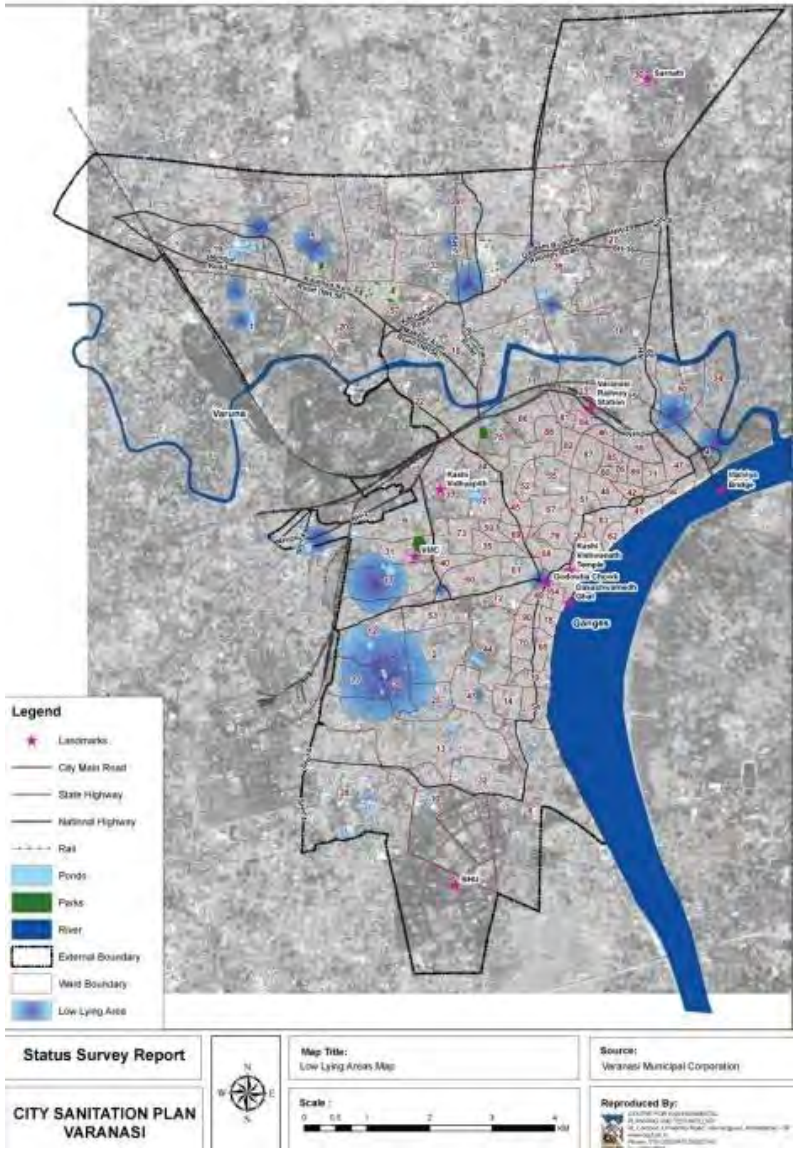
5.2.1.4 Institutional structure

Capital investments in water supply and sewerage are the responsibilities of the state agency- UP Jal Nigam, whereas the maintenance responsibilities have been demarcated between the UP Jal Nigam for sewerage and the Varanasi Jal Sansthan for water supply. Strom water management although over time has emerged as a serious issue in the city, does not feature in any fee, tax or charge being levied on the citizens. As per Revenue-Expenditure Statement, the revenue sources of MCV & Jal Sansthan also does not comprise storm water drainage head. It has been a largely neglected urban service until the DPR for the same was sanctioned.

5.2.1.5 Water logging

Water logging in monsoons is one of the major issues in the city. The areas prone to frequent water logging are Chaukaghat Water Tank, Gurabagh, Jal Sansthan area, Vikas Pradhikaran Colony, Shivpur, Nakkigthat area, Mahmoorganj, Ravindrapuri colony, Central Jail Compound area, Dingia Mohall area, Shivpurwa, Nawab Ganj, Bada Lalpur area, G.T. Road area, Nirala Nagar, Karaudi area, Chuppepur colony, Slaughter House area, Jaiprakash Nagar, Bazerdiha area, Khushall Nagar, Kamalagarha, Manduadih area, Brijenclave colony area, Paigamberpur, Salarpur etc.

The attached map shows the various low lying areas in the city.



Map 18- Low lying areas in Varanasi

5.2.2 Proposals under the DPR

Presently there is no revenue model for storm water drainage. The revenue model being adopted in this project report is capable to earn sizable revenue through logical rates of one time drainage charge and annual water conservation cess. This levy being compensatory nature is legally permeable and within the powers of the state government under the Nagar Nigam Adhiniyam itself.

The detailed project report on Strom water management deals with the three aspects of

- Rehabilitation/ renovation of existing drains and separation from sewerage system.
- Construction of new drains in served areas and areas wherever there are no drains.
- Construction of pumping stations to pump water from low lying areas.

The proposals under the DPR have been broken down into three sub heads

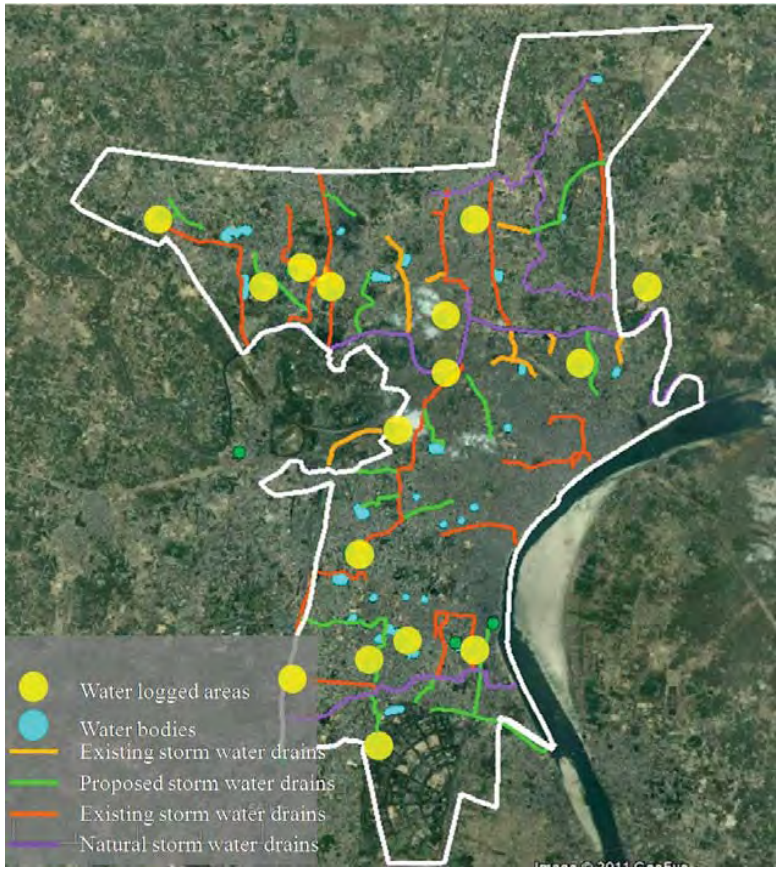
- Road Side Drain
- Major Drain
- Disposal drain/ Receiving Water Body

The details of the same have been classified as under

Table 35- Proposals under the DPR

Sr, no.	Components	Activities	Total Length (new construction)
1	Road Side drain	De-silting Cleaning Rehabilitation New construction	Drain With cover- 214.4km Hume Pipe- 188.6Km Total- 403Km
2	Major Drain		Channel- 40.8Km Hume pipe- 442 Km total- 483Km
3	Disposal Drain		Narokhar open channel- 64Km Assi nala open channel- 55.40Km Pond/kund- 55.41 km

The attached map shows the different layers of storm water drains in the city. The natural drainage of the city is mapped. The pockets that suffer from seasonal water logging are also demarcated.



Map 19- Proposed and existing storm water network

The proposed lines cover the areas with problems of water logging in the city. It is expected that these issues will largely be dealt once the proposed storm water lines are laid. The proposed lined also have a component of rehabilitation of the dilapidated storm water drains, hence making them more effective.

5.2.3 Key issues

- Most of the drains although working are insufficient. This leads to water logging in the areas in the vicinity. Certain storm water drains especially in the Trans-Varuna zone are not only insufficient but also damaged. However post completion of the DPR it is expected that the situation will improve in this regard.

- Overall, the entire drainage system works at just 10 percent of its total capacity[14].
- Frequent clogging of drains due to dumping of solid waste in the drains. This leads to an overflow of the sewage on the roads leading to very insanitary conditions.
- Urbanization has reduced the natural drainage capacity of the various water bodies in the city.
- Siltation reduces the carrying capacity of drains leading to water logging, particularly during monsoons.
- In the absence of a separate storm water system the capacity of the STPs fall short of the total effluent that reaches. Hence most of the rain water mixed with the sewage falls directly into the Ganges.

5.2.4 Recommendations

The coverage of the DPR in terms of dealing with the water logged areas, is pretty comprehensive. CEPT attempts to substantiate their efforts and also suggests better rain water harvesting practices to augment the water supply.

5.2.4.1 Better Storm water drain design

The existing storm water drains are open, which leads to the clogging of the same with solid waste. This reduces the capacity of these drains to carry off the rain water and results in flooding of the

Existing condition of Drains

Suggested covered drains

Captions for SWD

surroundings. It is suggested that the storm water drains be covered such that the solid waste does not enter them and reduce the capacity of the same. The images show the existing conditions vis-à-vis the suggested options.

For the new developments it is recommended that the storm water drains should be under the ground. The drain covers can be branded such as to educate people, not to throw solid waste into the same.

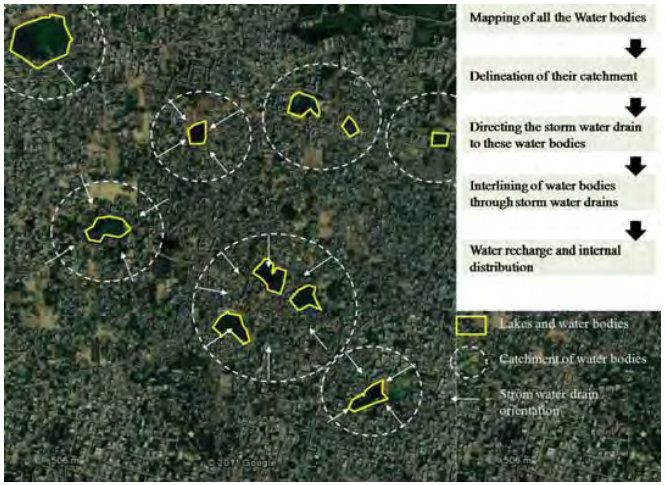
[14] Strom water drainage DPR

5.2.4.2 Urban Water Body Management

Varanasi has many lakes and ponds. The attached map shows them. The lakes used for religious purpose are known as *kunds*. These also relive their catchments by acting as a container of storm water. Urban development overtime obstructs these natural drainage patterns. These need to be restored by interconnecting the storm water drains of the catchment area. This shall naturally recharge the ponds.

It is recommended to develop the drainage to lakes and also use the storage capacity for diversion of storm water which can relieve the flooding in urban area to some extent. These water bodies will also act as holding ponds and relieve the pressure of storm water flooding in area of the city during monsoon.

Construction of catchments drainage network around the water body shall harvest the runoff into the lake depression. A cluster of water bodies can be linked by the means of storm water drains, which shall help in the redistribution of excess water internally within these. The attached flowchart diagrammatically shows the interlinking of the various water bodies in Varanasi which can reduce urban flooding and a better environment management.



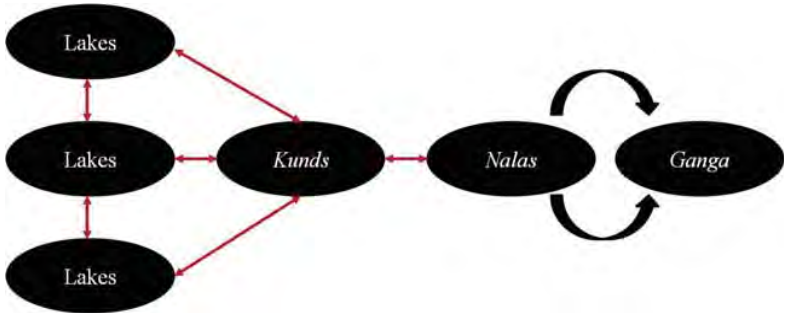


Figure 39- Interlinking of Lakes

5.2.4.3 Rain water harvesting structures

Rain water harvesting can be achieved through a combination of the following recharge structures[15]. The applicability of these recharge structures in Varanasi is indicated in the table below

Table 36- Options for Recharge structures in Varanasi

Recharge structure	Description	Applicability in Varanasi
Storage tanks	For harvesting the roof top rain water, the storage tanks may be used. These tanks may be constructed on the surface as well as underground by utilizing local material.	New developments in the peripheral areas
Recharge pits	Recharge pits are constructed for recharging the shallow aquifers. These are constructed 1 to 2 m. Wide and 2 to 3 m. deep which are back filled with boulders, gravels & coarse sand	In the dense core city. Vacant lands or footpaths can be used for the same
Abandoned dug wells and hand pumps	Existing abandoned dug wells and hand pumps may be utilized as recharge structure after cleaning and de-silting the same.	Wherever applicable
Abandoned tube well	Abandoned tube well may be used for recharging the shallow / deep aquifers. These tube wells should be redeveloped before use as recharge structure.	
Lateral trench with bore wells	For recharging the upper as well as deeper aquifers, lateral trench of 1.5 to 3 m. Wide & 10 to 30 m. long depending upon availability of water with one or more bore wells may be constructed.	In the peripheral areas

[15] Central Ground Water Board- 1999

5.2.4.4 Regulatory policies for institutionalizing Rainwater Harvesting

The policies for rainwater harvesting have to be institutionalized for better adherence to the same. The GoI has been promoting rain water harvesting through the water shed management program. Various measures initiated by the GoI for the same and the possible actions that Varanasi can adapt are elucidated in the attached table.

Table 37- GW management policy and applicability in Varanasi

Policy	Possible adaptation in Varanasi
Circulation of a Model Bill to all the States/Union Territories to enable them to enact suitable legislation for regulation and control of ground water development.	Varanasi Municipal Corporation should adopt the same as a mandatory requirement for the new constructions. Examples from Bangalore and Ahmedabad may be used.
Circulation of Manual on artificial recharge of ground water in 1994 to the States/Union Territories to enable them to formulate area specific artificial recharge schemes to check the declining trend in ground water levels	Varanasi can develop a city specific manual based on the ▪ Rain fall data analysis ▪ Ground recharge capacity identification ▪ Innovative ways to manage storm water ▪ Designing specifications for storm water recharge and diversion scheme for the city ▪ Adaptation and mitigation strategies for the low lying areas.
Implementation of pilot Central Sector Scheme on "Studies on Artificial Recharge of Ground Water" in the country at an estimated cost of Rs. 25.00 crore. Recharging wells and rain water harvesting are integral part of this scheme	

5.2.4.5 Incorporating RWH in building byelaws

DRRWH (Domestic Rooftop Rainwater Harvesting) should be made mandatory for all new developments. The Municipal Building Bye Laws must be amended to that effect. No Building Plan with plot size more than1000 sq.m should be approved by the Municipality unless it has provisions for rainwater harvesting system. This should also be extended to the commercial and institutional establishments in the city.

Incentives must be provided by way of rebate in property taxes for installation of such facilities in the existing residential houses, which do not have any system for rooftop water harvesting. Group Housing Societies must also be encouraged to set up injection well at the neighborhood level for conserving the rainwater. The technology is simple yet affordable and cost effective and can be implemented in new constructions.

5.2.4.6 Management of Natural stream

The 2 major natural streams of the city, *Varuna* and *Assi* are being used as waste dumps in the city. It has been estimated that almost 10 tonnes of waste is lying in the banks of these *nalas*. These obstruct the natural drainage pattern of the city. The carrying capacity of these is also substantially affected.

These need to be periodically cleaned and de-silted to maintain their storm water relieving capacity. While the garbage can is cleaned by mobilizing the citizens of the city, the silt management has to be organized and maintained by the corporation.

These have to done regularly and the waste management in the city has to be regularized such that the indiscriminate dumping of solid waste along the *nalas* is strictly banned.

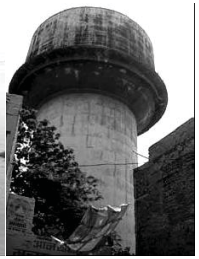
5.2.4.7 Urban Design Interventions

Over concreting of the urban fabric, has been identified as one of the major causes of urban flooding. CEPT proposes that this needs to be regulated. The parking lots and the footpaths are important places of rain water recharge. The paving should allow the percolation of water into the ground.

Varanasi specific standards for softscape to hardscape ratio must be set. The attached images display the various options of paving, which allow the rain water to percolate through the open joints.



Annexure V- Water Supply Quality


6 Water Supply Quality

6.1 Overview

The quality of water has a bearing on the health of the citizens. Water as a sector has been studied under the city sanitation plan with respect to its quality and the impact of other sanitation components like solid waste management and sewage management on the quality of water. The impact of the other components like sewage and soild waste, on the water quality has been dealt in their dedicated segments.

6.2 Assessment

6.2.1 Situation Analysis

The town has adequate perennial source of water in river Ganges, which provides approximately 37% of the total water supply. 63% of the total water supplied is sourced out of 197 tube wells operated by Jal Sansthan. Considering 15% losses in the water treatment process and 20% losses in transmission as assumed by the Jal Sansthan, 232.8 MLD is being supplied. As per one of the estimates around 10MLD is being extracted through the hand pumps which are installed at various location under various schemes by different welfare organizations, but maintained by Jal Sansthan (Jalkal).

6.2.1.1 Water Supply Zones

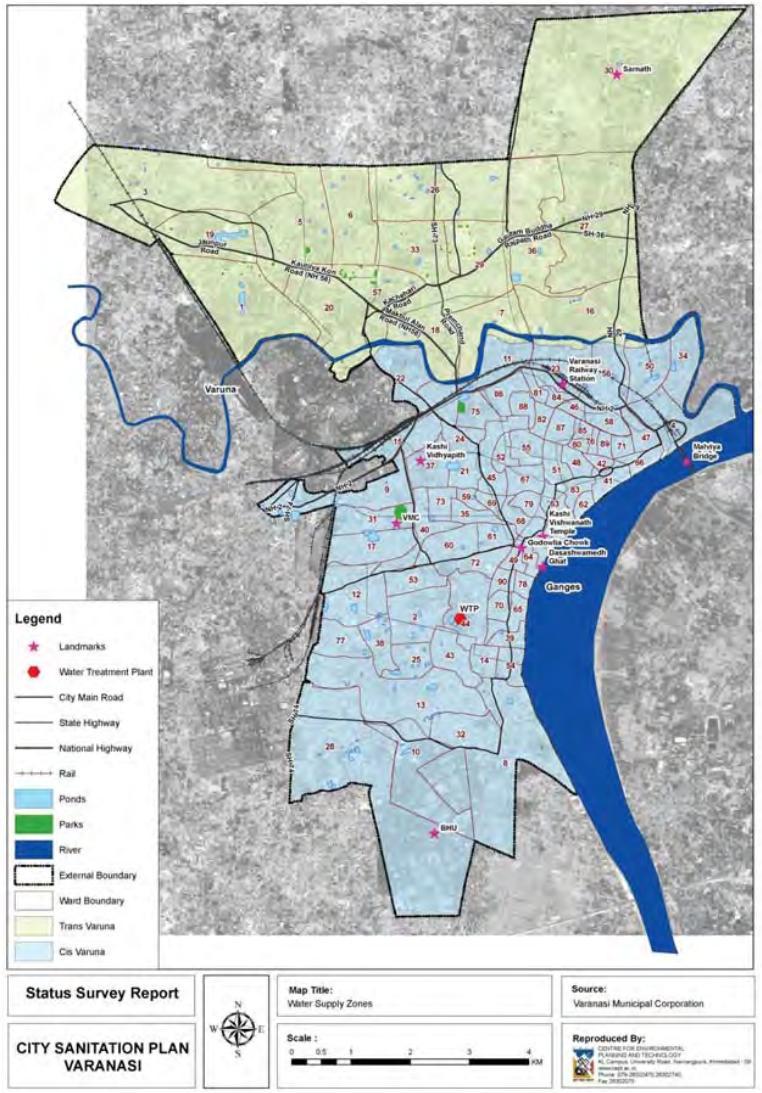
Varanasi is divided into 2 district areas viz. Cis Varuna and Trans- Varuna. The former comprises of old city and the areas of Lanka towards southwest and Lahartara zones. The Trans-Varuna area consists of Civil Lines and developing areas of Shivpur, U.P. College, Pandeypur and Paharai Zones.

For the purpose of water supply, the city is divided into 16 water supply zones of which 5 zones lie in the Trans-Varuna area and the remaining 11 lie in the Cis Varuna whereas Lahartara zone lie outside the municipal boundary. The water supply zones are shown in the Table 22 & Map no. 14.

Table 38- Areas uncovered from water supply

SR. NO.	CIS VARUNA DISTRICT	TRANS VARUNA DISTRICT
1	Lahartara Zone	Shivpur Zone
2	London mission Zone	U.P. College Zone
3	Cotton mill Zone	Pandeypur Zone
4	Jaitpura Zone	Paharia Zone
5	Rajghat Zone	Civil Lines Zone
6	Maidagin Zone	Shivpur Zone
7	Chowk Zone	
8	Benia Zone	
9	Sigra Zone	
10	Bhelupur Zone	
11	Lanka Zone	

Source: Jal Sansthan (Jalkal), Varanasi



Map 20- Water supply zones in Varanasi

6.2.1.2 Water Supply Demand and Supply

The table below shows the current water demand in Cis Varuna and Trans Varuna zones. The table indicates a deficit of 67 MLD at present out of which 42 MLD is met with temporary arrangements from tube wells.

Table 39- Current Water Supply Demand and Supply Details

Sl.	Description	Total
1.	Population	17.16 lakh
2.	Current Water Demand	257 MLD
3	Water Extracted	
4.	From River Ganges	120 MLD
5.	From Deep TWs	190 MLD (141 TW)
6.	From Mini TWs	11 MLD (56 TW)
7.	Total	321 MLD
8.	Supply side after losses	292 MLD
9.	Current deficit	43 MLD

Source: Jal Sansthan (Jalkal), Varanasi

The table attached below shows the projected water requirement for the years 2025 and 2040 considering 150 lpcd for general population and 40 lpcd for slum population. It is also assumed that the slum population in year 2040 will be reduced to 10% of the total population.

Table 40- Population & Water Requirement in MLD

Year	Population	Rate of Water Supply	Water Requirement in MLD
2010	1716100	150 lpcd + 20% (UFW) for General Pop. & 55 lpcd + 20% (UFW) for Slum Pop.	304
2020	2261433		402
2030	2806759		500
2040	3367900		601

Source: Jal Sansthan (Jalkal), Varanasi

6.2.1.3 Gap Analysis

The table below shows analysis of future demand of water and the gaps generated because of the increase in future demand. At present the design capacity of Water Treatment Plant is 310 MLD but it is only able to treat 120 MLD and requires up gradation. An up gradation of the treatment plant by UP Jal Nigam to utilize the total design capacity of 310 MLD is proposed. At present the deficit is being provided through tube wells and hand pumps. For future demand nothing has been proposed so far.

6.2.1.4 Key issues

- One of the major problems is about the quality of water. This is because Assi Nalla discharges its waste ½ to 1km upstream of water intake works.
- Contamination of river water by throwing burn/un-burnt human and animal dead bodies in to the river Ganga.
- High percentage of non revenue water.
- Some of the distribution lines are as old as 100 years and are deep down the ground, which are difficult to maintain and needs replacement.
- Storage capacity is insufficient in the new extension areas of the city.

6.2.2 Recommendations

6.2.2.1 Maintenance of Distribution system

The present distribution system of water supply is more than 100 years old and hence prone to leakages. At times the sewer lines cross the water supply lines posing a risk of contamination of the water supply. Preventive maintenance of the water supply lines through leak detection at regular intervals would prevent not only the contamination but also reduce physical losses and line loss of pressure. The frequent leakage and conflict points should be geo tagged and mapped for easy identification and prompt action.

Water supply at the consumer end should also be monitored regularly and water testing kits should be distributed in the ward council for ease of the consumers and detection of possible contamination.

6.2.2.2 Tariff Regulation

The non-revenue water is defined as the component of water supplied that does not provide any financial returns. This may be due to physical losses, thefts etc. The non-revenue water can be reduced by maintenance and tariff regularization. At present the water charges are levied as per connections and are collected separately (since prior to 2010 Jal Sansthan and VMC were separate organizations). This led to possible under reporting of the connections. It is suggested to link the water charges with property tax irrespective of the connection. This bundling of the taxes would result in lesser pilferages. This would also lead to more efficient tax collection regime.

6.2.2.3 Slum Areas

Integrated Low Cost Sanitation Scheme mandates provision of sanitation services irrespective of the tenure issues in urban poor pockets. It is therefore, recommended to back the sanitation infrastructure with adequate water supply and to have separate specialized proposals for water supply in slums, integrated with the city water supply.

6.2.2.4 Source Quality Management

One of the typical problems of Varanasi is the location of sewage discharge upstream of the water intake well. This not only adds an external cost to the treatment of water but also poses heath risk. In the sections of solid waste management and sewerage system this has been addressed.

Annexure VI- Inclusive Approach

7 Inclusive City Sanitation Plan

The policy instruments that allow the interventions discussed in the preceding sections, to be interwoven into the city's character and nature bridge the distance between paper plans to real time actions. This chapter deals with the three components of community participation in the interventions proposed, generating city level awareness and finally strategies that include and mainstream the poor in the decision making processes, and allow them equal access to sanitation facilities.

Varanasi is a special city, strongly rooted in tradition and religion. The component of culture and tradition is overpowering on the day to day activities in the city. This makes the interventions interesting at the same time very challenging. Varanasi has also witnessed large scale interventions in the form of the Ganga Action Plan, JICA and others. These however have not really impacted the way they were designed to.

There are multiple stakeholders with diverse claims and contribution to each aspect of sanitation in the city. Effectively and meaningfully roping them in the process is the key for implementing the sanitation plan. The city needs custom designed awareness strategies that are target group specific and can strongly and sustainably convey the message.

The efforts are directed at building a strong and meaningful relationship between the locals, stakeholders and the local body. The idea is to shift from a "donor-beneficiary" approach to partnership based approach.

7.1 Community Participation Mechanisms

The role of community participation to improve the quality and profitability of water and sanitation sector operations are numerous. The involvement of users and communities early on in the process of development of a water supply or sanitation project is critical in order to ensure the sustainability of these services. To secure effective community participation identification of the stakeholders in the process has to be very clear. The project proponent should have a clear idea of which group is involved in what is what their expected outcome of the process is. Community participation is a constant process, which begins right from the stage of planning to post constriction maintenance and monitoring..

7.1.1 Community participation strategies

Various options have been explored for effective community participation in the design, construction and maintenance of the community toilets in the city. Since for Varanasi open defecation is a pertinent issue, to realize the larger vision of the NUSP, securing effective public participation in this aspect is crucial.

7.1.1.1 Design Development and Planning

The involvement of the community should rightfully begin at the planning stage itself. The attached example shows the involvement of the various stakeholders in the design and planning of public toilets in the Ghat areas. The Ghats have multiple stakeholders and hence identification of the same and extracting their preferences is important.

Stakeholders (user segment)	Shopkeepers associations, Ghat samitis, Nauka Samities, Tourists others if any.
Assessment of facilities	Through questionnaire surveys of representative sample from all the user segments
Identification of location	
Micro-assessment of location	Area based- the people staying near the proposed location are to be surveyed for their opinion

7.1.1.2 Institutionalizing community participation

The community participation has to be institutionalized, such that any project does not get clearance unless it has secured the desired levels of community participation. Discussions and meetings are to be conducted with the community. An example of the case of solid waste management has been elucidated to indicate community participation in a neighborhood

Choice of system	Door to door or community dustbins
Timing of collection	The timings can be discussed with the residents to assess their preference.
Location	The location of dustbins. This should be specifically discussed owing to NIMBY syndrome.
Collection route	The collection route in case of a door to door collection should be discussed, and should be based on the convenience of the residents.
Willingness to pay	To assess the paying capacity of the citizens for the improved services.
Monitoring and Evaluation	This can be based on community score cards, wherein the people can evaluate the levels of service.
Awareness on segregation	A higher degree of waste segregation can be achieved if awareness is created.

The clearances for the system would be given only when the proponent has undertaken these studies and submitted the report.

7.1.1.3 Community Needs Mapping

The needs and expectations of the community have to be mapped in detail. This allows more informed decision making and also an organized community participation strategy. An example of the decentralized slum sewage management through community participation has been shown in the attached table

Identification of the affected community	Area based, social group based, CDS, mahila madals, marginalized sections of the society
Focused group discussion and structured interview	Understanding of the specific issues faced by the citizens. It should be attempted to understand the situation across all seasons of the year.

Timelines	Share community understanding of the incidences in the past, present and expected future. Similar initiatives that were undertaken in the past and the outcome
Community aided area mapping	A representative group of residents would be invited to make a map of the colony; showing key features relevant to sanitation like: ▪ Open defecation areas ▪ Houses with or without toilets ▪ Location of sewers, ▪ Location of leakages ▪ Location of water logged areas This gives a much better understanding of the areas problems and real time information than the stereotypical way of survey based mapping
Prioritization	Develop the priority matrix with people consultation. This shall help in understanding the people's priority with respect to what they feel is the pressing issue of the area.

7.1.1.4 Participatory models

Models from across the world have indicated that a participatory model- both in terms of finance and resource have been successful in planning and design of infrastructure facilities in slums.

Policies like 90-10 can be adopted such that there is some level of contribution from the community, wherein the community pays for 10% of the capital cost of the facility. The labor would be used from the beneficiaries. The process for community toilets provision has been examined in the attached table.

Planning	Identification of the stakeholders	Slum dwellers, Community development societies, *sakhi mandals*, schools, NGOs
	Awareness and sensitization process, case studies can be discussed where such models have been successful.	
Construction	Augmentation of labor from the Community	The construction should begin first, to instill confidence in the people. The labor may be used from the community. These labors in turn also help in generating awareness for the needs of a community toilet.
	Financial contribution from the user groups	Options of community participation funds from the JnNURM may be examined at this stage.
The user charges may be relaxed for the first few months depending on the financial viability. This helps in setting in the sanitation culture, and helping people to understand the advantages of toilets over open defecation.		

Maintenance	Options of maintenance through formal employment can be sought from the community	This ensures higher credibility and more community driven solutions.
Monitoring	User scorecard	Better monitoring thorugh a tripartite system- ULB, Users and Private party
Awareness	Drives, campaigns, Wall painting	The local school children should be used in this, they become important communication tools, since they can translate their learning's to their parents.

The possibility of community participation at each juncture from planning to maintenance can be seen from this model. This ensures better quality of service delivery and being community driven is a sustainable model.

7.1.1.5 Public private sector interaction

In the days when the sanitation infrastructure creation is being largely being created by the private sector, their involvement as participants of development is essential. Before the preparation of the terms and conditions of the PPP model, the private players may be involved to know their expectations out of the project.

Figure 40 -Players of Urban Sanitation

Their understanding and the modes of effective participative model development can be worked out in a consultative workshop based approach. This ensures higher adherence to the terms of service and consistency of user charges. These have to be initiated by the VMC or the respective institution involved in the facility creation. The interaction matrix has been indicated in the chart below.

7.1.1.6 Community sanitation fund

A city level "Community Sanitation Fund" would be created. This is a challenge fund for any ward councilors/NGO/Association coming up with innovative ideas for their areas. 3 final winners selected would be selected through transparent process like SMS voting or public polls. The implementation of the proposal would be funded.

The winner would be given special slots in the radio, local news channels and news papers to explain their initiatives. This becomes exemplary for the citizens of Varanasi. This can be linked with the community participation fund of the JnNURM, which entitles an amount of 10 lacs for community initiated activities.

7.1.1.7 CSP Communication Plan

The sanitation plan has to be backed with a strong CSP communication plan. This would essentially mean creation of a strong communication plan for the vision, aims, objectives and targets of the CSP. The importance of undertaking a sanitation plan and the advantages should be circulated to all the groups of stakeholders in the city.

Who		**How**
Government	All institutional stakeholders from state, para state and urban local bodies	Meeting, distribution of excerpts of CSP
Non Government	NGO, Institutions- school and colleges, CDS etc.	Workshops, seminars, discussion
Communities	*Ghat Samitis, Nauka Samitis*, *Sakhi mandals*, Slums, residential communities	Media, mass campassing, street plays, banners and hoardings
Media (tools for communication)	Television, Radio, newspapers, internet.	Distribution of materials, discussions

7.2 Awareness Generation

Varanasi is a city of contrasts, from the serene Ghats to the slums, the world famous Varanasi saris to the colonies where they are made, the pulsating religious sentiments in the city to its garbage and excreta strewn roads.





While the city is in dire need of sanitation infrastructure, capacity building and setting the sanitation culture is also equally important. It is necessary to educate the people on the benefits of sanitation as a basic need of life.

Awareness generation is the process of informing and educating people to "elevate the level of knowledge" about the different sanitation options, with the intention of influencing their attitudes, behaviors and beliefs towards the achievement of implementing a sustainable sanitation system in their community in particular and city in general. The ultimate goal of a sanitation awareness raising programme is to achieve a degree of understanding and motivation such that the members of the community can participate in the decision making process at a more informed level.

An effective awareness-raising campaign strategy will employ a variety of different communication approaches and techniques to ensure that the central message is received and understood by the diverse audience. These awareness raising campaigns demand time and financing, therefore, there should be adequate support for planning, promoting and performing these activities. Mobilizing the community and promoting community-management of sanitation services includes the following aspects:

- Informing the community about the scope of the plan and activities.
- Bridging knowledge gaps and capacity building by sharing information, both technical and non-technical

- Building awareness among citizens regarding their rights and responsibilities of safe water, sanitation and hygiene practices and health.
- Building an atmosphere of trust and transparency between ULBs and stakeholders
- Generating willingness to pay for the desired standards of facilities

7.2.1 Information Education and Communication

A comprehensive strategy for IEC (information education and communication) needs to be developed for the purpose. A detailed identification of beneficiary groups/target groups at various levels in the city and introducing them to the purpose and rationale of the plan in detail, is important.

Communication is pivotal for the social process in water supply and sanitation and is a tool to engage the community. IEC serves as an entry point in the community and opens a channel for dialogue with them on a whole range of issues in community-managed approach.

The specific objectives of the IEC Strategy are:

1. To improve the resident population's attitude to and perception towards sanitation as well as their capacity to participate in keeping Varanasi open-defecation free.
2. To improve and enlighten the pilgrim (floating) population on sanitation and hygiene practices.
3. To provide knowledge and information to all the pilgrims along the ghats
4. To find methods for community participation in order to establish the proposed environmentally and economically sustainable sanitation and sewage management systems with the help of local government bodies, NGOs, Religious leaders,and CBO Federation Varanasi.
5. To ensure that lessons learned provide useful inputs in designing the overall environmental improvement strategy for the city
6. Providing information on the benefits accruing from investing in right practices keeping in mind the barrier-variables related to infrastructure, socio-cultural traditions and beliefs.
7. To promote the recycling and reuse for selected streams of waste.

The success of an awareness program greatly relies on the right identification of the stakeholders and the target groups. From the set of people who can be seen as agents of change to subjects of change. The approach of the awareness generation strategies is as shown in the chart

The awareness generation program should have a set of outreach medium, tools, methods and frequency for the effective delivery of the strategies and programs.

7.2.2 Methodology

Awareness creation for people at different level is a long drawn process and needs a well designed strategic methodology. The identification of issues, key messages which convey these issues, identification of the target groups and the locations for disseminating these messages and the tools for delivery have to be identified.

The first initiative is development and initiate city wide theme based awareness campaigns like – Keep your city Clean, Open defecation Free City, etc. The next step should be strategies at different level starting from the city to specific areas. The basic events that can be organized under this initiative are detailed in the graphic below.

Figure 41- Methodology for Awareness Generation Activities

7.2.3 Framework for Awareness Creation

A detailed framework for the awareness creation has been developed. A clear identification of the issues and the messages to be used to communicate the same has to be identified and developed. The messages are to be kept simple, precise and to the point. The communication tools shall be according to the accessibility of the target groups.

The overall vision of a 100% sanitized city shall be achieved by smaller easy to achieve targets, and hence helping completing the larger picture. The chart elucidates the pressing messages and issues that need to be addressed. The list of stakeholders and target groups has been identified for reference.

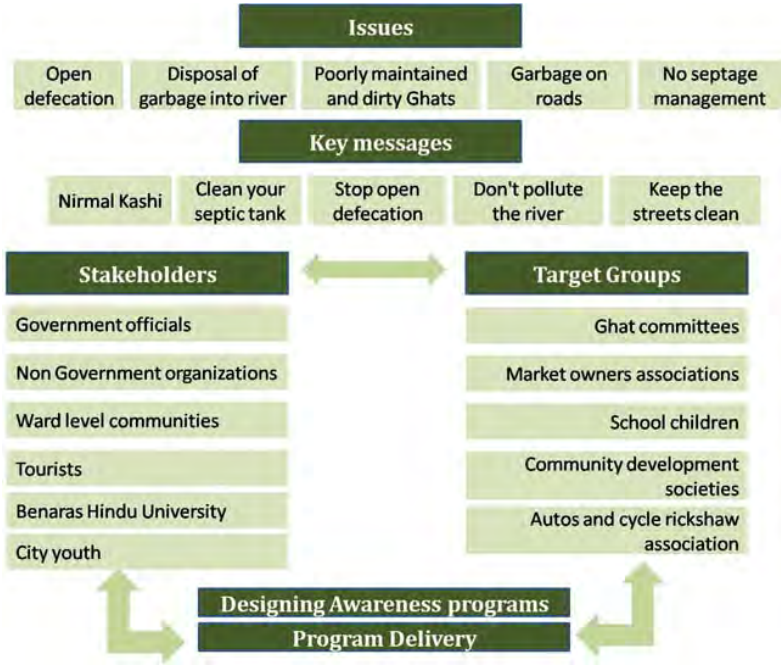


Figure 42- Framework for awareness generation

An appropriately designed sanitation awareness programme is one that meaningfully creates and retains the relationship between the stakeholders and target groups.

Designing the messages for spreading awareness should be simplified easily communicable. In Varanasi all the key messages should have to be in Hindi for better understanding.

The key message forms according the issues are for example: keep your city clean, clean your septic tanks, stop open defecation, don't throw flowers in the river, community toilets, and don't pollute our mother Ganges etc. The messages should be conveyed through meaning full channels so that it actually reaches the envisaged target groups.

In the next step major stakeholders are identified to whom the messages are to be conveyed. This is to ensure that the formulated messages are sent through right channels. Identified target group are like: citizens, auto & rickshaw pullers, domestic tourists, pilgrims, pandas, shop keepers and boatmen's etc.

These messages have to be conveyed to the target groups through suitable tools. From city level to target group specific communication stratgeis have been discussed in the subsequent section,

7.2.4 Awareness Packages

The awareness strategies have been broken down into several packages. These have been discussed in the following section. They range from mass city level awareness to target group specific activities. The programs have been designed to be participative and not the "I teach, you learn" model.

The modes of delivery have been explained trying to rope in innovative information tools which can be easily accessed by the citizens.

7.2.4.1 Mass Mobilization – Nirmal Kashi Campaign

Target group	Citizens of Varanasi
Purpose	*Nirmal Kashi* will be the kickoff for the sanitation initiatives. This will basically set the scene for the interventions to come.
Mode of delivery	▪ *Nirmal Kashi* Calendar - events for each month. These may be coupled with the festivals, since Varanasi has a strongly religious character. ▪ Street plays ▪ Inter school competitions- Debates, Skits ▪ Talk shows- celebrity of the month to deliver the message. ▪ Common people, who have some prominent contribution in the field, may also be the "celebrity of the month" ▪ Rallies and marathons ▪ Posters on allocations across the city behind buses for maximum outreach ▪ News papers can be requested to keep a column for sanitation practices and progress in the city which shall garner public support and also generate volunteering activities.





7.2.4.2 *Slums community development societies*

Target group	Slums of Varanasi
Purpose	Total 37.7 percent of the people in Varanasi live in slums. The condition of the slums is poor in terms of sanitation facilities. Open defecation is a common practice there. Hence they are an important target group where awareness strategies need to be undertaken.
Mode of delivery	▪ Volunteers going door to door, because access to media is lean in these areas ▪ Schools may conduct design competitions to design the mascot for sanitation drive ▪ The CDS in the city may compete for the open defecation free slums ▪ Slum tourism- where in the slums which achieve the sanitation targets can be taken up as model slums for slum walks. The tourists may be roped in for assessing the slums which are to be rewarded. ▪ The toilets and facilities created under the program should be free of cost of for 2 months to help people realize the advantage of sanitation and they subsequently when the habit sets user fees may be incorporated.



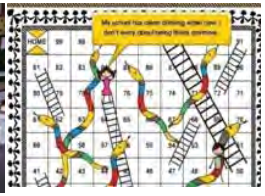
7.2.4.3 *Ghat Adoption*

Target group	Ghat *Sewa Samitis*, hoteliers association, Pandas, local tourists, Shop keepers association.
Purpose	There are total 84 Ghats in Varanasi, with their respective *Sewa Samitis*. The purpose of this programme is to ensure the maintenance of the Ghats. The program can be coordinated with a group of tourists or the institutions, such that each group adopts a Ghat along with the *Sewa Samitis* and strive for the upkeep and maintenance of the Ghats.
Mode of delivery	▪ Ghat heritage walks and cleanliness drives ▪ Since the Ghats are the most visited places in Varanasi, they are important locations for putting up the information kiosks and signs related to sanitation to spread the message. ▪ Ghat drawing and poster competitions, the design of a "sanitation mascot" be taken up in these. ▪ Youth cultural festivals may be organized at the ghats to spread the message in an interesting way. ▪ The shop owners along the Ghats are also stakeholders and important tool for spreading the message. The packages used for selling puja items may be specifically designed to convey the message. ▪ The hoteliers can be roped in to deliver the "*Nirmal Kashi*" message. The waste management from the hotels and guesthouses can be regulated and disposed off scientifically.



7.2.4.4 *Outreach program design*

Target group	Educational institutions, BHU, municipal schools,
Purpose	For a sustained awareness generation, the programme design for awareness strategies has to be designed by the people of Varanasi for the people of Varanasi. Schools are an appropriate location for sanitation awareness generation, as it gets effectively translated to their families.
Mode of delivery	▪ Varanasi Hindu University can be roped in. They already have an "Outreach & Social Welfare" division which works towards community development and awareness programs. They can dedicate Sundays for sanitation awareness generation activities. ▪ Design competition can be undertaken for designing posters, mascots and jingles for sanitation awareness.

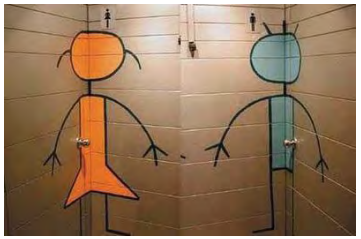



7.2.4.5 Nala Cleaning drives

Target group	Citizens, Students, VMC officials, Youth clubs, NGO
Purpose	The nalas are the unofficial waste dumps of the city. They empty into the river finally, transmitting the pollutants. Nalas are a city level property, hence adopting them shall have a city level impact
Mode of delivery	▪ Identification of Nala, and chalking the cleaning plan. ▪ An internet and sms based drive ▪ Requesting registration of participants ▪ City level hoardings- radio, sms, internet, and local channels. ▪ Distribution of participation souvenirs ▪ Development of a website which reports the activities and proceedings

7.2.4.6 Painting toilet walls

Target group	Slum children
Purpose	The external walls of the community toilets can be used to convey important messages of the importance of sanitation. These also improve the sense of ownership among the people.
Mode of delivery	▪ The walls of the newly constructed or revamped community toilets shall be painted by the slum children, with messages they want to convey. ▪ They may be taken up as design competitions among the slum schools. ▪ The interiors of the toilet and public amenities created under this scheme can have the messages written and communicated through them. ▪ Before/after images of the same facility reminding people that the facility needs to be maintained to retain its present state.



7.2.4.7 School sanitation campaigns

Target group	School children- I to V grade
Purpose	Focusing on youth and using education to transfer the messages to the families Demonstrate the link between sanitation, hygiene, health and economic development
Mode of delivery	▪ Rallies, sanitation awareness quiz, contests/competitions, sports/other events ▪ Distribution of sanitation kits etc. ▪ A designated Cleanliness / Hygiene Teacher per school ▪ Celebration of Hygiene Awareness day


7.2.4.8 Print Media driven sanitation campaigns

Target group	Citizens
Purpose	The print media has the largest outreach among its counterparts. Initiating cleanliness campaigns that the common citizens can participate in have a city level impact.
Mode of delivery	▪ Identification of areas in the city ▪ Weeklong sensitization of the sanitation issues of that area ▪ Registration of volunteers ▪ Cleanliness drives every weekend

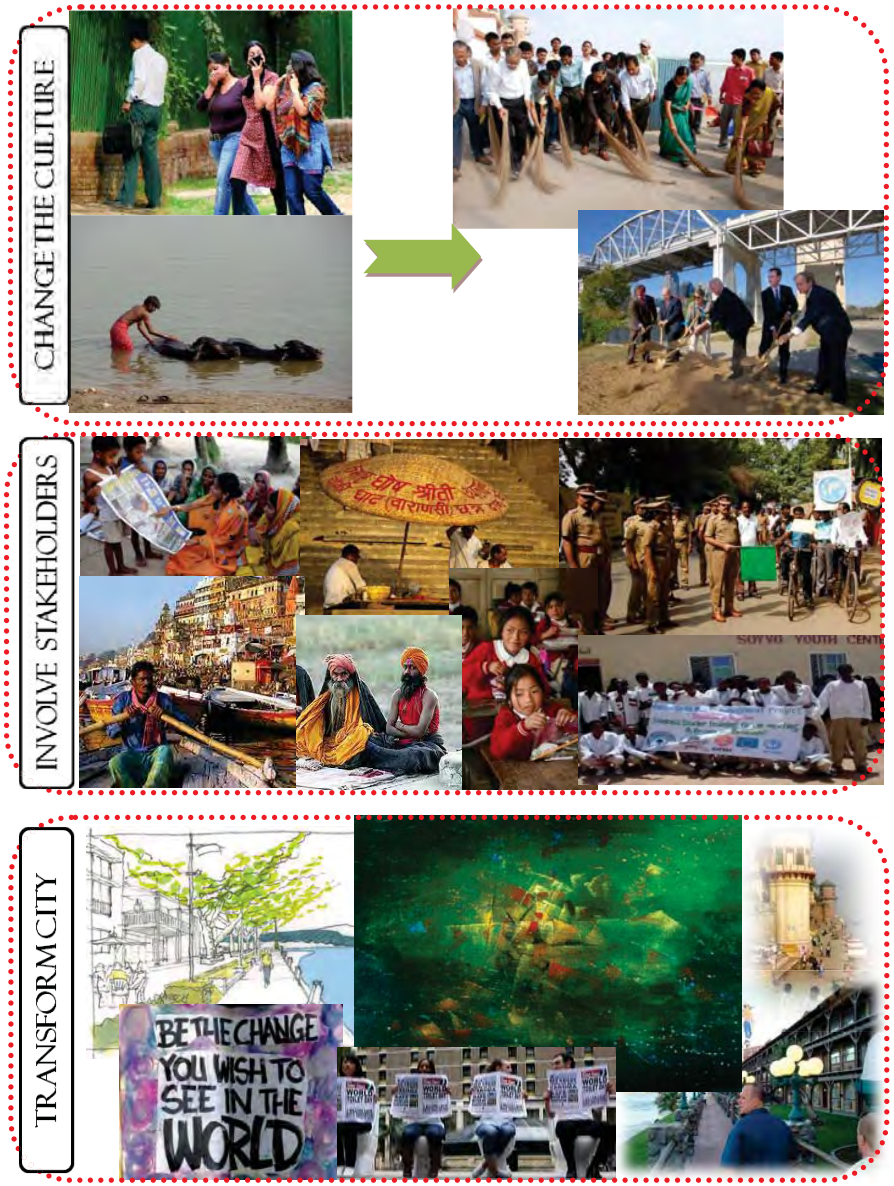
7.2.4.9 *Nirmal Ward of the week award*

Target group	Ward councilors, residents
Purpose	Acknowledgment of the positive initiatives not only encourages good practices but also become exemplary for the other parts of the city to follow the good example
Mode of delivery	▪ Declaration of the *Nirmal* Ward *Puraskaar* through the media ▪ Audits conducted by the City Sanitation Volunteers ▪ Felicitation and award and publicizing the good practices adopted. ▪ The ward councilor can be given a time slot on the radio to discuss the activities undertaken and the approach adopted. ▪ The slums may be adopted by the other ward residents

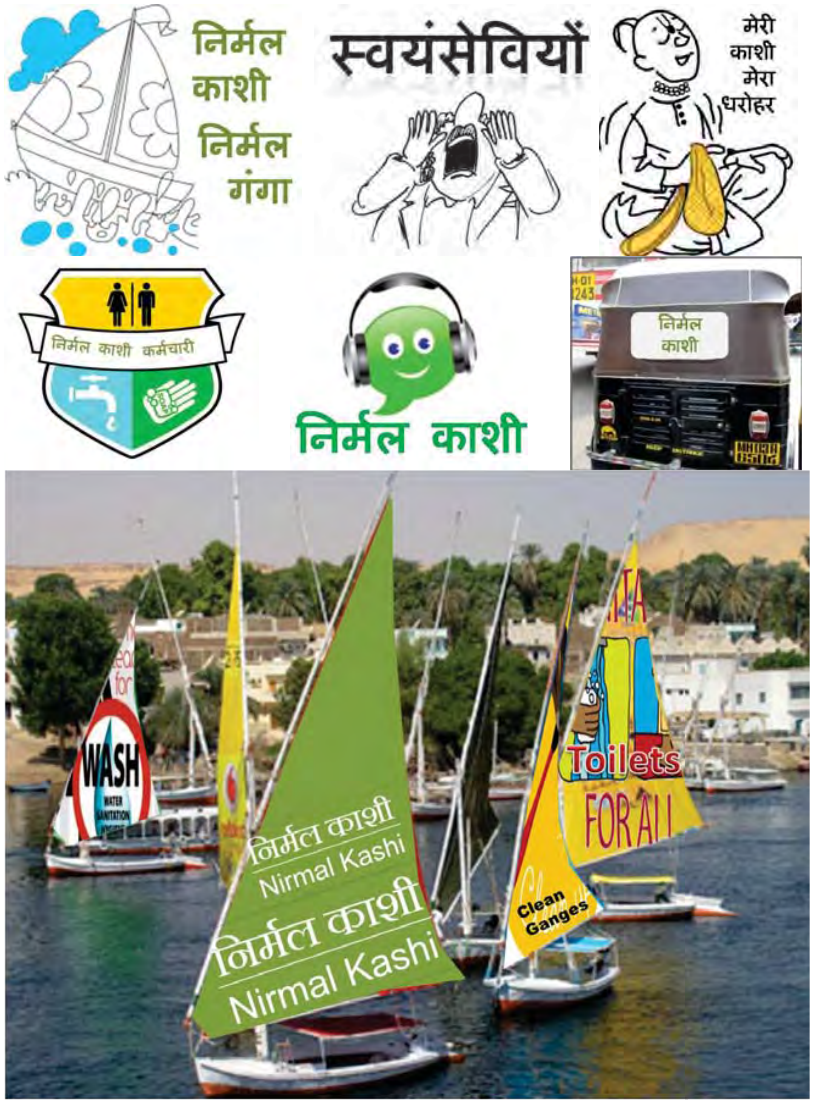
7.2.4.10 *City sanitation volunteers*

Purpose	Formation of City Sanitation Volunteers – 20 representatives from each stakeholder group
Target Group	The City Sanitation Volunteers may be picked from the following groups I the city so as to have a representative section ▪ Colleges and institutions ▪ Senior citizens ▪ Women groups ▪ Auto rickshaw drivers, ▪ Slum dwellers- youth and women ▪ Schools ▪ Associations- drivers, *ghat samitis, nauka samitis* etc ▪ CDS ▪ Ward councilors ▪ NGOs
Tools	▪ Registration of the city sanitation volunteers ▪ Provision of materials for IEC ▪ Workshops and seminars- Training of trainers ▪ Planning- Division of areas to each sub groups ▪ Spearheading the different sanitation campaigns These volunteers will be given a budget of Rs.5000. This shall be given in installments based on their pro activeness.

Attached are some sample display messages and display materials that may be used for spreading the awareness on Sanitation in Varanasi.



Awarenss for All



7.3 Pro poor initiatives

User communities, as 'informal' service providers, can supplement the role of formal service providers and can build useful partnerships with the public and private sectors, particularly in addressing the service needs of low-income urban communities. The wealthy are generally able to articulate their concerns, but it is to the poor, who constitute a non-standard group of consumers, that participatory approaches offer greatest benefit.

The people who cannot afford to monetarily pay for the facilities of sanitation need to be looped into the developmental process through innovative ways, such that they may be mainstreamed and contribute to the growth processes.

7.3.1 Pro Poor Strategies in Sanitation

7.3.1.1 Coverage of CDS with sanitation facilities

Through the *parivartan* packages it is expected that the CDS shall have coverage of at least one toilet seat for 30 people by 2016. This facility may be available at a monthly pass basis for each household. The current system allows 5 users per pass; however the average family size in Varanasi is of 7.2. This leads to reluctance on the part of the users, since even after paying family level access is not ensured.

Models for roping in the community for funding and maintenance options have been discussed in the section under community participation. This would help in reducing the O&M costs to some extent.

7.3.1.2 Cross subsidization of the community toilets with the public toilets

The community toilets are a lesser lucrative option from the business model point of view, since the user charges are inelastic and also they have lesser propensity of generating revenue from the advertisement rights.

CEPT suggests that the public VIP toilets, those located at the Ghats and the major commercial areas and community toilets should be given to the private operator as a package, such that he may realize the operation and maintenance of the community toilets through the public toilets, which can use higher user charges and also sell the advertisement rights.

The cross subsidization of community toilets by making a twin package can be an effective tool for achieving financial viability and reducing the burden on the slum households. In this section the financial viability of two cases is examined and the conclusions are used for similar cases. The cases examined here are:

Case 1: Cross Subsidizing Community Toilets through Premium[16] Public Toilets

Case 2: Cross Subsidizing Community Toilets through Non Premium[17] Public Toilets

[16] Premium public toilets refer to the proposed VIP/Premium public toilets near the Ghats with best quality of services.

[17] Non-premium public toilets refer to the proposed Public Toilets in the city other than the Ghats.

The financial viability for both these cases is given below:

Case 1: Cross Subsidizing Community Toilets though Premium Public Toilets

The revenue income from premium community toilets (toilets located along major ghats) would be much higher than the revenue income of the community toilets. Following assumptions are used to estimate the financial viability of the cross subsidization of one community toilets with 10 seats with one premium toilet with 10 seats:

- Cost of Capital is 10%
- Equity Debt ratio: 70:30
- Capital Expenditure per premium toilet with 10 seats – Rs.17.5 lacs
- Capital Expenditure per community toilet with 10 seats- Rs. 10 lacs
- Operation and Maintenance Costs as given in Annexure
- Charges of community toilets are revised every 5 years and charges of public toilets are revised every 10 years.
- Foot falls of public toilets are assumed 70% of the capacity and footfalls for community toilets assumed to be 100%.

Table 41: Cash flow for Premium Public Toilets and Community Toilets

	Cashflows for Premium Public Toilet																			
		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
A	Capital Investment	1750000																		
C	Revenue Income																			
1	Charges/usage	2	2	2	2	2	2	2	2	2	2	5	5	5	5	5	5	5	5	5
2	User charges	511000	511000	511000	511000	511000	511000	511000	511000	511000	511000	1277500	1277500	1277500	1277500	1277500	1277500	1277500	1277500	1277500
3	Advertisement	60000	66000	72600	79860	87846	96631	106294	116923	128615	141477	155625	171187	188306	207136	227850	250635	275698	303268	333595
C	Revenue Expenditure																			
1	O/M	262000	277720	294383	312046	330769	350615	371652	393951	417588	442643	469202	497354	527195	558827	592357	627898	665572	705506	747837
D	Deficit	309000	299280	289217	278814	268077	257015	245642	233972	222027	209833	963922	951333	938610	925809	912993	900237	887626	875262	863258
	Cashflows for Community Toilet																			
A	Capital Investment	1000000																		
C	Revenue Income																			
1	User Charge/HH	20	20	20	20	20	25	25	25	25	25	30	30	30	30	30	30	30	30	30
2	User charges	164835	164835	164835	164835	164835	206044	206044	206044	206044	206044	247253	247253	247253	247253	247253	247253	247253	247253	247253
3	Advertisement																			
C	Revenue Expenditure																			
1	O/M	136000	144160	152810	161978	171697	181999	192919	204494	216763	229769	243555	258169	273659	290078	307483	325932	345488	366217	388190
D	Deficit	28835	20675	12026	2857	-6862	24045	13125	1550	-10719	-23725	3697	-10916	-26406	-42825	-60230	-78679	-98235	-118964	-140937
E	Debt Servicing	825000	770000	715000	660000	605000	550000	495000	440000	385000	330000	275000	220000	165000	110000	55000				
	Installment	55000	55000	55000	55000	55000	55000	55000	55000	55000	55000	55000	55000	55000	55000	55000				
	Interest on loan	74250	69300	64350	59400	54450	49500	44550	39600	34650	29700	24750	19800	14850	9900	4950				
F	**Overall Deficit**	**208585**	**195655**	**181892**	**167271**	**151765**	**176561**	**159217**	**140922**	**121658**	**101408**	**887870**	**865617**	**842354**	**818084**	**792813**	**821557**	**789391**	**756297**	**722321**

The cashflows suggest appositive NPV of 1 .0 lacs. The charges of community toilets can be reduced from Rs. 30/HH for 5 users to Rs. 20/HH and with a HH size of 7.3. Thus the cross subsidization of community toilets is viable through premium public toilets.

Case 2: Cross Subsidizing Community Toilets though Non- Premium Public Toilets

The revenue income from non- premium community toilets (toilets located along major ghats) would be much higher than the revenue income of the community toilets. Following assumptions are used to estimate the financial viability of the cross subsidization of one community toilets with 10 seats with one premium toilet with 10 seats:

- Cost of Capital is 10%
- Equity Debt ratio: 70:30
- Capital Expenditure per premium toilet with 10 seats – Rs.10 lacs
- Capital Expenditure per community toilet with 10 seats- Rs. 10 lacs
- Operation and Maintenance Costs as given in Annexure
- Charges of community toilets are revised every 5 years and charges of public toilets are revised every 10 years.
- Foot falls of public toilets are assumed 50% of the capacity and footfalls for community toilets assumed to be 100%.

Table 42: Cash flow for Non- Premium Public Toilets and Community Toilets

	Cashflows for Non- Premium Public Toilet																				
		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
A	Capital Investment	1000000																			
C	Revenue Income																				
1	User charges/Use	2	2	2	2	2	2	2	2	2	2	5	5	5	5	5	5	5	5	5	5
2	User charges	365000	365000	365000	365000	365000	365000	365000	365000	365000	365000	912500	912500	912500	912500	912500	912500	912500	912500	912500	912500
3	Advertisement	12000	13200	14520	15972	17569	19326	21259	23385	25723	28295	31125	34237	37661	41427	45570	50127	55140	60654	66719	73391
C	Revenue Expenditure																				
1	O/M	136000	144160	152810	161978	171697	181999	192919	204494	216763	229769	243555	258169	273659	290078	307483	325932	345488	366217	388190	411482
D	Deficit	241000	234040	226710	218994	210872	202327	193340	183891	173960	163526	700070	688569	676502	663849	650587	636695	622152	606937	591029	574409
	Cashflows for Community Toilet																				
A	Capital Investment	1000000																			
C	Revenue Income																				
1	User charges/Use	20	20	20	20	20	25	25	25	25	25	30	30	30	30	30	30	30	30	30	30
2	User charges	164835	164835	164835	164835	164835	206044	206044	206044	206044	206044	247253	247253	247253	247253	247253	247253	247253	247253	247253	247253
3	Advertisement																				
C	Revenue Expenditure																				
1	O/M	136000	144160	152810	161978	171697	181999	192919	204494	216763	229769	243555	258169	273659	290078	307483	325932	345488	366217	388190	411482
D	Deficit	28835	20675	12026	2857	-6862	24045	13125	1550	-10719	-23725	3697	-10916	-26406	-42825	-60230	-78679	-98235	-118964	-140937	-164229
	Debt Servising	600000	560000	520000	480000	440000	400000	360000	320000	280000	240000	200000	160000	120000	80000	40000					
	Installment	40000	40000	40000	40000	40000	40000	40000	40000	40000	40000	40000	40000	40000	40000	40000					
	Interest on loan	54000	50400	46800	43200	39600	36000	32400	28800	25200	21600	18000	14400	10800	7200	3600					
	Overall Deficit	175835	164315	151936	138651	124411	150373	134065	116641	98040	78201	645767	623253	599296	573824	546757	558016	523917	487972	450092	410181

The cashflows suggest appositive NPV of 1 .8 lacs. The charges of community toilets can be reduced from Rs. 30/HH for 5 users to Rs. 20/HH and with a HH size of 7.3. Thus the cross subsidization of community toilets is viable through premium public toilets. In this sanitation plan, 10 Premium (VIP) Toilets, and 13 Non-premium toilets with 10 seats each and 3 Premium toilets and 16 non-premium toilets with 5 seats each are proposed.

Thus in all out of the total 109 community toilets with 10 seats, 32 community toilets can be subsidized through these premium and non-premium public toilets without any capital investment from the Urban Local Body

7.3.1.3 Slum School sanitation

Children's learning is directly influenced by the existence and the quality of safe water and sanitation facilities in schools. Girls especially are affected by poor sanitation facilities. Local actors such as government District Education Offices, school management committees, and parent teacher associations of the have to work in close synchronization to ensure that schools have acceptable facilities to make learning conducive. The children are the agents of change and they have to be provided with a conducive environment such that they may affectively educate their parents and hence the society.

Hygiene teachers should be instituted. The existing staff may also take up the role. They would be responsible for imparting education on the importance of sanitation. Games and sports may be played to highlight the importance of sanitation in an interesting manner.

7.3.1.4 Formation of Sanitation Committee

A strong community driven approach is highly recommended for slum sanitation. A sanitation committee should be formed for each Community development society. This would have the representatives from the CDS, slum women and the school teachers. They would be required to spread the awareness on the use of toilets and the issues of open defecation. Their role is then primarily to maintain the toilets and recover user charges. The revenue generated out of this shall be deposited in the account of the Sanitation committee. This may be used for development of the other sanitation infrastructure and for the payment of the salaries of the staff. Being a part of the community that is the user group also, ensures better maintenance and cost recovery and also attracts higher level of trust from the people. The attached box elucidates the experience in Tamil Nadu for similar initiatives.

Community Managed toilets, Tiruchirappalli (District), Tamilnadu,

Before intervention there were no basic municipal services such as water, sanitation, waste collection, drainage, street lights, paved foot paths etc. The dry toilets were in use in the slum and were manually cleaned by scavengers which resulted in unhygienic conditions. It was common to see the areas being polluted by human faeces. As both the sexes used the same spot, women and men had different times for defecation leading to problems for women.

As a part of the strategy, the first phase was to conduct a baseline study of the existing community toilets and the number of users for those toilets. The second step was to do an awareness programs in the slums about hygiene and the need to use toilets, and not to defecate in the open areas. As a continuity of this program, health educators and social workers went for a door to door campaign using flip charts. Once when the first round of door to door campaigning is over, people are encouraged to form SHG (Self Help Groups).

The formation of SHE (Sanitation Hygiene Education) teams was an important step. They played the important role of educating the people on the O&M of the toilets. The pay and use system was incorporated and the income out of it, was to be deposited in a bank by opening an account for the SHE team. The SHE team was involved in the appointment of the care takers and cleaners for the toilets and they will be used in a rotation basis.



7.3.1.5 Decentralized waste water management

Conducive institutional arrangements like pricing systems, community involvement, public private partnerships, and financing mechanisms can make the initiatives more people friendly, Newer innovative technologies can also be explored. Experience shows that decentralized system of waste water management has been effective, in the slums. The solution providers for decentralized systems should be institutionalized. This can be achieved by inviting consultants for empanelment and then using only from the empanelled pool. This shall ensure greater quality control, credibility and management of the systems.

7.3.1.6 Subsidization of Sanitation facilities

The poor may be assisted in the creation of sanitary infrastructure, through subsidization and cross subsidization. The slum communities may be encouraged to operate chit funding system, to operate and maintain the facilities created under the CSP.

The community participation fund is an important yet often ignored source of finance for the slums. Decentralized waste water treatment, community managed toilets are some of the suggested projects for garnering the support.

7.3.1.7 Solid waste management in the slum CDS

The solid waste management in the slums needs to be regulated and set in place. Community bins should be provided in the locations from where the municipal authorities shall collect the waste. Tins painted and standardized should be distributed free of cost, which would act as dustbins. The waste collection can also be organized by the community itself. Small handcarts can be effectively used to collect waste from door to door. The handcart bearer would have the first right of recovery frorm the wastes. This shall be in addition to his salary.

7.3.1.8 Organization of rag pickers for waste collection at Ghats

The wastes generated at the ghats are of high salvage value and the flower and pooja wastes can be re used for better purposes. The waste collection can be organized through a team of rag pickers. Each ghat shall be allotted to a particular group, which can comb the Ghats during fixed hours of the day. They may be paid by the municipal authorities, which is already short of staff. The rag pickers can also salvage and process the wastes to generate additional income.

7.3.1.9 Dealing with flower wastes

The flower wastes which are a large component of the total waste generated in city can be effectively used for income generating activities. The experiences from the other cities have been elucidated which shown how the local people can be involved in these processes, hence not only creating awareness and cleaner Varanasi, but also helping them generate income from the wastes.Flower composting has been successfully operating in the Mahakaal Temple Ujjain. Similar initiatives have been explored in the Kashi Vishwanath temple Varanasi as well. Composting can be a decentralized activity, wherein the process can be run by the locals instead of the ULB. This acts as a source of income and also reduces the requirement of a large piece of land, as in the case of a centralized system.

Annexure VII- Institutional Framework

8 Institutional Framework

8.1 Overview

Clarity of roles and responsibilities of institutions is a pre-requisite for good governance. This ensures greater enforceability of the policies and recommendations that are postulated in the plans. Clear role separation and clarity in the roles and responsibilities of the different verticals of city management shall ensure greater higher levels of accountability and transparency etc. This further leads to better efficiency in service provision.

8.2 Assessment

8.2.1.1 Exiting situation

The institutional structure for sanitation in Varanasi has been observed to have multiple stakeholders and institutions involved in the service delivery. There are multiple state level, para-statals and city level institutions offering sanitation services. The stakeholders involved for city level sanitation are both government and non government based. The table shows the various non government agencies involved in Varanasi City Sanitation.

State level	
Government	**Non government**
Uttar Pradesh State Pollution Control Board (UPPCB)	
State Urban Development Authority (SUDA)	
Urban Development Department	
Uttar Pradesh Jal Nigam (UPJN)	
City level	
Government	**Non government**
Varanasi Jal Sansthan (VJS)	Banaras Hindu University
Varanasi Nagar Nigam (VMC)	Mahatma Gandhi Kashi Vidyapeeth
Varanasi Development Authority (VDA)	Media and NGO's
District Urban Development Agency	Rotary Club
	Sanskrit Vishwa Vidyalaya
	Associations like Hotelier and Industrial
	A2Z Services Ltd
Local level	
Government	**Non government**
	Media and NGO's
	Temple trust
	Ganges Sewa Samiti and other Ghat Sewa Samiti
	Citizens of Varanasi

The subsequent sections detail the various organizations, their organizational structures and roles and responsibilities given to them.

8.2.1.2 Varanasi Municipal Corporation (VMC)

Jurisdiction

Varanasi Municipal Corporation was established on 24th January, 1959 under the Uttar Pradesh Municipal Corporation Act of 1959 as a Nagar Mahapalika. In 1994 it was converted into a Municipal Corporation under the U.P. Government act -2. It falls under the department of Urban Development. The 90 wards of the city are grouped into five different zones. At present total area under VMC is 79.79 Sq. Km. with a total population of 10, 91,918 as per census 2001.

Organization Structure and functions

A total of 90 councilors are elected, which form the general body of the VMC who work in tandem with the executive staff. The functions related to sanitation are as follows:

- Monitor the functioning and finance of Jalkal (after merger in Feb 2010)
- Provide and maintenance of public toilets and sanitation facility in the city
- Provide facilities for solid waste collection and disposal
- Collection of medical waste from
- Operations and maintenance of Storm water drains

The organization structure of Municipal Corporation is shown in the attached chart.

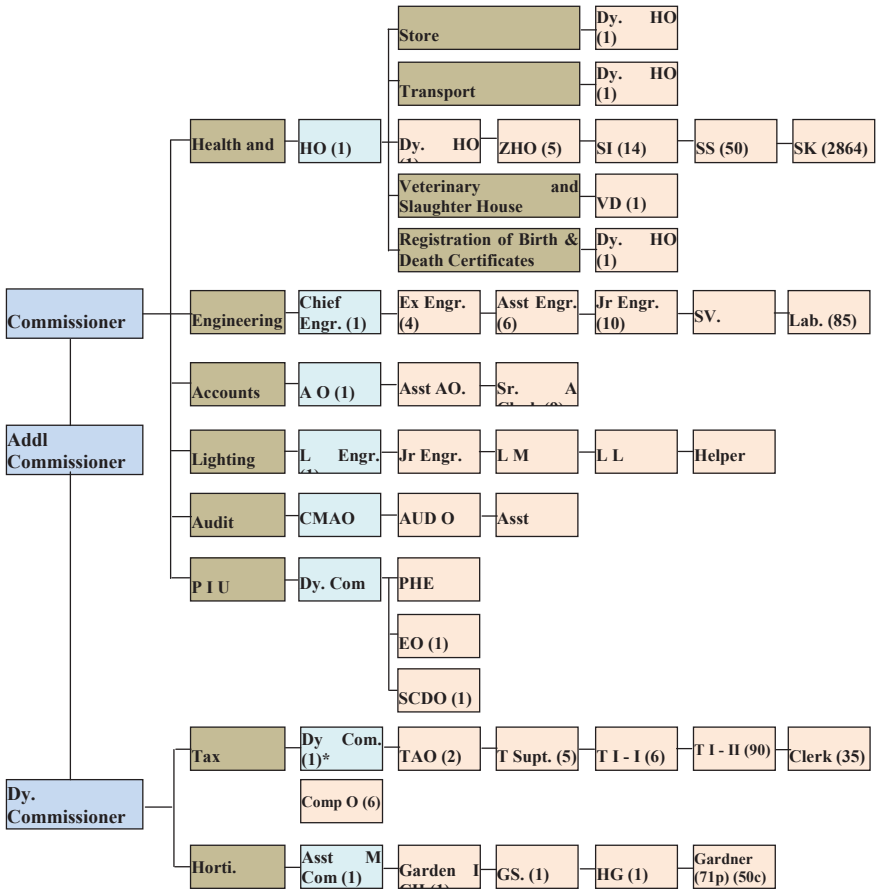


Figure 43- Organogram of Varanasi Municipal Corporation

However in spite of the robust organizational structure, it was observed that out of the total designate Class I officers, a total of 46% seats lie vacant. There are also vacancies within VMC for the solid waste management. The attached table gives an indication of the same

Table 43- Vacant posts in VMC

No.	Designation	Sanctioned Posts	No. of Workers Employed	Vacant Posts
1	Sanitary Worker	3200	2800	400
2	Sanitary Supervisor	140	85	55
3	Food and health Officer	19	12+2	5
4	Zonal Sanitary officer	2	--	2
5	Vice City Health Officer	1	1	0
6	Health Officer	1	1	0
7	Nagar Health Officer	1	1	0
8	Upper Nagar Heath Officer	1	1	0
9	Driver	35	25	10
10	Cleaner	31	28	3
11	Bhisti	133	125	8

8.2.1.3 U P Jal Nigam (UPJN)

Realizing the urgency to supply safe drinking water, a separate department in the name of Local Self Government at Secretariat Level was to be created in the year 1949. For this purpose, a Public Health Engineering Department was re-christened as Local Self Government Engineering Department in the same year. The State Government decided to finance such sanitation projects, keeping in mind the increasing demands and pressures on providing other civic amenities as well. It would provide a component of loan which would be repayable in easy installments, to a category of towns which had repayment potential. In order to supplement the funds, efforts were also made to seek soft term loans from International Monitory Fund/ World Bank.

However, World Bank put forward a condition that, in order to get soft term loans, it would be essential for the State Government to constitute an independent body in the State. This body would be responsible for repayment of loan and execution of projects as financed by the Bank. As a consequence to this condition the State Government promulgated an ordinance in February 1975 and converted Local Self Government Engineering Department into a corporation by the name of Uttar Pradesh Jal Nigam. This ordinance was subsequently converted into an Act named as Uttar Pradesh Water Supply & Sewerage Act, 1975. In pursuance of this Act, Uttar Pradesh Jal Nigam came into existence with effect from 18th June 1975.

Organization Structure and functions

The organization structure for Jal Nigam is shown in the attached figure

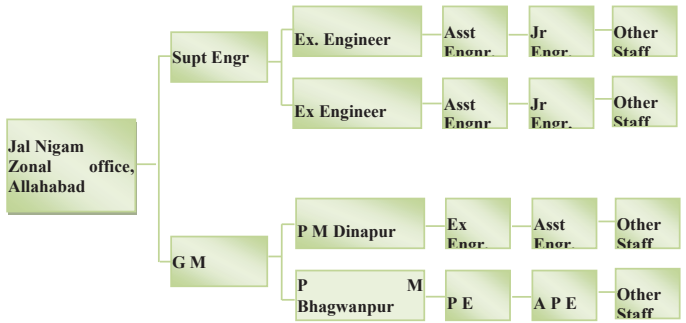


Figure 44- Organogram of Jal Nigam

The functions of the Jal Nigam are

- To maintain the STP
- To collect water on all the Ghats and transfer to Koniya STP and then at Dinapur
- To plan and construct all infrastructure related to water supply and sewerage
- To drill tube wells and hand pumps in the city
- Preparation, execution, promotion and financing schemes for water supply and sewage disposal
- To render all necessary services with respect to water supply and sewerage to the State Government and local bodies, on request to private institutions or individuals
- To prepare State plans for water supply, sewerage and drainage on the directions of the State Govt.
- To review and advise on the tariff and charges of water in the areas of Jal Sansthans and local bodies which have entered into an agreement with Jal Nigam under Section 46
- To assess requirement of materials and arrange for their procurement and utilization
- To establish state standards for water supply and sewerage services
- To perform all functions not stated herein which were being performed by the Local Self Govt. Engineering Department before the commencement of the act
- To review annually the technical, financial, economic and other aspects of water supply and sewerage system to every Jal Sansthan or local bodies which has entered into an agreement with the Nigam under Section 46 of the act
- To establish and maintain a facility to review and appraise the technical, financial, economic and other pertinent aspects of every water supply and sewerage scheme in the state
- To operate, run and maintain any water works and sewerage system if and when directed by the State Govt. on such terms and conditions and for such period as may be specified by the State Govt.

8.2.1.4 Varanasi Jalkal

The Varanasi Jal Sansthan (Jalkal) was disintegrated from VMC in 1974, by a mandate in one of the World Bank schemes, in order to avail funds for improvement in water supply facilities. Later in 2010, it was merged with the VMC, continuing to undertake responsibility for water supply and sewerage discharge. Though it continues to have a large amount of autonomy with regards to administrative and financial functions, the Municipal Commissioner is responsible its performance.

Jurisdiction

The city has been divided into four zones, with a population density of 20,681 persons/sq km, for the convenience of service, each of which is served by a local office under a Junior Engineer.

Organization Structure

The organization structure for Jalkal is shown in the chart attached

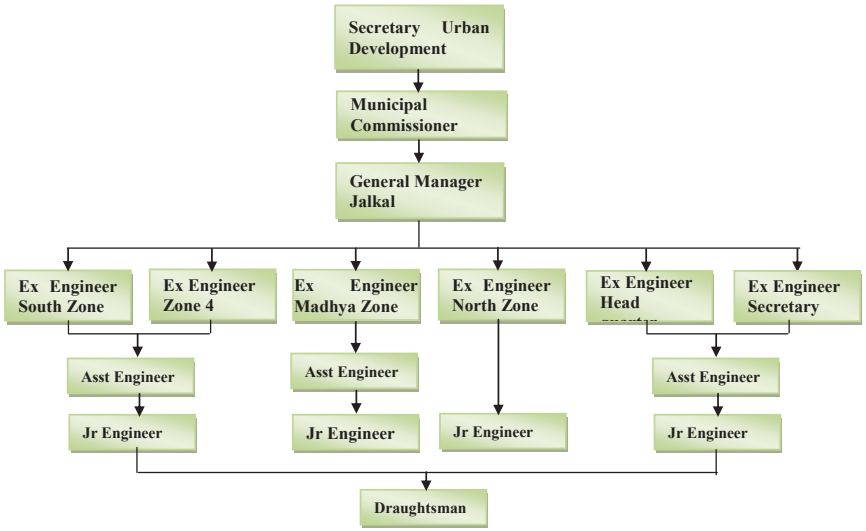


Figure 45- Organogram of Jalkal

Roles and Functions

UP Jal Nigam had previously created infrastructure for water supply and sewerage, whose ownership has been transferred to Jalkal. Planning and/or construction of new infrastructure are not a mandate of the department. The private sector is involved in the operation and maintenance of the tube wells and vehicles, and cleaning works of campus through service contracts for certain areas only.

Some of its functions are:

- Draw water from the Ganges River and from 167 tube wells
- Provide water supply and undertakes operation and maintenance of water supply network
- Undertakes operation and maintenance of sewerage network (Except STP)
- Construct new water supply and sewer lines at micro level
- Solely authorized to collect taxes and user charges for water supply and sewerage
- Redressal of complaints regarding its services
- Installation of new hand pumps, tube wells etc, in certain rare cases, with help of MP and MLA LAD funds

Vacancies

Jal Sansthan is under-served, as sufficient amount of man power is not available and 198 posts out of 801 posts lie vacant.

Financial details

After the merger with VMC, budget sanctions are made for Jalkal by VMC in March – April and revised in September – October. Monetary supervisions are also conducted by VMC. The General Manager of Jalkal has powers to sanction a project with a maximum budget of Rs 5 lacs, but projects involving more than Rs 5 lacs have to be sanctioned by VMC.

Jalkal has a computerized billing system; and charges water tax at 12.5% and sewerage at 4% of Annual Rental Value of the property. Its major expenditure is O & M costs of water supply and sewerage system, as well as on staff salaries. Further details are explained in section 4.4.4 in this chapter.

Collection efficiency of taxes is 40% – 42%.

Weaknesses

1. The utility has no master development plan nor does it have an annual report or a management information system.
2. The department is very weak in finances, as water and sewerage taxes are very low in amount and collection efficiency is also very low
3. It faces public resistance in increasing taxes
4. Due to weak finances, it can't afford to pay its electricity bill. This is being paid by VMC on its behalf on a regular basis.
5. The department levies taxes as well as water and sewerage charges on the users, based on ARV of properties worked out by VMC. As the collection efficiency is low, it is difficult to meet the revenue expenditures as well. This causes major issues in operations and management of the systems.

8.2.1.5 Varanasi Development Authority

Jurisdiction

VDA has a physical jurisdiction over the VMC area and an additional peripheral belt of 8 km from the VMC boundary. It falls under the department of Housing and Urban Planning, and has no overlaps with any other organization on issues of water supply, sewerage and solid waste.

Organizational structure and functions

The role division of VDA and VMC has been done on functional basis. VDA undertakes all the activities related to land use, zoning, development, implementation of DCRs, and providing building permission. It also prepares DP for the city at an interval of every 10 years. It also has to make sure that all regulations and building bylaws are being adhered to.

The organization structure for VDA is shown in the attached figure

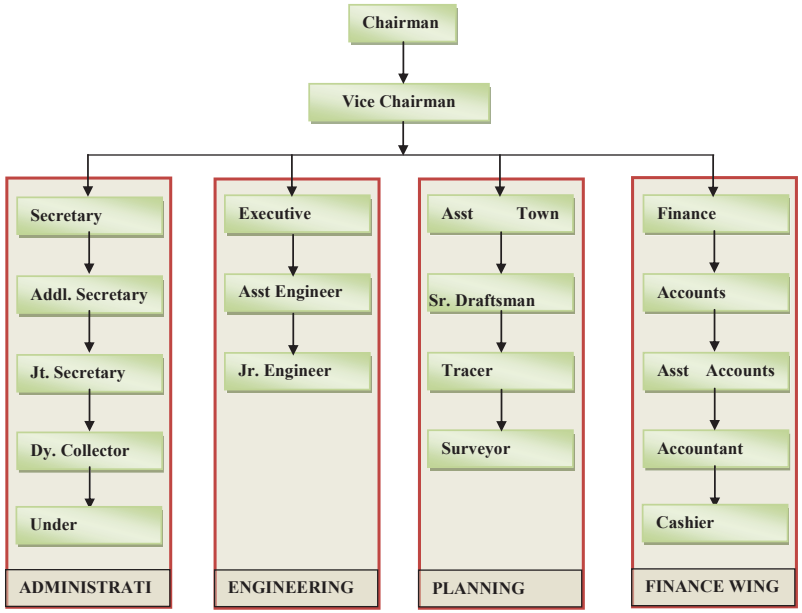


Figure 46- Organogram of VDA

8.2.1.6 District Urban Development Authority (DUDA)

The District Magistrate is the chairman of DUDA. His responsibility is coordination, in order to avoid functional overlaps amongst various agencies. The VMC has its representatives in member body of DUDA, so overlaps are taken care during project sanctioning. The functions of the DUDA are:

- Execute various government schemes for urban development and employment generation
- Create urban infrastructure, including water supply
- Undertake tasks related to urban infrastructure to generate local employment
- Construct community toilets and link it to sewer lines etc. Sewers are laid according to plan made by VMC.

Sewerage is generally not done by DUDA but currently 28 slums are provided with sewer lines by hiring agencies like Jal Nigam and UPRNL

The organization structure for DUDA is shown the attached figure

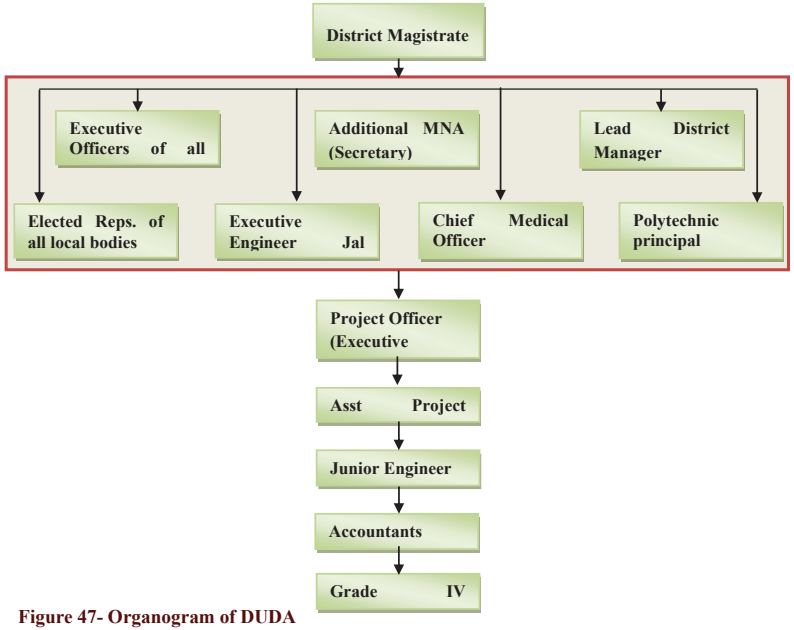


Figure 47- Organogram of DUDA

8.2.2 Key Overlaps

As mentioned above sanitation service delivery in Varanasi is a distributed responsibility. The table below shows the various institutional overlaps between the institutional responsible for maintenance of city sanitation

Table 44- Institutional overlaps in urban sanitation

Sector	Description	VMC	JK	UPJN	VDA	DUDA	GPU	UPPCB
Development Plan	Area Development Plan				√			
Water Supply	Plan, Design & Construction			√				
	HH Connection		√					
	O/M		√					
	User Charges		√					
Sanitation	HH Connection		√					
	Design Approval		√					
	HH Discharge Approval	√						
	Community Toilet	√				√		
	Public Toilet	√						
Sewerage	Plan, Design & Construction			√				
	HH Connection		√					
	Operation & Maintenance		√					
	Sewage Treatment Plant			√			√	
	Disposal			√			√	√
Strom Water Drainag	Plan, Design & Construction			√				
	Operation & Maintenance	√						
Solid Waste Management	Collection	√						
	Storage	√						
	Transportation	√						
	Sorting & Processing	√						
	Disposal	√						

It has been observed that the planning and design, construction and operations and maintenance of sanitation infrastructure are divided between the different organizations, that too at different levels, state and ULB. The broad framework for the work responsibilities of the stake holder institution has been shown in the attached table

Table 45- Framework of sanitation responsibilities

	Policy Formation & Implementation	Sector Strategic Planning	Budget Allocation	Regulatory Control	Sanitation Planning	Financial Institutional Planning	Project Identification	Detailed Project Planning & Design	Project Implementation	Monitoring Evaluation Feedback	Operation & Maintenance
Central Government											
State Government											
VMC											
Jal Nigam/Ganga Pollution Control Board/Jal Sansthan											
Special Committees											
Water/Sanitation Enterprise											
Consultants											
Contractors											
Private Water/Sanitation Operators											
NGOS and CBOs											
Community Groups											

Responsible
Partially responsible
Involved
Partially Involved

Merger of Jal Kal and VMC

At present the responsibility of sanitation operation and maintenance lies with two departments viz. Varanasi Municipal Corporation and Varanasi Jal Kal. The Jal Kal department was merged with Varanasi Municipal Corporation in 2010.

However, at present the merger is not smooth and hence the operation and maintenance of the system as whole faces severe challenge. The merger of the institutions has at present been only in the finance sector. It becomes mandatory for the UP Department of Urban Development to provide handholding support to carry the process of merger more efficiently.

8.2.3 Key issues

- The multiplicity of institutions in the service provision and maintenance. The merger of Jal kal and Varanasi Municipal corporation still is underway.
- There is no dedicated institution for environment management and infrastructure in the city. The environment responsibility is not yet defined at the council level.
- There is no standard communication procedure to communicate environment concerns.
- The Municipal Corporation Varanasi has so far not established an environmental management program with an action plan and there are no Standard Operating Procedures (SOPs) or working instructions elaborated in order to ensure compliance with internal and external standards and/or regulations.
- The number if sanctioned posts in the institutions are often not filled. In VMC the percentage of vacancy posts is as high as 46%, while in Jalkal 25% remain vacant. The developennt authorities although have the essential manpower, due to multiple overlaps are not able to performing below the desired levels.
- There is no set procedure for institutional capacity building. Training records are not maintained by the corporation.

8.2.4 Recommendations

Having understood the institutional setup responsible for managing the sanitation functions in the city, CEPT has suggested some institutional restructuring that shall assist in the appropriate implementation of the City Sanitation Plan.

8.2.4.1 The NUSP Guidelines

The NUSP guidelines identify the lack of clear and complementary institutional responsibilities as one of the key gaps in urban sanitation. The assignment of roles and responsibilities in NUSP is under two aspects: a) roles and responsibilities institutionalized on a permanent basis; and b) roles and responsibilities for the immediate campaign, planning and implementation of the City's Sanitation Plan – based on which the former can be outlined, experimented with, and finally institutionalized.

The Sanitation Task Force would recommend the assigning of permanent responsibilities for city-wide sanitation to the ULB. While the responsibilities for each of the above roles may temporarily vested in one or the other stakeholders, for reasons of efficiency and effectiveness during the campaign period, the Task Force will recognize that these roles must be permanently institutionalized in the ULB and amongst other stakeholders. Therefore, the recommendation of later permanent roles may be different from those in the Campaign Period.

Some of the recommendations for assigning roles and responsibilities are given below:

8.2.4.2 Formation of City Sanitation Cell/ Dedicated Environment Cell

City Sanitation Cell will need to have the support of a dedicated **city sanitation support unit**[18], during the course of CSP implementation. Post implementation, if adequate monitoring systems have been institutionalized, staffing will need to be reviewed.

The CSSU would broadly include the following specific sections:

- Specialists (From current ULB/Parastatal bodies/Private organization)
- Core Planning Support Unit (with full time Professional Planners engaged in day-to-day knowledge management)
- Short Term Specialists (IT/Web application, Documentation/Editors, Publication etc)

[18] Current indications are that the person heading engineering is over loaded with line responsibilities and such additional responsibilities that arise owing to his prior experience in Varanasi. Similarly, the Municipal Commissioner+One staff member model runs the danger of action being initiated only for deadlines and mobilization being piece-meal.

The functions of City Sanitation Cell and City Sanitation Support Unit could be broadly described as mentioned below

The City Sanitation Cell assisted by the CSSU becomes responsible more for design, planning and supervision making use of interface institutions (e.g. committees) and contract out implementation to contractors (mostly technical tasks). This would entail greater technical, procurement and contract supervision capacities within ULB, appropriately enabling this at the interface levels, and might also require to be facilitated by appropriate State Govt intervention.

This option would require considerable technical design capacities in-house, as also petty contract management (capacity that already exists) that could be streamlined. This would also enable building up of necessary databases as the work plan progresses and setting up systems for post-implementation monitoring. Third party monitoring of contractual work or post-implementation indicators could be explored which would have its cost implications.

The City Sanitation Cell assisted by the City Sanitation Support Unit (CSSU) becomes responsible more for defining an outcome-based goal, focuses on campaign components (e.g. social mobilization) and enabling interface institutions. The CSC brings in a private party as a significant partner in which they a) win build-operate-transfer contract after some number of years (esp. Wastewater treatment, sewerage systems, etc.) – refer to the Alandur model; or award separate contracts for Construction and another one for O&M management.

This would entail increased supervisory capacities within ULB, but at discrete time periods, and so something that could be facilitated by State Govt resource person. Here, Contract Management capacities will need to be considerably enhanced at ULB, whereas technical design capacities in-house may not be required at the ULB level. But post-commissioning, there will need to be a core capacity in the ULB to measure and monitor contract indicators and make payments (e.g. fees) based on such measurement. Some of the specialized measurements can again be given out to third parties (though this service will come at a cost) and general contract supervision retained within the ULB.

The dedicated Sanitation Support Unit will be responsible for the following functions:

- Initiating community mobilization through multiple channels – SHGs and CDS, employment/trade associations, etc.
- The SSU members will be familiar with social mobilization and shall be capable of learning participatory methods.
- Develop and launch the communication campaign (devised at the state) and build capacities in natural leaders who emerge during the city process to facilitate using them as spearheads for taking forward the campaign.
- Compile and disseminate the pros and cons of each of the technology options
- Train motivators and citizens in the operational guidelines of schemes (for urban poor)

8.2.4.3 Comparison of Public Health Department and City Sanitation Support Unit

The table shows a comparison of the present Public Health Department and City Sanitation Support Unit.

Table 46- Comparison of PHED and CSSU

Public Health Department/SWM Department		City Sanitation Support Unit	
Advantages	**Disadvantages**	**Advantages**	**Disadvantages**
SWM Department being integral part of ULB could perform well in good synchronization with rest of ULB staff	Building of team with specific educational qualification takes time.	Financial expenditure on SSU personnel is low in case he is hired from govt organization, as officers are on deputation (even if a deputation allowance is paid).	Higher expenditure for personnel from the open market
SWM Department formed of team aware of environment and sanitation knowledge, which would help to deliver better service	The idea of having specialized department at times could make the department work in isolation, if proper measures for internal coordination are not taken.	Familiarity with government/ULB administrative work culture and possibility of working well with the rest of the ULB staff.	CSSU could be difficult to continue in the longer duration of time due to administrative issues and changing policies of mother state
		May bring relevant experience if selected from other urban projects	Private Consultant may take time to acquaint to working condition of ULB

8.2.4.4 Clarity in the integration of Jalkal with VNN

The integration of the Jalkal and the VNN has to be clearly laid and the share and amalgamation of the responsibilities need to be clearly stated. It is suggested that the VNN should adopt Accrual accounting system and incorporate the municipal accounting reforms

8.2.5 Institutional Capacity Building

Capacity building is defined as the "process of developing and strengthening the skills, instincts, abilities, processes and resources that organizations and communities need to survive, adapt, and thrive in the fast-changing world." Capacity building is the elements that give fluidity, flexibility and functionality of a program/organization to adapt to changing needs of the population that is served.

Capacity Building is much more than training and includes the following:

- **Human resource development-** the process of equipping individuals with the understanding, skills and access to information, knowledge and training that enables them to perform effectively.

- **Organizational development-** the elaboration of management structures, processes and procedures, not only within organizations but also the management of relationships between the different organizations and sectors (public, private and community).
- **Institutional and legal framework development-** making legal and regulatory changes to enable organizations, institutions and agencies at all levels and in all sectors to enhance their capacities

The personnel engaged in management of urban affairs and municipal services are usually not trained for implementing a CSP in-house and thus, there emerges the need of long term handhold and capacity building support to the ULBs so as to enable them to internalize the urban sanitation planning and management capacities within the existing framework.

Thus, the underlying objective of the Capacity Building Program for Varanasi Town is to strengthen the existing in-house capacity of the ULBs for City Sanitation Plan (CSP) Preparation. The proposed strategy is to combine various forms of capacity building approaches.

CEPT proposes a combination of various consultative delivery activities under the strategy as in

- Hands-on City Workshops
- Theme specific Rapid Training Programmes
- Knowledge Support
- On Call Help Desk
- National Exposure Visits

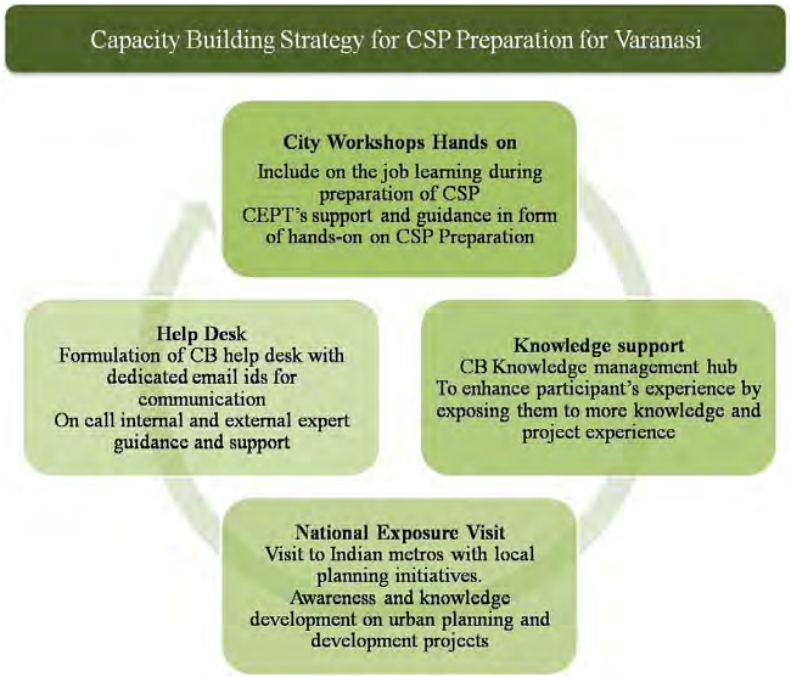


Figure 48- Capacity building strategy for Varanasi

- **City Workshops Hands on**: On the job learning during preparation of CSP CEPT's support and guidance in form of hands-on on CSP Preparation.
- **Knowledge support**: Capacity Building Knowledge management hub o enhance participant's experience by exposing them to more knowledge and project experience.
- **National Exposure Visit**: Visit to Indian metros with local planning initiatives. Awareness and knowledge development on urban planning and development projects.
- **Help Desk**: Formulation of CB help desk with dedicated email ids for communication On call internal and external expert guidance and support

8.2.5.1 Need for Capacity Building

Appropriate capacity building allows the translation of plans into action, since it involves the capacity building of the actual agents of change. In Varanasi the following heads have been identified that needs to have interventions which are not only technical but also have the component of capacity building of the right people. They are as follows:

- Operation and maintenance of underground drainage
- Sewage quality control and drainage connections
- Storm water drainage

- Bio- medical waste disposal
- Solid waste Management
- Landfill site development and management
- MIS development
- Scientific waste collection
- Community development
- Public awareness and public convenience
- Municipal budgeting cost accounting and project formulation
- Application of corporate planning principals
- Computer application and GIS

8.2.5.2 Handholding Support for CSP preparation and Sequencing of the Activities

The overall, proposed interventions are detailed out through the following Tasks/Sub-Tasks, as under:

Table 47- Sequence of capacity building excercise

Task 1	**Introduction of City Sanitation plan**
	Why? When? How? Kick off workshops City wide communication and awareness programmes
Task 2	**Hand Holding support to cities**
	City specific Engagement Planning Consultations/Workshops Hand-Holding Support (on and Off-line) Help Desk/Expert Pool support (on Call basis)
Task 3	**Capacity Development**
	Detailed engagement plans with Varanasi city Complete support intervention Knowledge and skill support Training the staff Establishing knowledge/skill transfer system Technical and resource workshops National Exposure Visits Identifying modern sanitation planning practices Training of the City Staff Formation of Specific Skill Sets Base map and GIS Database management Urban Sanitation Planning Urban Infrastructure Bids Process Management
Task 4	**Knowledge Management**
	Peer Experience Sharing Workshops with other cities in india. Knowledge workshop with experts of various fields (City Level) Process Documentation Resource/Knowledge Bank Support Model Planning Guidelines
Task 5	**Dissemination**
	Web page development/ site linking News letters Publications/Working Papers/Lessons Learnt Films

8.2.5.3 Pre Training Consultation for Nomination of Participants

The first step of pre-training preparation would be to consult with the targeted urban local bodies and state level Parastatals. The primary objective of the consultation would be aimed on to get better understanding about the need of training in each department. The secondary objective would be focused to convince the department heads and commissioners of ULBs about the need and importance of this training programme and request for the nominations.

A senior project team member from CEPT shall visit a few of the departments well in advance to discuss in detail with the secretaries of concerned departments as well as with the commissioners of ULBs. The pre-training consultation will be done through telephonic discussion, emails and faxes. Continuous follow up will be done with the cities to get nominations in time.

8.2.5.4 Selection of Target Groups

Since the training of the entire ULB is not possible, it becomes essential to identify the right target group who can be trained and they can transmit their learnings to their team. The target groups have been identified as under

Table 48: Summary of Target Groups for training

TG	Target Groups	Designations	
TG 1	**Elected Wing**	Mayor, Deputy Mayor, Councilors	
TG 2	**Executives**	**VMC-JS**	**VJN**
		Municipal Commissioner Additional Municipal Commissioner Deputy Municipal Commissioner General Manager – JS Chief Municipal Officer (CMO) Chief Executive Officer Medical Health Officer	Chief Executive Officers General Manager Executive Engineer
TG 3	**Technical Wing**	**VMC-JS**	**VJN**
		Chief Engineer Superintendent Engineer Executive Engineer Assistant Engineer Sub- Engineer Supervisors Junior Engineers City Engineer Assistant City Engineer Administrative Officer Assistant Director Assistant Manager	Chief Engineer Assistant Engineer Sub- Engineer Supervisors Project Engineer Assistant Project Engineer Junior Engineers City Engineer Assistant City Engineer
TG 4	**Financial Wing**	**VMC-JS**	**VJN**
		Superintendent / Chief Executive	Chief Officer – Accounts

		Accounts	Accounts Officer
		Deputy Commissioner Accounts	
		Accounts Officer	Administrative Officer
		Octroi Accountant	
		Statistical Officer	Assistant Director
		Assistant Statistical Officer	Assistant Manager

Engineers from sector specific Para-statals of individual department, like UP Jal Nigam, Varanasi Jal Sansthan, Public Works Department, Irrigation Department, etc. had been included. Inclusions of staff from Para-statals are critical as they are important for such capacity building programmes.

The training can be split into two broad levels

Level 1- Awareness and knowledge - which can be undertaken in 1-2 days

Level 2- Skill development – which can be undertaken in 3-5 days

Duration of the training programme has been finalized by looking into the level of training required for different category of participants and their availability. As the senior groups like TG-I and TG-II require more of awareness and knowledge it could be decided to organize the training for one or two days, as availability of senior officials for longer period might be difficult.

For junior engineers and officials the training should be proposed for about 3 to 5 days to have a detail training programme for skill enhancement.

8.2.5.5 Strategy Framework for Capacity Building

The broad strategy framework for capacity building shall revolve around base minimum requirement which could be enlisted as below.

- On-site short Term Awareness Programme (1/2 day to 2 days)
- On-site medium/long term programmes along with specialized programmes
- Off-site specialized programmes
- Study Tours/Exposure Visits within the state
- Study Tour/Exposure visits- National
- Help Desk support/On-call expert support

8.2.5.6 Preparation of Training Calendar

As a part of training calendar spread over one year duration, few thematic area based on the needs of the city were selected for capacity development.

- Strategic Sanitation Planning
  - Operation and Management of septic tanks especially from individual houses
  - Cleaning of Nullahs/Storm Drains
  - Cleaning of Sewer Lines/Manholes
  - O&M of Water Treatment and Sewage Treatment Plants
- Billing, contracts and tender management
- GIS based mapping and GSM/SCADA based monitoring, Leak detection, Water safety Planning etc
- Works Management
- Public Awareness/Communications

- Investment Planning and Asset Management

National Exposure Visit: Target officials are not fully exposed to sanitation planning practices happening in other cities of India. Before each of these cities start taking actions of preparing CSPs for their own city/ urban area, it is essential for these city representatives to be aware and to see what other cities in India are doing.

In India there are some great examples of progressive sanitation planning, where multiple initiatives have been take for betterment of their own cities. It almost becomes inevitable for city officials to learn from other cities and then share their knowledge with other cities of similar nature. Method of peer learning, debates and participatory workshops are important to bring out ideas from peers.

Two of such visits have been suggested

- Sanitation & planning efforts by Ahmedabad and Rajkot cities.
- Visit to Lukhnow and Pune for better Municipal Services

Annexure VIII- Financial Framework


9 Financial Framework

9.1 Introduction

Acquiring and installing the new infrastructure will need significant amounts of capital investments, the cost of which the corporation will have to bear, at least partially (as they will get major assistance from the State and Central Government under the scheme of the Jawaharlal Nehru National Urban Renewal Mission (JNNURM)). Apart from this initial Capital investment expenditure, the Corporation will also have to bear the periodic cost of operation and maintenance for the investments that would be installed. Even though part of the capital investment requirement would be met by external agents (in this case the State and Central governments) the operation and maintenance of the entire new infrastructure will certainly be the sole responsibility of the Corporation.

The first step of the FOP involves a detailed analysis of its present financial flows (as documented in its annual budget documents and other financial records), and over-all financial situation.

The financial flows of a municipal corporation, (as any other entity), are grouped into its Revenue Account that documents the periodic flows of income and day to day running expenses, the Capital Account that documents inflows of capital finance and capital expenditure towards development of infrastructure, and the Extraordinary Account that records the financial liabilities of the corporation (deposits of other agents that are to be refunded, and advances given to other agents that will be recovered). The extraordinary account, deals with liabilities and so, is in a sense external to the central finances of the corporation, and does not figure in the investment decisions.

9.2 The Present Financial Scenario

At present the accounts of Varanasi Municipal Corporation are maintained on Single Entry basis. The Municipal Corporation is yet to migrate towards double entry accounting. In fact it is case of very rudimentary form of single accounting wherein all revenue and capital receipts and outlays have been clubbed together. In such a scenario knowing the exact expenditure for operations and maintenance and for new projects is very difficult. Also there seems to be no classification of different heads of expenditure as per their characteristic or function. In simple words no chart of accounts exists, which makes it further difficult to know from where exactly the money has come and more issues in knowing where exactly it is being spent. Still an effort to rearrange the full set of accounting heads into revenue and capital is made here. The accounts of the Jal Kal have balance sheet and profit and loss account duly audited, but is has now been included in Varanasi Municipal Corporation for operational purpose. As per information received the accounts of Jal Kal are to be kept separately till the time of last balance sheet received. Since the accounts of the year 9-10 onwards are not available we have projected the figures on conservative grounds.

Another noteworthy point is that, we could not estimate any liability. VMC does not have updated figures for liabilities of ULB in terms of debt towards government, pending payments to employees or vendors or similar nature expenditure.

9.2.1 The Revenue Account

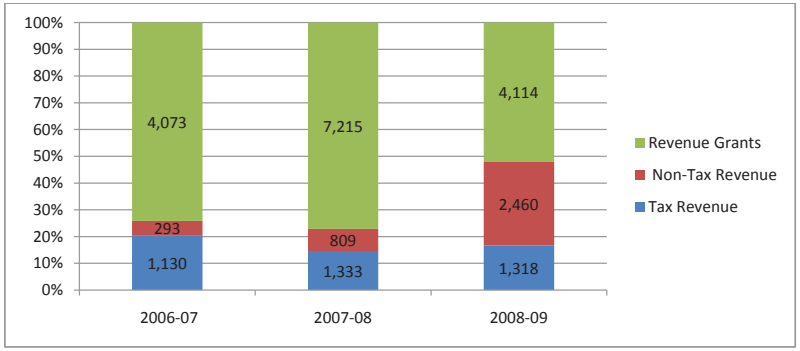
The Varanasi Municipal Corporation has its revenue income from various taxes fees, rent, licenses and permits and water tariffs. It also gets revenue grants from State Government. On analysis of the revenue account it is apparent that the ULB is highly dependent on the State to finance its activities. ***Its share of own revenues is 25% of the total revenues***. Also this has marginal buoyancy in the succeeding years. This suggests that this function has received little attention in the past. Since there is no consistency in growth of own revenues the revenues are unlikely to grow further. Also on the expenditure front the set of data reveals that majority of the expenditure is for salaries and maintenance. There are very few capital works that have been undertaken in the past. Such expenditure forms 6-7 % of the total expenditure of Varanasi Municipal Corporation. Also a point to be noted is that this expenditure is purely out of grants and not from own sources.

Particulars	2006-07	2006-07	2007-08	2008-09*	2009-10*	2010-11*
Revenue Income (Rs. Lacs)	5496.11	9356.71	7892.66	8524.07	9206.00	9942.48
Revenue Expenditure (Rs. Lacs)	5065.52	5821.34	7606.16	8366.77	9203.45	10123.80
Surplus/Deficit (Rs. Lacs)	430.59	3535.37	286.50	157.29	2.54	-181.32

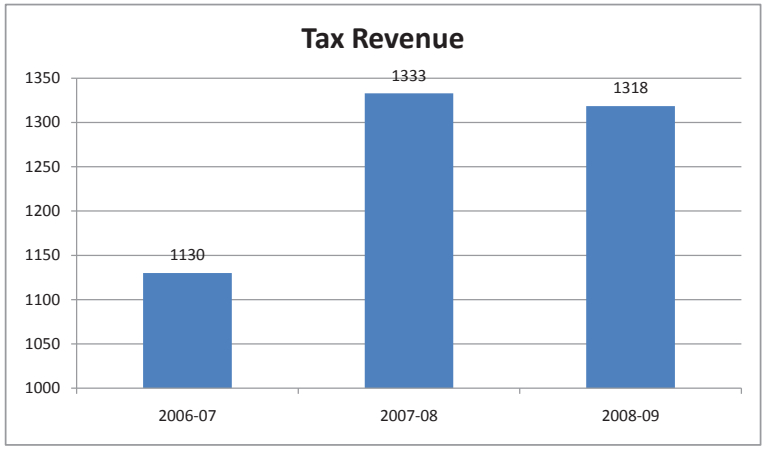
figures from 2008-9 to 2010-11 are projected

9.2.1.1 Revenue Receipts

The revenue receipts are comprised of taxes collected by the Corporation, non-tax revenues (fees, fines, user charges for civic services, interest incomes and other miscellaneous receipts), and revenue grants received from State or Central government. The following chart shows the relative composition of each. As mentioned earlier there is marginal increase in the own revenues of the ULB. The share of own revenues has grown little from 25% to 27%. This highly inelastic income suggests little efforts by ULB to enhance it.



(All figures in Rs. Lacs)



Till late the ULB was responsible for only functions like sanitation, health, registration of births and deaths etc. Recently the functions of Jal Kal have been merged with the ULB; hence from the year 2008-09 the VMC would be able to mobilize water tariffs and shall also have to incur expenditure for water supply and sewerage. The Property tax demand shows little increase vis-a-vis the increase in population of the city suggesting large number of un-accessed properties. Also amongst the accessed properties the tax recover is very little.

The non tax income it collects seems to be quite low. The major items are penalties, interest income and land rent.

The Corporation would do very well if it levies user charges for basic service delivery in a systematic, and socially acceptable way (differential pricing and cross subsidization), so as to cover at least the cost of operation and maintenance. The present cost of operation and maintenance of Water Supply indeed far exceeds the charges that are collected, as the following table demonstrates.

In Rs Lacs	2008-09
Total income from water supply	1673.91
Total expenditure on water supply	3421.23

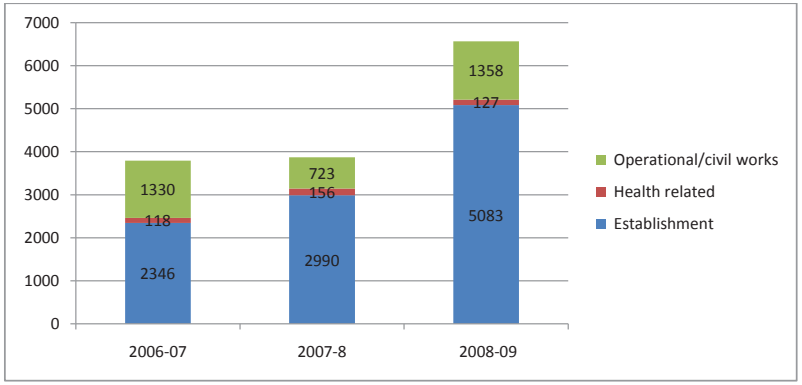
Revenue Grants comprise the component of revenue income that comes from external sources, mainly State grants

9.2.1.2 Revenue Expenditures

Revenue expenditure is comprised of Establishment expenses (salaries, wages, and other payments to various employees), Administrative and contingency expenses (office expenditures) and costs of

running and operating the various services delivered by the Corporation. These constitute the day to day running expenses.

The VMC's revenue expenditures are given in the following table and the chart shows the relative composition / share of each component over the years.



(All figures in Rs. Lacs)

Establishment expenditure grew at a rate of about 22%, on an average over the 3 year period, while Operation and maintenance showed a mixed trend . The rise in salary is definitely more than normal. The ULB seems to have paid some past arrears. The share of establishment in revenue expenditure appox. 50% and that of Operation and Maintenance is about 30%. The VMC seems to have been not very efficient at controlling the growth of its establishment expenditures, which would otherwise have given it a much desired leeway to spend appropriately on keeping the civic service delivery systems of the city in good running order.

In operations and maintenance spending, it seems that it has given priority to a few sectors/activities sometimes by choice, and sometimes by compulsion. In its workshop branch significant expenditure is incurred on petrol and diesel in running vehicles. Also the lack of detailed classification leaves little scope for analysis and the existing expenditure in detail. The VMC seems to be not regular in paying interest on its loans. It seems that interest payments of existing debt are not made regularly and hence estimation for future interest liabilities could not be made.

9.3 The Capital Account

9.3.1 Capital Income

The capital income of the VMC has come from 3 sources:-

- Its own sources by selling of assets primarily land. This source is not very frequent and has brought little consistent flow of capital finance to the VMC, with which it has performed its development activities on a regular basis.

- New Loans have been acquired from the government directly and other government sources
- The Capital grants received by the VMC are mainly from the government, for some specific purpose. Some handsome grants have come on a regular basis like the MP LAD (Local Area Development), and MLA Grant. These the VMC can spend on any developmental infrastructure for the locality and to that extent they permit a limited flexibility. Some other Capital Grants are sporadic and lump sum, or come in a few installments, for some specific one-shot capital investment.

9.3.2 Capital Expenditures

Capital expenditures covered during the years of this study; do not seem to have followed any trend. Many sporadic one shot capital investments seem to have been acquired under various schemes. Also some investments in infrastructure development and renewal have been conducted regularly. For most of these years there have been sporadic bursts of capital expenditure as and when a major new infrastructure item has been acquired and installed. On the whole the total expenditure for capital projects has been minimal suggesting very little development to city infrastructure.

After the amalgamation of Jal Kal, the capital expenditure for water supply and sewerage will take precedence and hence forth it seems that reasonable capital expenditure will be reflected in future.

9.4 Emerging Observations from Financial Analysis

- Over the past three years the consistent low/negative growth of revenue income and the persistent revenue surplus is mainly due to low recovery efforts, stable and obsolete tariffs and low tax base. The ULB shall have to have a disciplined reform to enhance revenues which will make future investments possible.
- Because of the State government finances majority of expenditure, the VMC appears to have been negligent in the area of efficient property tax recovery. Large arrears remain and gather up as the rate of recovery is persistently low. Part of the reason is that the property tax department maybe under skilled or under staffed. But this problem can easily be overcome if the BPR initiative is undertaken to redeploy or reshuffle staff in other departments or by outsourcing/privatization.
- Again, probably because of the strong presence of the Government grant on the revenue income front, the VMC has resisted from levying any substantive user charges for the delivery of civic services. At least the water supply department should attempt to become self sufficient as far as operating costs are concerned, by levying reasonable and socially sensitive water charges relying on cross subsidization among different income groups. Subsidies are very voluminous and expensive.
- The VMC seems to have been not very efficient at controlling the growth of its establishment expenditures, which would otherwise have given it a much desired leeway to spend appropriately on keeping the civic service delivery systems of the city in good running order. The VMC will need holistic vision and commitment in all round well being of the city and spends well on running civic services and well as social services. The establishment expenditure especially for the salary of sweepers needs to be controlled drastically. In fact it should be freezed immediately. The new needs can be catered by outsourcing.
- The VMC has no regular streams of capital income which, on an average, would cover the regular obligations on capital expenditure (periodic renewal, local area development, etc),

with a small amount of capital surplus. That helps partially to offset the capital deficit when any one shot voluminous capital expenditure has to be incurred towards installing of any major new infrastructure on a large scale.

- At present the VMC does not seem to be paying their debts properly and on time. This will definitely create low credit rating and apart from that wrong signal to financial world. They will need to scale up their capabilities and improve in this area.
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9.4.1 Recommendations

9.4.1.1 Borrowing Capacity of ULB

With the present, performance of VMC finances, any further investment can only be taken if the investment is self sustainable. Along with this the corporation immediately needs to make concentrated efforts for increasing revenue income by increasing efficiency of tax recovery and switch to the system of double accounting system. An estimation of future cash flows was carried out to understand the borrowing capacity of the ULB with the following assumptions:

1. **The Revenue Account**: - The revenue receipts (after subtracting Octroi tax) (R1) , has grown from 2006-7 at an annual average growth rate of 10-12%. For financial prudence it is assumed that it will grow at a slightly lower rate (8 %) in the future. The government compensation grant (o) has been projected for each year with same rationale. The revenue expenditure, net of debt service, has grown at an annual average growth rate which is cyclical however on a safer side it is assumed that in the future it will grow at 10% (as it will be mandated to bring establishment expenditures under control).
2. **The Capital Account**: - All the receipts and expenditure are sporadic in nature. But those that take place more or less every year have been averaged, and have been found to have a capital balance. This is assumed to happen every year. This balance can be used to repay outstanding loan installments, and part of the required capital expenditure under the new JNNURM projects.
3. **Outstanding debt burden :-** The outstanding loans of the VMC at present are from government sources. So it is assumed that they will be repaid in equal installments over the next 10 years, and each year interest (10 % per annum) will be paid on the outstanding balance.

The cash flows with these assumptions is shown in the table below:

Table 49. Projected Revenue Income-Expenditure Deficit

Particulars	2006-07	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Revenue Income	5496.11	9356.71	7892.66	8524.07	9206.00	9942.48	10737.88	11596.91	12524.66	13526.63	14608.76
Revenue Expenditure	5065.52	5821.34	7606.16	8366.78	9203.45	10123.80	11136.18	12249.80	13474.78	14822.25	16304.48
Surplus/Deficit	430.59	3535.37	286.50	157.30	2.55	-181.32	-398.30	-652.89	-950.12	-1295.62	-1695.72
New O&M exp							2420.00	2770.00	3110.00	3280.00	3440.00
New Deficit											
Capital Income	0.25	12112.21	21072.60								

(All figures in Rs'0000)

At present Varanasi Municipal Corporation is showing positive surplus for the accounts of 2006-07, 2007-08, 2008-09. The surplus seems to be as a result of unutilized state and central grants. Hence in a way the ULB is practically operating with deficit. In this situation financing out of existing resources is not possible. However looking at is special status, it might get additional support from JnNURM. However still it will have to bring out 30%. This can be managed by getting additional support from state and rest by borrowing from outside sources. The ULB can leverage its position by offering any commercial property for mortgage or by escrow of receivables from property tax.

Even when the capital side has been funded, it will need additional finance for operations. That seems to be possible only by way of increased tariffs (awaiting government sanction), recovery of old arrears (1458.20 lacs), assessing new properties (atleast 60,000 to 70,000). It shall also have to set norms for discretionary expenditure and adopt rational budgeting practices.

Almost every Indian city has gone through such situations before evolving to or which are now emerging with robust finances. The strategy adopted and the people involved will be the decisive forces for success.