SCBP

Sanitation Capacity Building Platform

Urban Wastewater Management in Madhya Pradesh

A City Level Sanitation Study
(Jabalpur, Rewa, Sheopur)

National Institute of Urban Affairs

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Foreword

Sanitation Capacity Building Platform (SCBP) established in 2016 is anchored by NIUA. It works as a collaborative initiative of experts and organisations committed to the goal of sanitation to support and build the capacity of towns/cities to plan and implement decentralized sanitation. The platform lends support on urban sanitation to Ministry of Housing and Urban Affairs (MoHUA), Government of India and supports states and cities to move beyond Open Defecation Free (ODF) status by addressing safe disposal and treatment of human faeces. It is a resource centre for Learning and Advocacy Material, important Government Orders and Reports, Training Modules, Workshop Reports and other publications produced under SCBP and its partner organisations.

The Platform partners include Center for Water and Sanitation (C-WAS) at CEPT University, CDD Society and BORDA, ECOSAN Services Foundation (ESF), Administrative Staff College of India (ASCI), UMC, Centre for Policy Research (CPR), iDeck and WASHi. The Platform also engages and supports Nodal AMRUT accredited training institutions, universities, research organisations and NGOs. SCBPs work on faecal Sludge and Septage Mangement (FSSM) is a Bill and Melinda Gates Foundation (BMGF) supported urban sanitation programme initiative. It is a knowledge platform on decentralised urban sanitation. It is a resource centre for Learning and Advocacy Material, important Government Orders and Reports, Training Modules, Workshop Reports and other publications produced under SCBP and partner organisations.

ABOUT NIUA

National Institute of Urban Affairs (NIUA) is premier institute for research, capacity building and dissemination of knowledge for the urban sector in India. It is registered as an autonomous body under the Ministry of Urban Development, Government of India. NIUA conducts research in emerging themes such as urbanization, urban policy and planning, municipal finance and governance, land economics, transit oriented development, urban livelihoods, environment and climate change and smart cities. NIUA supports innovations in the urban sector through informed dialogues, knowledge exchanges, training and capacity building. In its mission to promote evidence-

based policy-making and urban scholarship, NIUA is currently engaged in inter-disciplinary research and proactive engagements with change agents, which involve projects that create & maintain digital interface solutions.

ABOUT THE STUDY

In order to understand the urban sanitation challenges in the Indian states, a field based research on septage and wastewater management was commissioned by NIUA. The states of Odisha, Madhya Pradesh, Karnataka and Telangana were selected for the study. Under this project 3 towns were also selected per state by the researchers for qualitative and quantitative assessment of current sanitation, septage and wastewater management. The ULB's institutional landscape and the major challenges in these towns were analysed. Using the town wise findings, a state level perspective and understanding of urban sanitation management was obtained. The deliverable of the research will be used as inputs into the training material for the Sanitation Capacity Building Platform (SCBP).

The key research areas for the study were –

1. Status of septage containment, conveyance, disposal and treatment systems in each town.
2. Analysis of the sustainability and equitability of the existing and proposed sanitation services in the context of municipal finances and institutional structure of the ULBs.
3. The business and operational model for private sector operators with a special focus on profitability and their relationship with ULB.
4. Impact of unsafe disposal and lack of treatment of wastewater and faecal sludge on ground water and surface water bodies.
5. Possible improvements that can be brought about in septage and wastewater disposal in terms of provisioning and governance in urban areas of the state and towns.

The research focused on primary data collection in the 3 towns and its contextualization and assessment at the state level. Municipal and ULB norms, actual operations of ULBs and government departments were studied along with an analysis of the budgets and expenditures of ULBs related to sewerage management. The study also focused on the affordability, equity and technology comparison between septage and sewerage management. Slum sanitation and wastewater challenges in the 3 towns also provided some perspective on equity issues. Review of other secondary data such as DPRs, performance reports, annual budget documents etc. were used in the study. Laboratory tests of water samples from surface water, groundwater and potable water were also conducted to provide the evidence for contamination and environmental damage.

Introduction to the Research

Given these problems with FSSM and the inadequate number and underperformance of the Sewerage Treatment Plants (STP) the following research questions have been decided upon so as to provide information for proper future planning -

1. What is the current status of sanitation, septage and wastewater management?
2. What are the septage containment, conveyance, treatment and disposal systems?
3. How environmentally and financially sustainable socially equitable are the existing and proposed waste management systems?
4. What is the contribution of unsafe disposal and treatment to the contamination of ground and surface water?
5. What are the possible improvements that can be brought about in the wastewater and septage management?

The study is based on a critical review of secondary sources, interviews with key informants and group discussions with a sample of the general population, especially in the poverty pockets as follows –

1. Study of Town Plans, City Development Plans, Detailed Project Reports and Performance Reports of various projects proposed or undertaken with funding from the Asian Development Bank (ADB), Jawaharlal Nehru National Urban Renewal Mission (JNNURM), Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Swachh Bharat Mission and UN HABITAT.
2. Analysis of the annual budget documents of the concerned municipal bodies and the State Government and the actual operation of the various departments concerned with wastewater management including FSSM.
3. Interviews with key informants in the Government, Civil Society, and cesspool operators (private and government) and group discussions with residents welfare associations, residential committees and other communities, especially those residing in poor pockets in the core city

areas and survey of these areas to record pictorially the status of sanitation services being provided.

4. Laboratory testing of water quality of water bodies in the urban areas like rivers, streams and lakes and also of ground water and the potable water which are poorly monitored.
5. Comparison of the cost of waste disposal services as calculated from the budget data with the **Consumption Expenditure data of the National Sample Survey Organisation** to determine the affordability and equity of these services.
6. Comparison of the standard of waste disposal services with the norms specified by various statutes and manuals to determine the reliability and efficiency of these services.
7. Review of literature on alternative wastewater disposal and FSSM practices in India and abroad to arrive at possible remedial measures.

Executive Summary

The study gives an overall review of the sanitation, septage and wastewater management situation in Madhya Pradesh with special emphasis on three towns selected for detailed study namely Sheopur, Rewa and Jabalpur.

As per the financial analysis in 2016-17, the per capita revenue expenditure for Tier I Indian cities was only 2% of that in UK, 9% of that in South Africa and 13% that of China. Similarly, the per capita capital expenditure for Tier I Indian cities in 2016-17 was only 4% of that in UK, 13% of that in South Africa, 15% of that in China. This reflects the lack of per capita financial investments made in Tier-I Indian cities. In Madhya Pradesh, cities of Sheopur, Rewa and Jabalpur have less than INR 3,500 per capita revenue expenditure respectively. Sheopur and Jabalpur have less than INR 6,000 per capita capital expenditure as compared to Rewa that has INR 14,327.

The report also showcases impact of financial unsustainability highlighting the lack of trained human resources in Urban Local Bodies (ULBs) and comparative analysis of sewerage surcharge with average monthly household expenditure. In MP, most of the septic tanks are often oversized due to lack of technical competence and are not accompanied by soak trenches/pits, thus effluent is released untreated. Lack of private sector participation and limited cesspool vehicles with ULBs results into improper septage management in these towns.

The large municipal corporations in the state cumulatively have the highest proportion of households followed by the Municipalities and the Nagar Panchayats. The proportion of households in the 32 AMRUT (Atal Mission for Rejuvenation and Urban Transformation) towns is 56 percent. The provision of services too is much better in the larger towns as compared to the smaller ones as per the Census 2011 Household data.

The proportion of households with toilets is 74.2 percent while that for Scheduled Castes is significantly lower at 54.2 percent and Scheduled Tribes are even lower at 47.7 percent. There is also a big difference between the AMRUT towns and the non-AMRUT towns with the former having 83.5 percent of households with toilets and there being only 62.4 percent in non-AMRUT towns. Similarly, the data for open defecation also show a poorer situation in the SC, ST and NAT categories. However, due to the Swachh Bharat Mission

(SBM) there has been a reduction in open defecation and an increase in the proportion of households with toilets as 4,93,450 individual toilets and 18,896 community toilets have been constructed in the state under SBM.

Septic Tanks are the most used means of disposing for toilet waste at 67.5 percent for the total population. There is not much difference with the SC and the ST households with the latter having a greater proportion at 68.3 percent. However, there is a big difference between AMRUT and non-AMRUT towns with the former having 58.3 percent households with septic tanks as opposed to 83 percent for the latter mainly due to a lesser provision of sewerage systems in the latter. The proportion of pit latrines is very low across all categories but this must have increased slightly with the implementation of the Swachh Bharat Mission since 2015. Provision of sewerage systems is low and especially so in non-AMRUT towns.

Most of the water is disposed in Open drains with Scheduled Caste households having the highest proportion of 53.6 percent. The Scheduled Tribe households had the highest proportion of 40.7 percent with no drains at all which is a very unhygienic situation. Also, the AMRUT towns had much better sanitation situation drainage than the Non-AMRUT towns.

There is no reliable data with regard to the treatment of black and grey wastewater that is carried away from the households by open drains and sewers or septage emptied from tanks. These are mostly being discharged untreated into fields and surface water bodies.

The census data paint a dismal picture of the situation of sanitation in urban areas of the state, especially so in the non-AMRUT towns which constitute almost half the total urban population. Some sewerage treatment capacity has been installed in a few towns and the Central Pollution Control Board (CPCB) Report on *Inventorisation of Sewerage Treatment Plants (STP)* in 2015 gives the data for Madhya Pradesh which has 17 STPs having total treatment capacity of 482.23MLD. Out of 17 STPs, 03 STPs of capacity 6.75 MLD are Non-Operational.

An STP of 12 MLD capacity has been constructed in Rewa which is still not operational because sewerage lines have not been connected to it yet and an STP of 130 MLD capacity has become operational in Indore. Not only is this total installed capacity of 624.23 MLD only about 20 percent of the estimated generation of sewerage and septage for the urban areas of the state of 3090 MLD but according to other more detailed assessments by the CPCB, the actual treatment being done was much less. This other report says that the capacity of the treatment plant at Gwarighat in Jabalpur is only 0.15 MLD and the bigger one at Kathonda is non-operational as is the STP in Ujjain town. The other STPs

were operating well below capacity and cumulatively treating only about 180 MLD. Thus, bringing down the actual sewerage treatment to only 6 percent of the total estimated generation of sewerage and septage. It is also to be noted in the table that the consent from the State Pollution Control Board to operate these STPs has either not been obtained or has expired indicating that there may be serious problems with their design and operation.

This is confirmed by this second CPCB report which says that the STPs were not being operated properly because of lack of qualified staff, supply of chemicals and electricity and regular upkeep. As a result the treated effluent discharged from these STPs is of a polluted nature with values well above the prescribed limits, especially for the disease spreading coliform bacteria and most of the sewerage coming to them was being by passed and released into the nalas instead of being treated in the STPs. This assessment was confirmed by actual site visits made to these STPs.

A major issue is that for sewers to run properly there must be adequate supply of water and this is not happening in Madhya Pradesh cities. Thus, in the absence of adequate flow the sewers tend to clog up and have to be frequently cleaned further increasing the costs. Since ULBs do not have the funds to acquire mechanical sewer cleaning machines, this work is done by Dalits in violation of the Prevention of Manual Scavenging Act (2013) and every year a considerable number of Dalit sewer cleaners die after entering the sewer manholes to clean them. Even in the case of faecal sludge management through the use of vehicles with tanks and pumps to empty the sludge from septic tanks and pit latrines in urban areas and carry them to faecal sludge treatment plants (FSTPs) or to compost pits on farms in nearby villages there is the issue of the high cost of transportation.

The brief characteristics of the three towns revealed from the study are described here. The proportion of households with toilets is the highest in the case of Jabalpur and lowest in the case of Sheopur as is to be expected given the increase in per capita income and per capita municipal expenditures with the size of the towns. The implementation of SBM since 2015 has resulted in more toilets being constructed but the situation is still deficient.

Septic tanks remain the most popular means of disposal of toilet waste, even in large cities like Jabalpur which has some amount of sewerage. Thus, given the huge investments involved in laying sewers and constructing STPs, proper decentralised faecal sludge management will have to be the way ahead to ensure proper sanitation in the state.

Once again the situation in Jabalpur is better than for the other towns except in

the case of open drains which are less for Rewa than for Jabalpur mainly due to the fact that Rewa has a very high proportion of households without any drains.

The slums had mostly single pit latrines which have been built recently with grants from the municipal corporation under the Swachch Bharat Mission. Many residents complained that despite their names being enrolled for toilets, they have not got the same. The built up houses in the colonies nearby had septic tanks which released their outflow into the open drains. Consequently these drains carry contaminated water which is a breeding ground for pigs. Due to the inadequacy of the pit latrines in some congested slums, there are community toilets but even in these the septic tanks have outflows going into the nala behind the toilets. The closed drains get clogged and they have to be cleaned from time to time. This cleaning is done by Dalit staff of the ULBs and like elsewhere in India they clean out the drains and leave the waste on the road. The single pit latrines have been constructed poorly given the very low grant amount of Rs.12,000 per latrine so are likely to fall into disuse soon.

Septic tanks too have mostly been built in violation of the norms prescribed by the CPHEEO. In most cases these are actually big leach pits with open bottoms. However, over time the sludge at the bottom reduces the leaching velocity so there is some outflow into the open or closed drains. The outlets of these septic tanks or leach pits are below the level of the ground so these will have to be closed and the sewerage connected directly to the new sewer lines that are being laid in the towns of Rewa and Jabalpur. This is also necessary to ensure enough flow in the sewers. However, the householders with septic tanks or leach pits in both towns are reluctant to do this because of the costs involved in connecting their toilet lines with the sewers.

The Jabalpur Municipal Corporation (JMC) has three big septic tank cleaning vehicles of 9,000 litre capacity each and 5 smaller ones of 4500 litres capacity. The charge is a uniform Rs.1,505 per trip and according to the sanitation staff they attend to about 7 requests per day. However, the actual recovery of charges from septic tank cleaning as mentioned in the budget for the year 2015- 16 was only Rs.2,66,160 which works out to one septic tank cleaning in two days. Even if the rate of tank cleaning may have gone up subsequently it is unlikely that it would be as high as 7 per day. Especially since there is also a private agency named Narmada Safai Samrakshak Enterprises which is Dalit owned and has three six thousand litre capacity vehicles which does only two cleanings per day on an average. This agency charges anything between Rs. 1,000 and Rs. 2,000 depending on the distance and the size of the septic tank to be cleaned. Apart from this there are still groups of Dalits who clean septic tanks by hand in the more congested areas where the cleaning vehicles are not able to go even though this is in clear violation of The Prohibition of Employment as Manual Scavengers

and their Rehabilitation Act, 2013. Rewa Municipal Corporation has one septic tank cleaning vehicle and Sheopur Municipality has none. Thus, private Dalit groups clean the tanks in these towns using tractor tankers to cart away the septage from the septic tanks for emptying into the nalas without any treatment.

Jabalpur Municipal Corporation has three new septage treatment plants set up in Awadhpuri, Adhartal and Tilwara. Each of these have a daily capacity of 50,000 litres and has been set up by a firm called Mecotechnologies which has been given the contract for installation, operation and maintenance for five years for Rs. 69 lakhs each from 2017 onwards. These treatment plants use the Moving Bed Biofilm Reactor (MBBR) technology which is economical both in terms of space and energy utilisation. The Jabalpur Municipal Corporation vehicles according to the sanitation staff are emptying their septage load into these plants but the private operators are not doing so. They say that these plants are situated far away from their area of operation so unless the Corporation subsidises the transport cost they will continue to empty septage into the nalas. This high cost of transportation seems to be affecting the Jabalpur Municipal Corporation tankers. Also since they too are not emptying enough septage into the treatment plants to keep them running continuously so they are mostly lying idle.

All the three towns have some underground sewer lines in both Government and private residential colonies. Currently some of the sewerage from Zone 1 in Jabalpur is being carried through a sewer system to the sewerage treatment facility in Kathonda which consists of two facultative ponds of one km length and about 50 meters width each. The capacity of the plant is 50 million litres per day (MLD) but the actual flow observed was a few kilolitres per day only. The initial structure for dosing the wastewater with chemicals and distributing it to the facultative ponds was lying idle. Rewa has one STP of 12 MLD but it is not operational. More STPs and sewerage lines are under construction in Rewa under the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) scheme but presently none of this sewerage is being treated and instead it is being emptied into nalas directly. Sheopur does not have any STPs so the whole of the sewerage is being released into the nalas untreated.

The polluted water from the open drains and the septage not only contaminates the surface water but also the ground water. Tests were carried out on various surface water and ground water sources in the study towns. The test results showed the coliform, streptococci, ammoniacal nitrogen and total nitrogen values to be above the prescribed limits so most of the sources are polluted. This despite the fact that the samples were collected during the monsoon when it was expected that greater flow in surface and ground water dilutes the pollution.

The staff strength of the Health and Sanitation Department of the studied

towns is grossly inadequate. There is severe understaffing of the sanitation department which is affecting the provision of sanitation services, especially to the slum areas.

The overall finances of the three study towns have been summarised in Table 1 below.

Table 1: Overall Finances of Study Town ULBs from 2017-18 Budget Estimates

Item	Sheopur		Rewa		Jabalpur	
	Total (Rs) Lakhs)	Per Capita (Rs)	Total (Rs Lakhs)	Per Capita (Rs)	Total (Rs Lakhs)	Per Capita (Rs)
Revenue Receipts	2112.40	2669	8075.76	3106	60400.13	5135
Revenue Exp.	2112.12	2668	7246.73	2787	39008.81	3316
Revenue Surplus	0.28		829.23		21391.32	
Cap Receipts	3800.0	4801	33683.76	12955	45778.56	3892
Cap Expenditure	3800.0	4801	37250.68	14327	67133.77	5708
Cap Deficit	0		3566.92		21355.21	

Extrapolating from the analysis presented in a study by the Mckinsey Global Institute, the per capita revenue expenditure for Tier I Indian cities in 2017-18 was Rs. 9,000. The average revenue expenditure on urban services in Indian cities was only 2% of that in the UK, 9% of that in South Africa and 13% of that in China (MGI, 2010). Similarly the per capita capital expenditure for Indian Tier 1 cities in 2017-18 was Rs. 7,300. The capital expenditure on urban services in Indian cities was 4 percent of that in the UK, 13 percent of that in South Africa and 15 percent of that in China. Clearly even in the case of Jabalpur, which is a Tier 2 city, the per capita expenditures are way below the Indian average. Only in the case of Rewa, is there a high per capita capital expenditure because of the heavy investment under AMRUT for the laying of sewerage lines.

The low levels of revenue mobilisation and the high dependence on State and Central Government grants makes the finances of the ULBs very unsustainable and they are not able to offer proper sanitation services as described earlier. The actual user charges recovered, and capital and revenue expenditures for 2015-16 for the water supply and sanitation (WSS) services of the Jabalpur Municipal Corporation provide a good idea of the lack of financial sustainability of these sectors. The Jabalpur Municipal Corporation is not recovering the costs

of water supply and sanitation and especially so in the case of the latter even though the standard of such services is very low and inadequate. The per capita sanitation cost in 2015 assuming a population of 12 lakhs for the JMC area was Rs. 523. According to a study by NIUA, the per capita cost of providing standard sewerage services in 2004 -05 prices was Rs. 1,418 and that of providing solid waste management was Rs. 253 for a total sanitation cost of Rs. 1,671. Assuming a 6 percent annual inflation rate the standard cost of sanitation services in 2015 would be Rs. 3,172. Thus, the current levels of expenditure on sanitation in JMC are way below the norm and the situation in Rewa and Sheopur is even worse.

Affordability Analysis of Sanitation Services

If the JMC were to recover even the current lower standard of sanitation costs which it is not doing, then assuming total number of the surcharge paying households to be 1.6 lakhs in 2015 (70 percent of total households, as 30 percent live in slums and are too poor to pay charges), the per household sanitation charge per month would be Rs. 327. The Average urban monthly per capita consumer expenditure in the 66th round of the National Sample Survey Organisation survey for Madhya Pradesh in 2010-11 was Rs. 1,666 (NSSO, 2011). Assuming a household of five persons, this gives average monthly household consumer expenditure in 2010-11 of Rs. 8,330. Assuming an average annual consumer price inflation rate of 6% from 2010-11 to 2016 the average monthly household consumer expenditure in 2015-16 will be Rs. 11,147. Thus, the proportion of the sanitation cost recovery surcharge works out to 3 percent of the average monthly household expenditure which is an unacceptable high proportion. The proportion of households who had a monthly per capita consumer expenditure less than the average is 70 percent of whom the bottom 30 percent have been exempted as being too poor to pay. Thus, as much as 40 percent of the population would have to spend 3 percent or more of their monthly expenditure on sanitation which is not affordable by any means. This, when the services are grossly inadequate.

The budgeting has been done in a very unprofessional manner, so considerable time had to be expended to rearrange the data for the above financial analysis. Despite the claim of the State Government that since 2007 the Madhya Pradesh Municipal Accounts Manual has introduced computerised double entry accrual based system of accounting to properly track accounts and inventories and generate financial reports that can help in proper budgeting, in practice the accounts are still opaque (GoMP, 2014). Not surprisingly the administration cannot easily draw any conclusions for better financial performance from the budget exercise at present and instead this is done mechanically year after year. The above analysis shows that the finances of the ULBs in the study towns are unsustainable and inadequate so are adversely affecting the provision of services to the citizens especially so in the sanitation sphere.

Introduction

The problems faced in the management of cities and towns in developing countries became the focus of attention as early as in the first United Nations Conference on Environment and Human Settlements held in Vancouver in 1972. There was a recognition of the need for adequate provision of sustainable and equitable access to municipal services required to make urban environments healthy and liveable (Mahadevia, 2003). This was named as the "Brown Agenda" (McGrahanan and Satterthwaite, 2000). Subsequent to this in 1983 the World Commission on Environment and Development set up by the United Nations studied the problem of environmental degradation brought about by development. The Commission came out with a report in 1987 that for the first time put forward the concept of sustainable development which "meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations Organisation, 1987). Subsequent to this, the issue of environmental sustainability began to assume more and more importance and in the case of urban development this was named as the "Green Agenda" (McGrahanan and Satterthwaite, op cit.).

The increasing urbanisation of the world made the reconciling of the Brown and Green Agenda very difficult as a large number of people migrated from the rural areas into the towns and cities for livelihoods. Cities as the engines of economic growth obviously needed good civic infrastructure to be able to accommodate the growing population and burgeoning economic activity. Such a growth path had very large ecological footprints, much larger than their own territories both for resource extraction and waste disposal (Martinez Alier, 2002). Problems cropped up as the poor occupied and developed vast shanty towns and poverty pockets in the marginal spaces like riversides and waste lands. These are precisely the areas that the rich seek to sequester to beautify the city or for dumping garbage. The drive for environmental and financial sustainability in such circumstances leads to social conflicts as the poor get squeezed out of their habitats and livelihoods while being asked to pay for municipal services (COHRE, 2006).

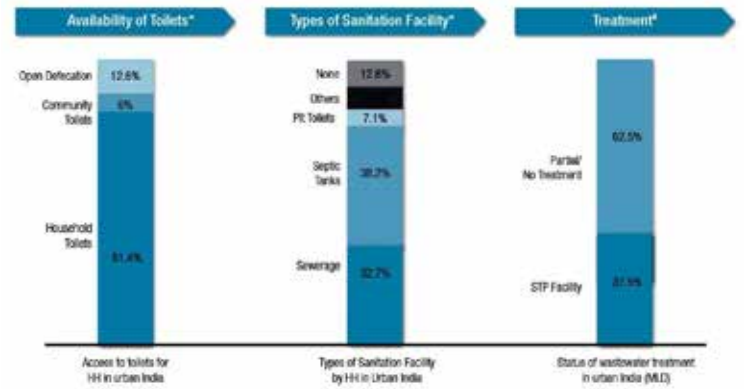
The World Conference on Environment held in 1992 in Rio de Janeiro further stressed the need for sustainable development. This was followed by the second

UN Habitat Conference held in Istanbul in 1996 when an attempt was made to bridge the brown and green agenda and a Sustainable Cities Programme (SCP) was conceptualised and executed under the aegis of the United Nations Human Settlements Programme (UN HABITAT) and the United Nations Environment Programme (UNEP) in two phases upto 2007. However, this programme has been criticised for stressing more on the environmental and financial sustainability of city development at the cost of majority of the poor inhabitants of cities. Especially in the developing countries where municipal services are of poor quality and reach due to lack of resources (Mahadevia, 2001).

The Jawaharlal Nehru National Urban Renewal Mission (JNNURM) was initiated by the Central Government in 2005 to improve the urban infrastructure and services in 35 cities with one million plus population in 2001 and 28 other urban areas of tourist or historical or religious importance (JNNURM, 2005). The JNNURM envisaged heavy grant funding from the Central and State Governments of over Rs 1,20,000 crores over a seven year period from 2005-6 to 2012-13 to urban local bodies for specific projects concerning water supply, sanitation and solid waste management. There was a stress on public private partnership (PPP) to ensure that in the long run the operation and maintenance costs, which always pose a problem, could be recovered. Nevertheless, there was simultaneously a stress on the provision of basic services to the poor. Thus, the JNNURM struck a balance between the two goals of achieving financial social sustainability in provision of quality urban infrastructure and services.

Despite these measures, in reality, the provision of quality municipal services sustainably and equitably remained a distant dream. A major area of concern was in the provision of sanitation services with not only the prevalence of open defecation but also inadequate treatment and disposal of waste from toilets and households, leading to pollution of open spaces and surface and ground water resulting in adverse health impacts (CSE, 2012). The status of urban sanitation as portrayed by the Census 2011 data and the Central Pollution Control Board (CPCB) Report on sewerage treatment, as quoted in the National Policy on Faecal Sludge and Septage Management (MoUD, 2017), was nothing short of alarming as shown in Figure 1 below.

Figure 1: Status of Urban Sanitation in India 2011



Only 32.7 percent of households were connected to sewerage sytems and of these sewers only 37.5 percent were connected to Sewerage Treatment Plants. Moreover, there is little reliable information regarding the treatment of faecal sludge and septage being generated by septic tanks which account for 38.2 percent of all households. Consequently, there is a need to study in depth the situation of sanitation prevailing in various states so as to be able to plan properly and improve the overall sanitation situation in the country as the ameliorative interventions have to be state specific in nature.

This paper presents the status of sanitation in Madhya Pradesh based on a review of the available literature and a field study of a sample of three towns of different sizes in the state. In what follows, first the obstacles to faecal sludge and septage management are discussed and then an overview of the sanitation situation in the state is given. After this the findings of the sanitation situation in the three study towns are summarised from the details given in the annexure at the end. The findings of the study with regard to the research questions are detailed in the penultimate section. The report concludes with the recommendations for improvement in the sanitation of urban Madhya Pradesh.

Section I

Faecal Sludge and Septage Management

Faecal Sludge and Septage Management

The Swachh Bharat Mission was launched in 2014 to tackle the problem of sanitation head on. This brought to the fore the need for cost effective and robust solutions not only for the problem of conveyance of human excreta and wastewater through sewers and their proper treatment but also for the even greater problem of the proper treatment and disposal of the huge excreta load of On Site Sanitation (OSS) systems like septic tanks, cesspools and leachpits. The National Policy on Faecal Sludge and Septage Management (FSSM) clearly states that due to high capital and operation and maintenance costs, centralised sewerage and treatment systems will not be implementable in all towns, so decentralised OSS systems along with proper FSSM will have to be implemented on a large scale. The policy lists the following problems plaguing FSSM that have to be overcome -

1. The widespread perception due to the caste system that handling of faeces pollutes the person so the reluctance to even consider cleaning the septic tanks and leach pits at regular intervals.
2. Reliance on illegal manual scavenging despite a stringent legislation (The Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013).
3. Septic Tanks or pits are often placed under toilets and sealed or are located in corners resulting in no or limited access for cleaning.
4. Septic tanks are often oversized due to lack of technical competence of the masons. They do not meet the standards prescribed in the National Building Code or the manual on sanitation prepared by the Central Public Health and Environmental Engineering Organisation (CPHEEO). Thus, regular cleaning is not done and the householder waits for the tank to fill up.
5. Septic tanks are not accompanied by soak trenches or soak pits which are essential to treat the effluent further before releasing it into the ground. So in most cases the septic tanks are built without a concrete floor and the highly polluted effluent directly leaches into the ground. Even if they are built with a concrete floor the effluent is released into the open drains along with the grey water from the bathroom and kitchen.

6. Urban Local Bodies have inadequate services like suction tankers and trained human resource to provide proper tank cleaning services at a moderate cost.
7. There are very few formal private tank cleaning service providers who can provide quality tank cleaning services and also treat the septage properly afterwards. Informal small scale contractors provide substandard services and empty the septage into open fields and water bodies creating serious health hazards.
8. Most towns lack proper septage treatment systems and even the municipal suction tankers dump the septage in open grounds and water bodies. There is no clear citywide approach to FSSM integrating good technology and cultural practices.
9. There is a huge lack of awareness among the public about the serious health hazards of improper septic tank construction and FSSM. Especially affected are the women and children who suffer from the insanitary conditions as established by the Economic Survey Report for 2016-17 (MoF, 2017).
10. Despite there being stringent laws like the Water (Prevention and Control of Pollution) Act 1973, the CPHEEO manual and Building Codes and Rules, these are all being flouted at will by all with the ULBs being the biggest culprits and the Pollution Control Boards being lax in their monitoring.

Section II

Status of Wastewater Management in Madhya Pradesh

Status of Waste Water Management in Madhya Pradesh

The census has a category called Census Towns in addition to the statutory towns like municipality, municipal corporation, cantonment board or notified town area. A census town is defined as -

1. Having a minimum population of 5,000;
2. With at least 75 percent of the male main working population engaged in non-agricultural pursuits; and
3. Having a density of population of at least 400 persons per sq. km.

Table 1 gives the number of housholds and the proportion of households of the different categories of urban areas in Madhya Pradesh.

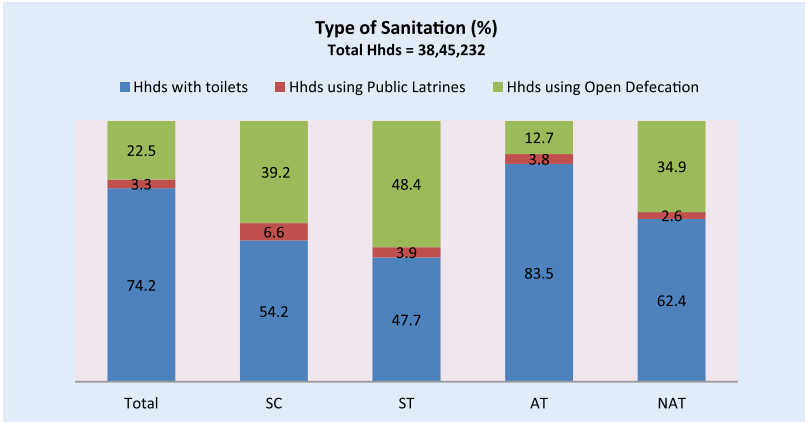
Table 1 : Category of Urban Area with Number of Households

Category	Number	Households	Proportion of Total Hhds (%)
Census Town	113	224932	5.8
Nagar Panchayat	249	744609	19.4
Nagarpalika	96	1170334	30.4
Mun. Corporation	14	1669597	43.4
Cant. Board	5	35760	0.9
Total	477	3845232	100.0

Thus, we see that the large Municipal Corporations cumulatively have the highest proportion of households followed by the Municipalities and the Nagar Panchayats. The proportion of households in the 32 AMRUT (Atal Mission for Rejuvenation and Urban Transformation) towns is 56 percent. The provision of services too is much better in the larger AMRUT towns as compared to the

smaller non-AMRUT ones as can be seen from the Census 2011 Household data which has been summarised in the chart below.

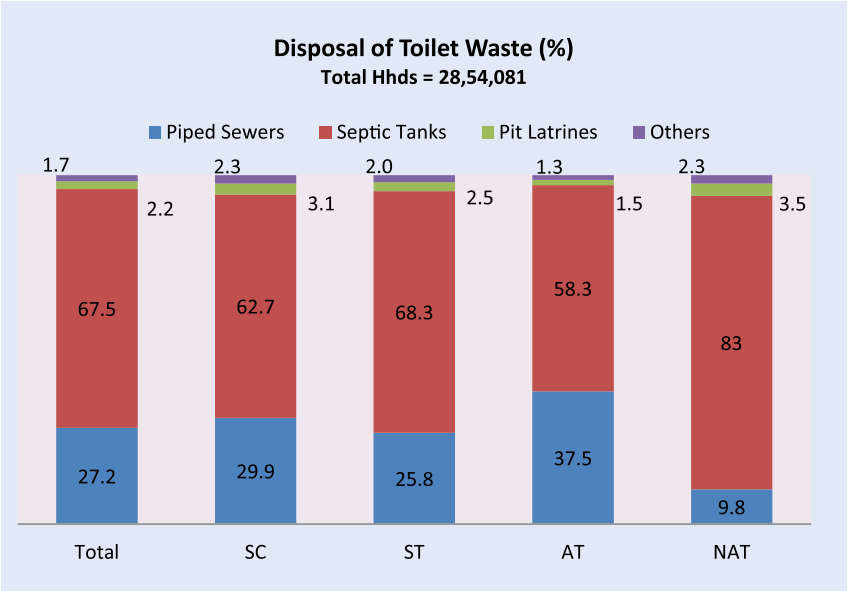
Figure 2. Type of Sanitation in Urban Areas in Madhya Pradesh



SC-Scheduled Caste, ST-Scheduled Tribe, AT-AMRUT Town, NAT-Non-AMRUT Town

Out of the total M.P. population the proportion of households with toilets is 74.2 percent while that for Scheduled Castes population is significantly lower at 54.2 percent and Scheduled Tribes are even lower at 47.7 percent. There is also a big difference between the AMRUT towns and the non-AMRUT towns with the former having 83.5 percent of households with toilets and there being only 62.4 percent in non-AMRUT towns. Similarly the data for open defecation also show a poorer situation in the SC, ST and NAT categories. However, due to the Swachh Bharat Mission (SBM) there has been a reduction in open defecation and an increase in the proportion of households with toilets as 4,93,450 individual toilets and 18,896 community toilets have been constructed in the state under SBM.

Figure 3. Disposal of Toilet Waste



SC-Scheduled Caste, ST-Scheduled Tribe, AT-AMRUT Town, NAT-Non-AMRUT Town

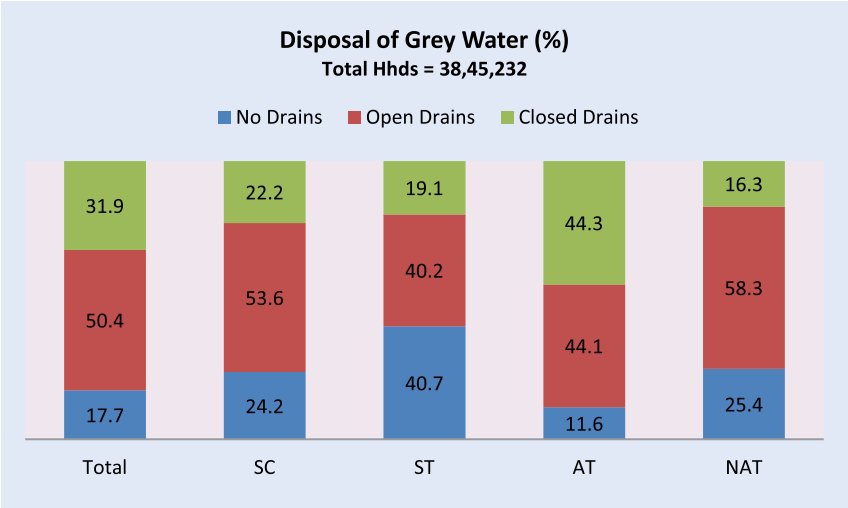
Septic Tanks are the most used means of disposing of toilet waste at 67.5 percent for the total population. There is not much difference with the SC and the ST households with the latter having a greater proportion at 68.3 percent. However, there is a big difference between AMRUT and non- AMRUT towns with the former having 58.3 percent households with septic tanks as opposed to 83 percent for the latter mainly due to a lesser provision of sewerage systems. The proportion of pit latrines is very low across all categories but this must have increased slightly with the implementation of the Swachh Bharat Mission since 2015. Provision of sewerage systems is low and especially so in non-AMRUT towns.

The data on the methods of disposal of Grey water generated from bathrooms is shown in Figure 4 below. Most of the water is disposed in Open drains with Scheduled Caste households having the highest proportion of 53.6 percent. The Scheduled Tribe households had the highest proportion of 40.7 percent with no drains at all which is a very unhygienic situation. As before the AMRUT towns had a much better sanitation situation with much better proportions for closed drains, open drains and no drainage than the Non-AMRUT towns.

There is no reliable data with regard to the treatment of black and grey water

that is carried away from the households by open drains and septage emptied from tanks. These are mostly being discharged untreated into fields and surface water bodies.

Figure 4. Disposal of Grey Water



SC-Scheduled Caste, ST-Scheduled Tribe, AT-AMRUT Town, NAT-Non-AMRUT Town

The census data paint a dismal picture of the situation of sanitation in urban areas of the state, especially so in the non-AMRUT towns which constitute almost half of the total urban population. Some sewerage treatment capacity has been installed in a few towns and the Central Pollution Control Board Report on Inventorisation of Sewerage Treatment Plants (STP) (CPCB, 2015) gives the data for Madhya Pradesh shown in Table 2. According to this Madhya Pradesh has 17 STPs having total treatment capacity of 482.23MLD. Out of 17 STPs, 03 STPs of capacity 6.75 MLD are Non-Operational.

Table 2: Inventorisation of STPs in Madhya Pradesh 2015 by CPCB

Sl. No	City/ Town	STP Location	Year of Commi-ssioning	Operational Status	Installed Capacity (MLD)	Tech.	PCB Consent Status
1	Ujjain	Ujjain	Information not provided	Operational	52	WSP	Information not provided
2		Sadaval	2001	Operational	50	OP	Not Obtained
3	Gwalior	Lalitpura	2010	Operational	50	WSP	Obtained
4	Indore	Kabitkhedi	2006	O&M by IMC	78	USAB	Not obtained
5		Kabitkhedi	2009	through contractor	12	USAB	Not obtained
6	Burhanpur	Burhanpur	2009	Non-operational	6	OP	Not obtained
7	Jabalpur	Gwarighat	2012	Operational	150	FAB	Not obtained
8	Bhopal	Maholi Dhamkheda	2001	Operational	25	WSP	Expired
9		Badwai	2001	Operational	17	OP	Expired
10		Gondermau	2001	Operational	2.36	OP	Expired
11		Kotra Singhpur	2001	Operational	10	WSP	Expired
12		Ekant Park	2008	Operational	8	OP	Not Obtained
13		Bawadia Kalan	1975	Operational	13.56	OP	Not Obtained
14		Mata Mandir	1959	Operational	4.56	BF	Not Obtained
15	Nagda	Nagda	information not Provided	Non-operational	–	KT	Information not povided
16	Vidisha	Vidisha		Operational	–		Information not povided
17	Keolari	Keolari		Non - operational	0.75		Information not povided

An STP of 12 MLD capacity, constructed in Rewa is still not operational because sewerage lines have not been connected to it yet and an STP of 130 MLD capacity has become operational in Indore. Not only is this total installed capacity of 624.23 MLD only about 20 percent of the estimated generation of sewerage and septage for the urban areas of the state generating 3090 MLD but according to other more detailed assessments by the CPCB, the actual treatment being done was much less. This other report (CPCB 2015b) says that the capacity of the treatment plant at Gwarighat in Jabalpur is only 0.15 MLD and the bigger one at Kathonda is non-operational as is the STP in Ujjain town. The other STPs were operating well below capacity and cumulatively treating only about 180 MLD. Thus, bringing down the actual sewerage treatment to only 6 percent of the

total estimated generation of sewerage and septage. It is also to be noted in the table that the consent from the State Pollution Control Board to operate these STPs has either not been obtained or has expired indicating that there may be serious problems with their design and operation.

This is confirmed by this second CPCB report which says that the STPs were not being operated properly because of lack of qualified staff, supply of chemicals and electricity and regular upkeep. As a result the treated effluent discharged from these STPs is of a polluted nature with values well above the prescribed limits, especially for the disease spreading coliform bacteria and most of the sewerage coming to them was being by passed and released into the nalas instead of being treated in the STPs. This assessment was confirmed by actual site visits made to these STPs. Thus, the situation with regard to treatment of sewerage too is unsatisfactory. The main reasons for this as noted in the CPCB report are as follows -

1. There is a big gap between the wastewater generation and treatment. The inadequately treated and untreated wastewater is being released into water bodies causing ground and surface water contamination.
2. Cities do not have proper sewerage networks to collect the entire sewerage and a major part of the untreated sewerage is discharged in open drains which joins the surface water bodies or percolate into the subsoil.
3. Majority of STPs are operating without obtaining consent to operate from the State Pollution Control Boards under the provisions of the Water (Prevention & Control of Pollution) Act, 1974.
4. The agencies or departments engaged in the operation & maintenance of STPs are suffering from financial crisis and lack of skilled manpower.
5. The treatment and disposal of sludge from the STPs is a problem leading to a reduction of cleaning of the STPs resulting in a drastic reduction in treating capacity.
6. Industrial effluents are also being mixed into the sewerage coming to the STPs instead of being treated in ETPs separately.
7. Majority of the STPs have no arrangements to measure inlet and outlet flow. A few plants have flow meters at the inlet to measure flow but none of them are working.
8. All the STPs have a by-pass arrangement. The STPs treat only a portion of the sewerage received and the rest of the sewerage is discharged through by-pass arrangements. During monsoons the whole flow is bypassed.
9. The oxidation ponds & waste stabilization ponds do not have proper paths and approach roads and the surroundings are covered with grass and bushes. More importantly some STPs do not have even lighting arrangements and boundary wall. The overall maintenance of these oxidation ponds and waste stabilization ponds is very poor.
10. The treated sewerage of most of the STPs is not being monitored and

analysed on a regular basis for the assessment of the degree of treatment as there are no dedicated laboratories in the STP campus for this purpose.

11. Proper records are not being maintained for the operation of the STPs like inlet flow, outlet flow, sludge generation etc by the operators.
12. There is no planned reuse or recycling of treated wastewater which is an important means of cost recovery.
13. The treated sewerage is being discharged in the nearest wastewater drain. Chlorination is not being done at the outlet of any of the STPs for control of Coliforms thus contributing to the contamination of surface water bodies.
14. Diesel generator sets are not provided in the STPs for backup power for operation of the biological system without any interruption during power failure.

This brings to fore the major constraint that faces efficient disposal and treatment of sewerage and septage in India - the lack of financial resources. The centralised collection and treatment of sewerage and septage involves huge capital expenditures initially in laying sewers and constructing STPs to connect them to. Subsequently these STPs have to be run 24x7x365 and this requires high operation costs in keeping the sewers and STPs operational. Consequently, as detailed in the fourteen points above, the STPs are not properly designed and also not properly run. A major issue is that for sewers to run properly there must be adequate supply of water and this is not always the case, even in Tier I cities. Thus, in the absence of adequate flow the sewers tend to clog up and have to be frequently cleaned further increasing the costs. Since ULBs do not have the funds to acquire mechanical sewer cleaning machines, this work is done by Dalits in violation of the Prevention of Manual Scavenging Act and every year a considerable number of Dalit sewer cleaners die after entering the sewer manholes to clean them. Even in the case of faecal sludge management through the use of vehicles with tanks and pumps to empty the sludge from septic tanks and pit latrines in urban areas and carry them to faecal sludge treatment plants or to compost pits on farms in nearby villages there is the issue of the high cost of transportation.

An even more disturbing result of this lack of financial resources is the dilution in the norms for discharge of treated effluents from STPs for surface water bodies and agriculture. The Environmental Protection Rules 1986 were amended in 1993 to relax the standards for release of STP effluents. To take just one important parameter, the Biochemical Oxygen Demand (BOD) was made 30 mg/l for release of effluents into surface water bodies like lakes and streams. The permissible levels of BOD for such surface water bodies is 3 mg/l (IS:2296, 1982) and this is also the recommendation of a committee set up by the National River Conservation Directorate. However, the Bureau of Indian Standards has since withdrawn IS:2296. If STPs release large amounts of

effluents into streams and lakes with BOD of 30 mg/l then these water bodies are bound to be contaminated. Indeed a high level committee appointed by the Ministry of Urban Development and Poverty Alleviation recommended that the BOD standard for release of effluents by STPs into the Yamuna River should be 10 mg/l (CPCB, 2008). Given the serious contamination of surface water bodies that is taking place, The Ministry of Environment, Forests and Climate Change (MoEFCC) has notified in 2015 under the Environment Protection Rules 1986, a more stringent standard for BOD of effluents of STPs to be built in future at 10 mg/l with the proviso that all existing STPs will also have to meet this standard within 5 years of its notification (MoEFCC, 2015). However, since even the earlier diluted standards are being violated it remains a moot point as to whether the newer more stringent ones will be followed.

Section III

Status of Wastewater Management in Study Towns

Status of Wastewater Management in Study Towns

The million plus population urban areas of Madhya Pradesh are the cities of Indore, Bhopal, Gwalior and Jabalpur. Of these, the city of Indore has already been studied in detail (Banerjee, 2012), so the choice of a big city to be studied had to be made from the other three. Jabalpur is important because it is on the banks of the Narmada River, Bhopal because of its lakes and Gwalior because it is a part of the Chambal River basin. Jabalpur was selected for the study because of its location in the Narmada River Basin. The second urban area to be studied had to be selected from the second tier of important towns in terms of population such as Ujjain, Rewa and Hoshangabad. Of these, the town of Ujjain, which is important because it is a centre for religious tourism, has already been studied in detail (Banerjee, 2016). Rewa is important because it is in the remote and under studied Baghelkhand region of the state and part of the Sone River Basin. Since Jabalpur has been chosen from among the million plus cities, Hoshangabad became redundant as it too is situated on the banks of the Narmada River. So Rewa was selected for the study as it is in the Sone River Basin. The third urban area to be selected is a district headquarter town in a relatively remote area of the State that falls in a different river basin. Sheopur, which is one of the most backward districts of the state because of its Sahariya Adivasi population, was selected as it is located in the Chambal River Basin. The location of the three towns is shown in the map of river basins in Madhya Pradesh in Figure 5 below.

Figure 5. River Basin Map of Madhya Pradesh Showing Location of Study Towns

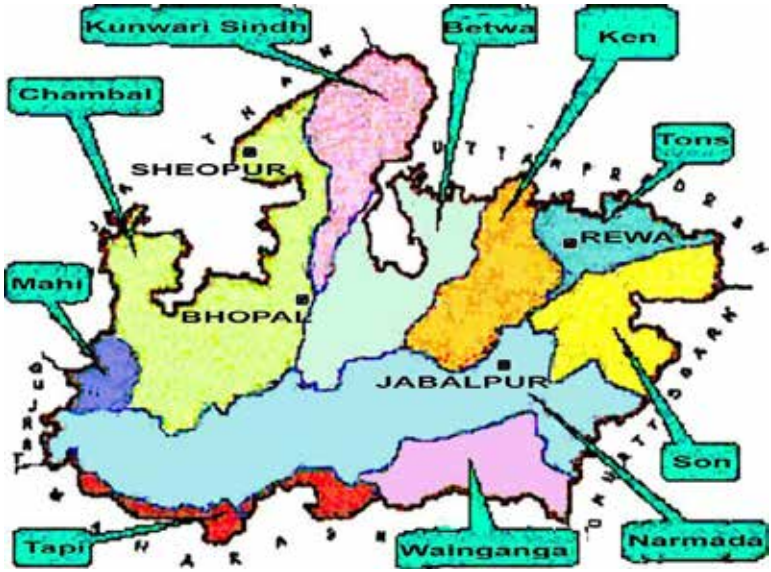
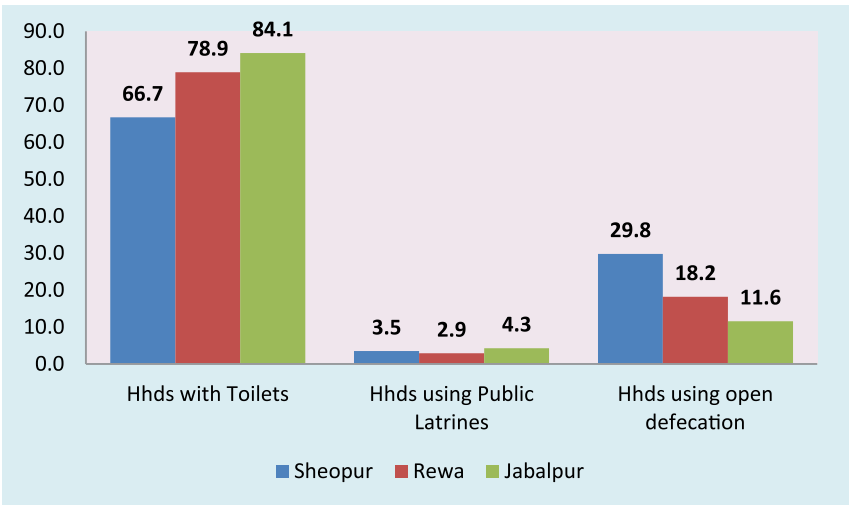


Figure 6. Type of Sanitation Available in Towns in M.P. in 2011 (%)

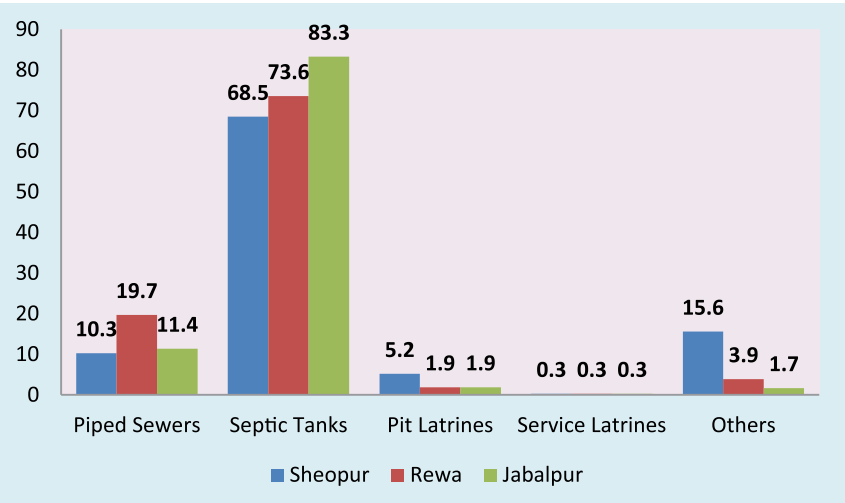


The proportion of households with toilets is the highest in the case of Jabalpur and lowest in the case of Sheopur as is to be expected given the increase in per capita income and per capita municipal expenditures with the size of the towns. The implementation of SBM since 2015 has resulted in more toilets being constructed as shown in Table 3 below.

Table 3: Individual Household Toilets Constructed under SBM in Study Towns 2017

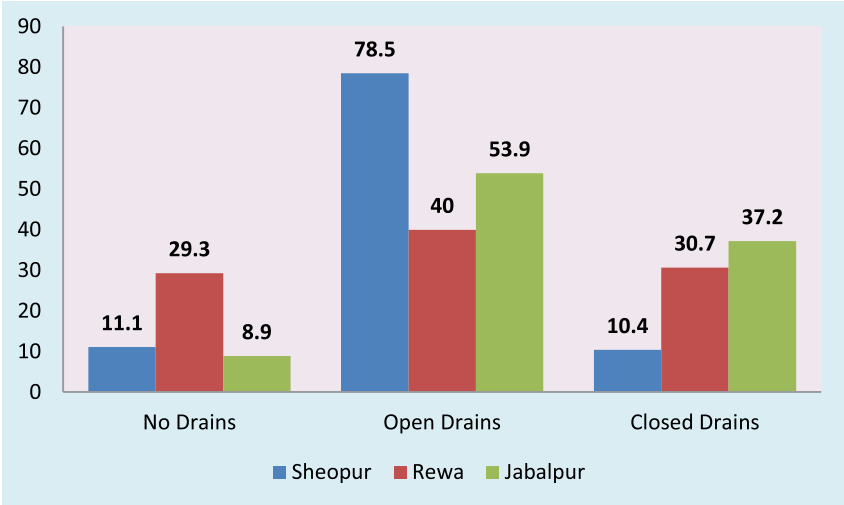
SBM	Constructed	To be Constructed
Sheopur	1000	570
Rewa	5239	46
Jabalpur	40000	400

Figure7: Disposal of Toilet Waste in Towns of M.P. in 2011 (%)



Septic tanks remain the most popular means of disposal of toilet waste, even in large cities like Jabalpur which also has some amount of sewerage. Thus, given the huge investments involved in laying sewers and constructing STPs, proper decentralised faecal sludge management will have to be the way ahead to ensure proper sanitation in the state.

Figure 8: Disposal of Grey Water in Towns of M.P. in 2011 (%)



Once again the situation in Jabalpur is better than the other towns except in the case of open drains which are less for Rewa than for Jabalpur mainly due to the fact that Rewa has a very high proportion of households without any drains.

The ground survey of septage management in the study towns was done by conducting group discussions with the residents and inspecting the septage management procedures in a selected sample of ten wards in each of the towns. These wards were selected in consultation with local NGO staff with experience of working in the slums in the city. Wards were chosen as follows -

- From the main congested areas of the city
- From those areas where there is a high concentration of Scheduled Castes and Scheduled Tribes residing in slums.

The slums had mostly single pit latrines which have been built recently with grants from the Municipal Corporation under the Swachch Bharat Mission. Many residents complained that despite their names being enrolled for toilets, they have not got the same. The built up houses in the colonies nearby had septic tanks which released their outflow into the open drains. Consequently these drains carry contaminated water which is a breeding ground for pigs. Due to the inadequacy of the pit latrines in some congested slums, there are community toilets but even in these the septic tanks have outflows going into the nala behind the toilets. The closed drains get clogged and they have to be cleaned from time to time. This cleaning is done by Dalit staff of the ULBs and like elsewhere in India they clean out the drains and leave the waste on the

road. The single pit latrines have been constructed poorly given the very low grant amount of Rs 12,000 per latrine so are likely to fall into disuse soon.

Septic tanks too have mostly been built in violation of the norms prescribed by the CPHEEO. In most cases these are actually big leach pits with open bottoms. However, over time the sludge at the bottom reduces the leaching velocity so there is some outflow into the open or closed drains. The outlets of these septic tanks or leach pits are below the level of the ground so these will have to be closed and the sewerage connected directly to the new sewer lines that are being laid in the towns of Rewa and Jabalpur. This is also necessary to ensure enough flow in the sewers. However, the householders with septic tanks or leach pits in both towns are reluctant to do this because of the costs involved in connecting their toilet lines with the sewers.

The Jabalpur Municipal Corporation has three big septic tank cleaning vehicles of 9,000 litre capacity each and 5 smaller ones of 4,500 litres capacity. The charge is a uniform Rs 1,505 per trip and according to the sanitation staff they attend to about 7 requests per day. However, the actual recovery of charges from septic tank cleaning as mentioned in the budget for the year 2015-16 was only Rs 2,66,160 which works out to one septic tank cleaning in two days. Even if the rate of tank cleaning may have gone up subsequently it is unlikely that it would be as high as 7 per day. Especially since there is also a private agency named Narmada Safai Samrakshak Enterprises which is Dalit owned and has three six thousand litre capacity vehicles which does only two cleanings per day on an average. This agency charges anything between Rs. 1,000 and Rs. 2,000 depending on the distance and the size of the septic tank to be cleaned. Apart from this there are still groups of Dalits who clean septic tanks by hand in the more congested areas where the cleaning vehicles are not able to go even though this is in clear violation of The Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013. Rewa Municipal Corporation has one septic tank cleaning vehicle and Sheopur Municipality has none. Thus, private Dalit groups clean the tanks in these towns using tractor tankers to cart away the septage from the septic tanks for emptying into the nalas without any treatment.

Jabalpur Municipal Corporation has three new septage treatment plants set up in Awadhpuri, Adhartal and Tilwara. Each of these has a daily capacity of 50,000 litres and has been set up by a firm called Mecotechnologies which has been given the contract for installation, operation and maintenance for five years for Rs 69 lakhs each from 2017 onwards. These treatment plants use the Moving Bed Biofilm Reactor technology which is economical both in terms of space and energy utilisation. The Jabalpur Municipal Corporation vehicles according to the sanitation staff are emptying their septage load into these

plants but the private operators are not doing so. They say that these plants are situated far away from their area of operation so unless the Corporation subsidises the transport cost they will continue to empty septage into the nalas. This high cost of transportation seems to be affecting the Jabalpur Municipal Corporation tankers. Also since they too are not emptying enough septage into the treatment plants to keep them running continuously so they are mostly lying idle.

All the three towns have some underground sewer lines in both Government and private residential colonies. Currently some of the sewerage from Zone 1 in Jabalpur is being carried through a sewer system to the sewerage treatment facility in Kathonda which consists of two facultative ponds of one km length and about 50 meters width each. The capacity of the plant is 50 million litres per day (MLD) but the actual flow that was observed was a few kilolitres per day only. The initial structure for dosing the wastewater with chemicals and distributing it to the facultative ponds was lying idle. Rewa has one STP of 12 MLD but it is not operational. More STPs and sewerage lines are under construction in Rewa under the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) but presently none of this sewerage is being treated and instead it is being emptied into nalas directly. Sheopur does not have any STPs so the whole of the sewerage is being released into the nalas untreated.

The polluted water from the open drains not only contaminates the surface water but also the ground water. Tests were carried out on various surface water and ground water sources in the study towns. The results of these tests are given in Table 4. The various parameters that have been tested are –

BOD – Biochemical Oxygen Demand,
TDS – Total Dissolved Solids,
TSS – Total Suspended Solids,
DO – Dissolved Oxygen,
TC – Total Coliform,
FC – Faecal Coliform,
FS – Faecal Streptococci,
AN – Ammoniacal Nitrogen,
TN – Total Nitrogen

Table 4: Results of Tests Conducted on Water Sources in the Study Towns

Town	Type of Water Source	Test Parameters								
		BOD mg/l	TDS mg/l	TSS mg/l	DO mg/l	TC	FC	FS	AN mg/l	TN mg/l
						Most Probably No /100 ml				
Sheopur	Open Well	2	140	12	5.5	TNTC*	TNTC	TNTC	1.5	4.5
	Borewell	1	240	8	8	Absent	Absent	Absent	1.5	7.5
	River	1	320	8	6	TNTC	TNTC	TNTC	1.5	12
	Nala	16	360	60	1	TNTC	TNTC	TNTC	1.5	3
Rewa	Open Well	1	880	8	5.2	TNTC	TNTC	TNTC	1.7	6.2
	Borewell	3	670	8	5.7	TNTC	TNTC	Absent	1.1	4.4
	River	2	150	14	5.4	TNTC	TNTC	TNTC	1.4	4.1
	Tank	8	100	10	5.1	TNTC	TNTC	Absent	0.3	4.7
	Nala	24	550	60	0	TNTC	TNTC	TNTC	12.3	29.4
Jabalpur	Open Well	1	210	8	0	TNTC	TNTC	TNTC	0	9.4
	Borewell	1	200	15	2.8	TNTC	TNTC	TNTC	0	5.4
	River	5	80	8	7.9	TNTC	TNTC	TNTC	0.3	4.6
	Tank	30	260	35	0	TNTC	TNTC	TNTC	1.4	20
	Nala	20	230	28	1	TNTC	TNTC	TNTC	0.3	4
Permissible Value for Class A Water Sources (IS:2296) except for TSS		2	500	20	>6	50	50	50	Absent	Absent
Permissible Value for Class C Water Sources (IS:2296) except for TSS		3	1500	40	>4	5000	5000	5000	Absent	Absent

* Too Numerous To Count

Even though the Bureau of Indian Standards has withdrawn IS:2296, this is the standard that is being adopted here to assess water quality as being more appropriate than the diluted standards prescribed by the MoEFCC given the serious impact on envrionmental and human health that such a diluted standard is having. Class A water is that which can be used for drinking without conventional treatment but with disinfection and Class C water is that which can be used for drinking with conventional treatment and disinfection. Clearly most of the water sources are polluted for class A water as shown by the values marked in red in the table above. Even as per the standards for Class C water, the coliform, streptococci, ammoniacal nitrogen and total nitrogen values are above the prescribed limits so most of the sources are polluted. This was despite the fact that the samples were collected during monsoon when greater flow in surface and ground water dilutes the pollution. The borewell water in Sheopur too was found to have ammoniacal nitrogen and total nitrogen.

Section IV

Planning for Wastewater Management

Planning for Wastewater Management

The Sheopur Development Master Plan 2021 (DTCPMP, 2007) identifies 13 wards out of the total 21 as having slums inhabited by 56 percent of the total population which are in need of infrastructure development. Even though the Master Plan acknowledges that there is a lack of proper sanitation and sewerage arrangements with most of the households using septic tanks and directing the outflow into drains, no plan is detailed for laying sewer lines and setting up an STP to treat the sewerage. The City Development Plan (CDP) prepared under the JNNURM (IDFC, 2011) estimates the total wastewater to be about 10.58 Million Litres per Day (MLD) by 2020 and 16.52 by 2035. The CDP proposes the laying of under ground sewers to take advantage of the slope of the town towards the north. Two gravity mains are proposed in the middle and in the east of the town and an interceptor sewer along the Seep River to the west of the the town. An STP is proposed north of the town on its periphery to treat the sewerage. There is no provision for septage management in this proposal as the overflow from the septic tanks are proposed to be connected to the sewers. However, there is a proposal for decentralised sewerage treatment for a cluster of households in the interim till a full fledged sewerage treatment system is in place.

The Rewa Town Plan 2021 (DTCPMP, 2010) has a brief paragraph that states that there is no sewerage system in the town and does not have any provisions for improvement of the sanitation situation. The City Development Plan prepared as part of the JNNURM (DMGC, 2011) has the following provisions -

1. The current wastewater generation is estimated at 30 MLD rising to 60 MLD by 2035.
2. Development of a sewerage network and STPs for treating the collected sewerage.
3. Intercept all drains flowing into the Beehar and Bichiya rivers and

direct their flow to the STPs for proper treatment along with river front development.

4. Use biochemical treatment technologies for STPs which require less land and less operation and maintenance costs.
5. Provide individual toilets for all households within five years.
6. Provide community toilets in all busy public locations and also congested slum areas where individual toilets may not be feasible and have these managed by communities with greater awareness and mobilisation.
7. Costs of wastewater collection and treatment should be met by a combination of the sale of treated water and the levying of adequate user charges.

The Jabalpur Town Plan 2021 (DTCPMP, 2009) says that in 2009 when it was prepared, the total sewerage and wastewater generated was 140 MLD but there was no sewerage system or treatment facility and all the wastewater was being discharged untreated into nallas and other water bodies. The town plan proposed the construction of three STPs at Karmeta (85 MLD), Kathonda (50 MLD) and Tilwara (35 MLD) for a total capacity of 170 MLD at a cost of Rs 227.5 crores. This was prepared by the Madhya Pradesh Public Health Engineering Department (MPPHED) but the details are not given in the plan document. The City Development Plan for Jabalpur prepared under the JNNURM has given the details of the earlier plan prepared by the MPPHED which are as shown in Table 5 below. Three STPs are to be constructed to treat the sewerage generated from the five zones which are to be conveyed to them through underground sewer lines.

Table 5: Details of Proposed Sewerage Treatment Plan for Jabalpur

Sl. No	STP Location	Sewerage Collection Zones	Capacity Required by 2024 (MLD)	Capacity Required by 2039 (MLD)
1.	Karmeta	Zone 1 which covers the central city area and currently empties into the Omti Nala and Zone 5 which covers the western part of the town.	70	85
2.	Kathonda	Zone 2 which covers the rainage in the northern and parts of the central area of the city and Zone 3 covers the Ranjhi area of the city to the north.	40	50
3.	Tilwara	Zone 4 which covers the area of the city south of the central ridge upto the Narmada River.	30	35
Total	STP Capacity		140	170

A plant at Kathonda of 50 MLD capacity has been constructed but sewerage lines have not been properly laid through the collection zones. Under the Smart City Proposal a revised plan is being implemented by constructing and connecting the sewers in Zones One and Five to the Kathonda STP.

It is noteworthy that there is no mention of on - site faecal sludge and septage management and wastewater treatment and recycling in any of the plans. Even though these plans predate the national and state policies of faecal sludge and septage managment which have made extensive provisions in this regard, nevertheless these plans are deficient because the CPHEEO guidelines with regard to wastewater management, which have been there for quite some time, too have not been followed so whatever sewerage and treatment capacity has been built is not performing well due to bad design and lack of operation and maintenance.

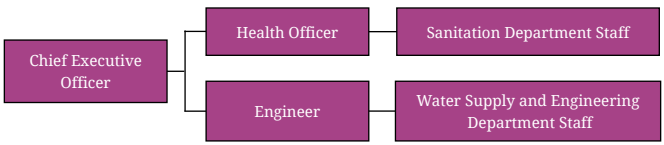
Section V

Staffing and Sanitation Services

Staffing of Sanitation Services

The Urban Local Bodies in the state are headed by a Chief Executive Officer who is assisted by a sanitation department headed by a health officer and an engineering department headed by an engineer to take care of water supply, maintenance of drains and sewers as shown in Figure 9 below.

Figure 9: Organogram of Urban Local Bodies Related to Sanitation



The staff strength of the Health and Sanitation Department of the studied towns is grossly inadequate. The sanctioned strength and the actual employment are given in Table 6 below. There is severe understaffing of the sanitation department which is affecting the provision of sanitation services, especially in the slum areas.

Table 6: Staffing of Health and Sanitation Department of Study Towns

Post	Jabalpur		Rewa		Sheopur	
	Sanc.	Act.	Sanc.	Act.	Sanc.	Act.
Chief Health Officer	1	0	–	–	–	-
Health Officer	2	1	1	0	-	-
Assistant Health Officer	8	2	3	0	1	0
Chief Sanitation Inspector	23	15	5	0	-	-
Sanitation Inspector	45	17	9	2	1	0
Assistant Sanitation Inspector	89	30	9	2	3	1
Sanitation Supervisor	150	40	31	8	3	2
Sanitation Workers (Permanent)	2256	1154	471	471	91	87
Sanitation Workers (Contractual)		440		287		242

Section VI

Review of Municipal Finances

Review of Municipal Finances

The overall finances of the three study towns have been summarised in Table 7 below.

Table 7: Overall Finances of Study Town ULBs from 2017-18 Budget Estimates

Item	Sheopur		Rewa		Jabalpur	
	Total (Rs) Lakhs)	Per Capita (Rs)	Total (Rs Lakhs)	Per Capita (Rs)	Total (Rs Lakhs)	Per Capita (Rs)
Revenue Receipts	2112.40	2669	8075.76	3106	60400.13	5135
Revenue Exp.	2112.12	2668	7246.73	2787	39008.81	3316
Revenue Surplus	0.28		829.23		21391.32	
Cap Receipts	3800.0	4801	33683.76	12955	45778.56	3892
Cap Expenditure	3800.0	4801	37250.68	14327	67133.77	5708
Cap Deficit	0		3566.92		21355.21	

Extrapolating from the analysis presented in a study by the Mckinsey Global Institute, the per capita revenue expenditure for Tier I Indian cities in 2017-18 was Rs 9,000. The average revenue expenditure on urban services in Indian cities was only 2% of that in the UK, 9% of that in South Africa and 13% of that in China (MGI, 2010). Similarly the per capita capital expenditure for Indian Tier 1 cities in 2017-18 was Rs 7,300. The capital expenditure on urban services in Indian cities was 4 percent of that in the UK, 13 percent of that in South Africa and 15 percent of that in China. Clearly even in the case of Jabalpur, which is a Tier 2 city, the per capita expenditures are way below the Indian average. Only in the case of Rewa is there a high per capita capital expenditure because of the heavy investments under AMRUT for the laying of sewerage lines.

The low levels of revenue mobilisation and the high dependence on State and Central Government grants makes the finances of the ULBs very unsustainable and they are not able to offer proper sanitation services. The actual user charges recovered and capital and revenue expenditures for 2015-16 for the water supply and sanitation (WSS) services of the Jabalpur Municipal Corporation provide on analysis a good idea of the lack of financial sustainability of these sectors. These are given in Table 8 below.

Table 8: WSS Receipts and Expenditures of Jabalpur Municipal Corporation 2015-16

Item	User Charges Recovered	Capital Expenditure (Rs Lakhs)	Revenue Expenditure (Rs Lakhs)			Under recovery of costs* (%)
			O&M	Salaries	Total	
Water Supply	2694.98	1440.62	4137.11	1225.53	5362.64	51.4
Sanitation	229.27	5252.58	1774.43	3826.46	5600.89	96.4

Source: Jabalpur Municipal Corporation
*Assuming Capital Expenditure is to be recovered in 10 years @ 5 % annual interest

Clearly, the Jabalpur Municipal Corporation is not recovering the costs of water supply and sanitation. Especially so in the case of the latter even though the standard of such services is very low and inadequate. The per capita sanitation cost in 2015 assuming a population of 12 lakhs for the JMC area was Rs 523. According to a study (Mathur et al, 2007), the per capita cost of providing standard sewerage services in 2004-05 prices was Rs 1,418 and that of providing solid waste management was Rs 253 for a total sanitation cost of Rs 1,671. Assuming a 6 percent annual inflation rate the standard cost of sanitation services in 2015 would be Rs 3,172. Thus, the current levels of expenditure on sanitation in JMC are way below the norm and the situation in Rewa and Sheopur is even worse.

Affordability Analysis of Sanitation Services

If the JMC were to recover even the current lower standard of sanitation costs which it is not doing, then assuming total number of surcharge paying households to be 1.6 lakhs in 2015 (70 percent of total households, as 30 percent live in slums and are too poor to pay charges), the per household sanitation charge per month would be Rs 327. The average urban monthly per capita consumer expenditure in the 66th round of the National Sample Survey Organisation survey for Madhya Pradesh in 2010-11 was Rs 1,666 (NSSO, 2011). Assuming a household of five persons gives average monthly household consumer expenditure in 2010-11 of Rs 8,330. Assuming an average annual consumer price inflation rate of 6% from 2010-11 to 2016 the average

monthly household consumer expenditure in 2015-16 will be Rs 11,147. Thus, the proportion of the cost recovery sanitation surcharge works out to 3 percent of the average monthly household expenditure which is an unacceptably high proportion. The proportion of households who had a monthly per capita consumer expenditure less than the average is 70 percent of whom the bottom 30 percent have been exempted as being too poor to pay. Thus, as much as 40 percent of the population would have to spend 3 percent or more of their monthly expenditure on sanitation which is not affordable by any means. This when the services are already grossly inadequate.

The budgeting has been done in a very unprofessional manner so considerable time had to be expended to rearrange the data for the above financial analysis. Despite the claim of the State Government that since 2007 the Madhya Pradesh Municipal Accounts Manual has introduced a computerised double entry accrual based system of accounting to properly track accounts and inventories and generate financial reports that can help in proper budgeting, in practice the accounts are still opaque (GoMP, 2014). Not surprisingly the administration cannot easily draw any conclusions for better financial performance from the budget exercise at present and instead this is done mechanically year after year. The above analysis shows that the finances of the ULBs in the study towns are unsustainable and inadequate so are adversely affecting the provision of services to the citizens. Especially so in the sanitation sphere and for poor people.

Section VII

Conclusions and Recommendations

Conclusions and Recommendations

The foregoing discussion has made it clear that the sanitation situation in urban areas in Madhya Pradesh is in severe crisis. The sanitation services being provided and the plans for the future are environmentally and financially unsustainable and lacking in equity. Given the fact that centralized sewerage collection and treatment is very expensive and ULBs do not have the capacity to generate resources to implement and maintain them, the policy of making one time investments through AMRUT to facilitate these will prove counter-productive in the long run and further aggravate the situation. Consequently, there is an urgent need to explore other sanitation systems for urban areas than the centralized ones being proposed.

Water Sensitive Urban Design

Sanitation systems have to be designed in tandem with water supply and storm water management systems since all three are very closely connected to each other. The concept of Water Sensitive Urban Design (WSUD) is defined as "an approach to urban planning and design that integrates the management of the total water cycle into the urban development process" (SASTORM, 2011). It includes:

1. Integrated management of groundwater, surface runoff (including stormwater), drinking water and wastewater to protect water related environmental, recreational and cultural values,
2. Storage, treatment and beneficial use of runoff,
3. Treatment and reuse of wastewater,
4. Using vegetation for treatment purposes, water efficient landscaping and enhancing biodiversity, and
5. Utilising water saving measures within and outside domestic, commercial, industrial and institutional premises to minimise requirements for drinking and non drinking water supplies.

Thus, by reusing stormwater through appropriate decentralised water harvesting techniques involving both surface and aquifer storage and the

treatment and reuse of wastewater, the need for expensive drainage and water supply systems is reduced considerably. The design of buildings is done in such a way so as to save on water use and increase water storage and reuse. In the process the environment is also conserved as extensive soil conservation and plantation activity is undertaken in the unbuilt environment. This approach can bring about substantial benefits at less cost compared to further investments in solutions that rely only on technological fixes for water supply and wastewater management problems. Moreover, decentralized solutions can be adopted by private parties who are financially capable of doing so on their own, thus considerably reducing the financial load on the ULBs. In the urban water management context this involves an optimal use of both groundwater and surface water sources and recharging, harvesting and reuse of storm and wastewater.

Recharging of Groundwater Aquifers

Extensive water recharging and wastewater treatment and reuse have to be explored for a sustainable hybrid ground cum surface water combination. There are already rules that all buildings of an area more than 140 sq. m. must have water recharging systems in place so that all the stormwater is filtered and recharged within these building premises in a decentralised manner (MP Govt., 2010). However, these rules are not being followed. The cost of installing a water recharge system is about 3 percent of the total building cost and it goes down proportionately as the size of the building increases, yet this is not being done.

The benefits in terms of obviating the need for extensive centralised storm water drainage systems and increasing the groundwater availability far outweigh these costs. Moreover, since these costs will be borne by the building owners themselves it is a progressive measure wherein those with better economic capacity are made to bear the costs directly without burdening the ULBs. The Central Groundwater Board has prepared a detailed artificial recharge master plan for the whole of the country so as to replenish the available groundwater storage capacity. The details of the measures to be adopted have been given by CGWB in 2016. If this plan were to be implemented then the availability of groundwater would be improved considerably. Moreover, many surface water bodies would be suitably replenished.

Treatment and Reuse of Wastewater

As with storm water it is much cheaper to treat wastewater and reuse or recharge it in a decentralised manner. The Dhas Gramin Vikas Kendra in Indore has installed such a decentralised system in its office premises in which the bathroom and kitchen wastewater is filtered through a soak pit and recharged into the ground with a BOD of less than 30 mg/litre which is the permissible

limit for discharge into the ground (Pillai, 2012). The toilet wastewater is first directed into a septic tank. This septic tank has an aerator installed in it that causes aerobic digestion of the waste to take place. Thus, the inlet water which has a BOD of about 500 mg/litre is treated by the aeration process resulting in a BOD of about 55 mg/litre of the water flowing out of the septic tank. This water is then filtered through a soak pit and the final water that seeps into the ground has a BOD within the permissible limit of 30 mg/litre. The installation cost of this system is less than 1 percent of the total building cost while the running cost of the aerator is only Rs 2 per 1000 litres per day of toilet sewerage. Moreover, due to the oxidation of sewerage through aeration there is no generation of sludge and foul smelling gases. Most importantly, the need for a centralised underground sewer system and sewerage treatment plants, which are expensive to construct and maintain, can be done away with. Over and above, all the wastewater which constitutes about 80% of the potable water supplied, is recharged into the ground enhancing the groundwater availability. The greater availability of groundwater will mean lesser use of electrical energy which in turn means the lesser production of greenhouse gases. Thus, this alternative system will also have a positive climate change mitigation impact. There is also the option of treating the wastewater a little more and re-using it for flushing of toilets and gardening which together constitute close to 47 percent of the domestic water use (CPHEEO, 1999). There are many other cost effective and environmentally sound decentralised treatment options, some of which have been detailed in the CPHEEO manual on sewerage and sewerage treatment (CPHEEO, 2012).

Equitable and Sustainable Sanitation Management

Storm water recharge, wastewater treatment and reuse done in a decentralised manner, is a much more sustainable alternative in financial, social and environmental terms. This kind of hybrid alternative system has also been recommended by a committee formed to recommend National Sustainable Habitat Standards for the Urban Water Supply and Sewerage sector under the National Mission for Sustainable Habitat (NMSH, 2011). Instead of relying on taxes, user charges and grants to fund hugely expensive centralised systems, this alternative system would put the onus on the more affluent citizens, corporations, private institutions and government institutions, who are all in possession of a considerable portion of urban land, to tackle their water supply and wastewater disposal needs in a decentralised manner leaving the ULBs to take care of the water supply and sanitation needs of the slum residents who are not in a position to bear these costs.

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Annexures

Annexure I
Septage Management Factsheet
Jabalpur

I. INTRODUCTION

1. **Location:** Jabalpur is the main town of the Mahakoshal region in the Eastern part of Madhya Pradesh located at 23^{0}10'N latitude and 79^{0}57'E longitude. It is situated 330 kms away from the capital city of Bhopal and is connected to it by road and rail. It is the headquarters of both the eponymous Division and District.
2. **Terrain, Geology and Climate:** The town is situated on the banks of the Narmada River which forms the southern boundary. The topography is undulating with low hills and is surrounded by the Kariapather hills to the North East, Sitapahar and Kandhari hills to the East and the Madanmahal hills to the Southwest. The soil is sandy clay and silt with gravelly variants in parts. The underlying rock structure is of granite and sandstone with some basaltic traps. The major groundwater bearing formations are sandstone and fractured granites. The premonsoon water level is about 2.5 m below ground level while the post monsoon water level is about 1.0 m below ground level.

   The climate is characterized by a hot summer and dryness except for the south west monsoon season. The normal annual rainfall is 1279 mm with 94% in the period from June to September. Thus, water for ground water recharge is available only during the south west monsoon period.
3. **Demography:** The population characteristics of Jabalpur town for all the 79 wards are given in Table 1 below.

Table 1: Demographic Characteristics of Jabalpur Municipal Corporation Area 2011

Area	Number of House-holds	Total Popu-lation	Male (%)	Female (%)	SC (%)	ST (%)	Lite-rate (%)	Male Lite-rate (%)	Female Lite-rate (%)	Wor-kers (%)	Male Wor-kers (%)	Female Wor-kers (%)
Jabalpur Municipal Cooporation	222613	1069292	51.7	48.3	14.3	4.2	87.4	90.8	83.7	36.2	53.3	18.0

Source: Census 2011

The decadal growth rate of population is 12.4 % which is very moderate and below the average population growth rate for the district of 14.5%. The proportion of Scheduled Tribes in the population is comparatively low while the literacy rate is quite high. There is a very high difference in the work participation rate among males and females with the former being three times that of the latter. The overall work participation rate is slightly higher at 36.2 percent as compared to the National rate of 35.3 percent. The population density in the Jabalpur Municipal Corporation Area spread over 129.2 sq. kms is 83 persons per hectare. The Jabalpur Development Plan 2021 specifies four different density areas for planning and development -

a. Low Density - 0 to 99 persons per hectare in the periphery
b. Low to Medium Density - 100 - 299 persons per hectare also in the periphery
c. Medium to High Density - 300 - 399 persons per hectare in the inner city areas
d. High Density - 400 or more persons per hectare in the city centre.

The wardwise population details for the wards with high concentration of SCs and STs are given in Table 2 below and the ward map of Jabalpur in Figure 1. The wards having a high proportion of Scheduled castes in excess of 20 percent have been marked in pink. The wards having a high proportion of STs in excess of 10 percent have been marked in blue and those with high concentrations of both SCs and STs have been marked in green.

Table 2: Wardwise Demographic Characteristics of Jabalpur Municipal Corporation Area 2011

Ward No.	Ward Name	No. of Hhds	Pop.	SC (%)	ST (%)
5	Sardar Patel	2255	11112	13.2	18.9
6	Indira Gandhi	2893	13093	24.4	6.8
7	Veer Savarkar	2154	10966	28.8	0.9
17	Rani Durgavati	2154	10922	23.3	3.1
19	Kamla Nehru	2333	11920	29.9	1.7
18	Shahid Gulab Singh	2339	11874	62.8	3.1
25	Mahatma Gandhi	3576	17642	21.1	1.8
29	Dr. Rammanohar Lohia	2367	11472	31.9	3.1
30	Pandit Deendayal	2516	11558	21.1	1.6
31	Rajiv Gandhi	2476	12404	30.1	4.2
46	Pandit Dwarka Prasad	2333	11322	18.9	10.1

Ward No.	Ward Name	No. of Hhds	Pop.	SC (%)	ST (%)
47	Seth Govind Das	2519	12035	26.3	10.6
48	Siddh Baba	4324	20562	30.6	15.6
68	Gokalpur	4697	20718	25.7	7.3
69	Chandrashekhar Azad	2808	14368	31.9	10.2
70	Lala Lajpat Rai	2637	12537	21.1	9.7
65	Subhashchandra Banerjee	2131	9661	20.6	6.0
53	Maharshi Arvind	3195	14301	11.2	11.3
33	Swami Dayanand	2575	12971	23.3	4.3
34	Bhavaniprasad Tiwari	3039	14725	32.9	3.4
28	Jaiprakash Narayan	3413	16436	53.6	1.6
38	Pandit Motilal Nehru	3811	22265	24.5	0.0
74	New	290	1333	27.7	18.1
75	New	111	583	40.8	56.9

Source: Census 2011, Jabalpur Municipal Corporation, 2011

Figure 1: Ward Map of Jabalpur

There is a considerable area towards the Northeast of the city which constitutes the army cantonment and is governed by the Cantonment Board. Its 2011

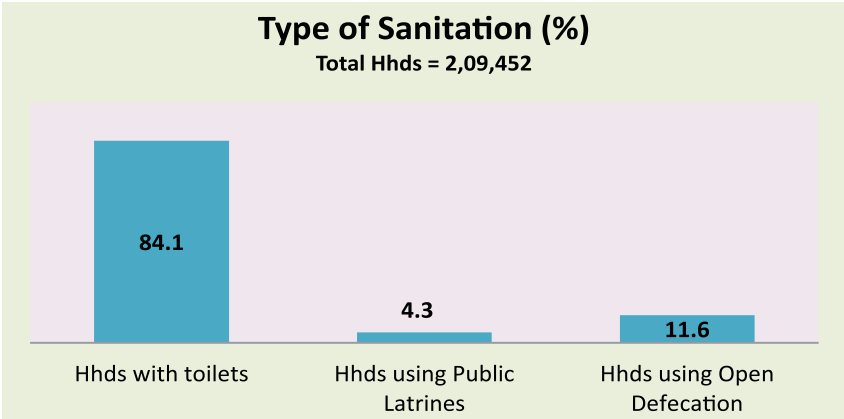
population was also quite large at 72261. However, this area is not part of the present study. The city centre shown in white is highly congested some of the ponds in this area have been filled in and reclaimed for development.

II. DRAINAGE AND SANITATION

1. **Drainage:** There are lined open drains in the city which cover the whole of the municipal area. These drains empty into nalas which flow on both sides of the central ridge running through the city. The nalas on the south of the ridge empty into the Narmada River downstream of the city while the nalas north of the ridge empty into the Pariyat River which in turn joins the Hiran river which is a tributary of the Narmada River. There are also a number of ponds in the city which too are connected to these nalas and drains. Both the storm water and the wastewater are drained by these drains and nalas. Consequently, during monsoons, the inner city areas get inundated by a mixture of rain and wastewater.
2. **Sanitation Situation:** There is a minimal sewerage system in the northern areas of the city in Zone 1 covering about 11 percent of the households which is connected to a sewerage treatment plant at Kathonda in the northern part of the city but this STP is not working properly as will be detailed later. A project for laying of sewer lines in zones II to V along the Omti Nala in the city centre which is to be covered for non-motorised transport has been sanctioned under the Smart City Programme but work has not started yet. Thus, in some houses and even in the newer colonies being developed, sewerage is being released directly into the open drains whereas in most houses this is directed into septic tanks and the outflow is emptied into the open drains. There are some private and Government residential colonies in which there are sewerage lines but these are emptied into one of the many drains. There is no data with the Municipal Corporation on how much of the sewerage is being discharged into open drains and how much of it is being directed into septic tanks.

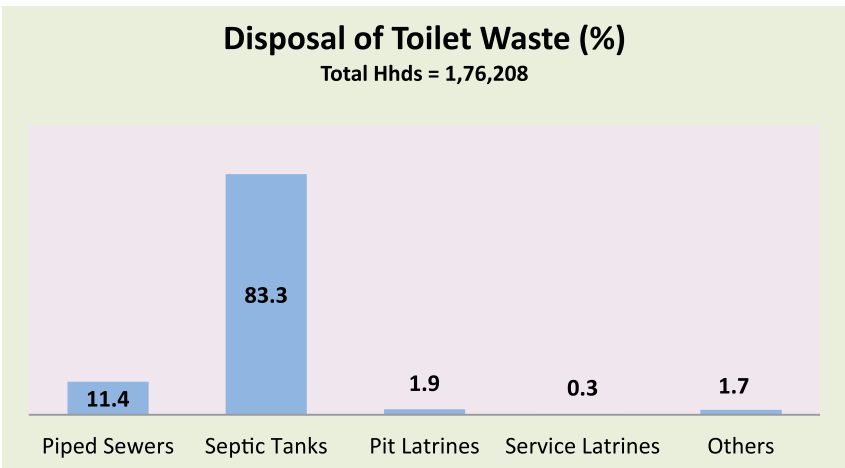
3. The Census 2011 data on sanitation in the town are given in Figure 2 below.

Figure 2. Type of Sanitation Available in Jabalpur Municipal Corporation Area 2011



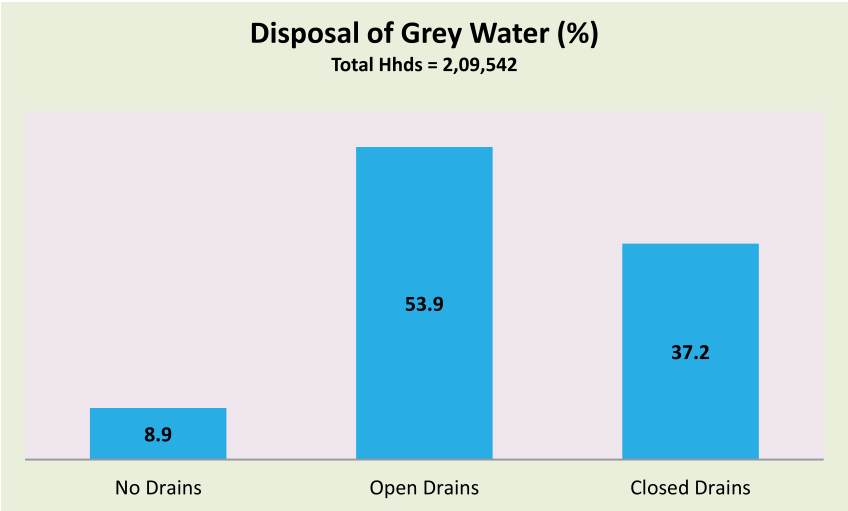
The proportion of open defecation has gone down to some extent due to the implementation of the Swachh Bharat Mission under which 40,000 single leach pit latrines have been constructed in 360 slums of the city. However, due to poor construction most of these latrines are not being used. Many slums are situated on hillocks so the supply of extra water for latrine use and then the carrying away of wastewater is a problem. The census 2011 data on disposal of toilet waste are given in Figure 3 below.

Figure3: Disposal of Toilet Waste in Jabalpur Municipal Corporation Area 2011



Most of the toilet waste is disposed into septic tanks and then the outflow goes into open drains and as mentioned earlier the little that is going into sewers is also not being treated properly. The Census 2011 data on disposal of grey water is given in Figure 4 below.

Figure 4: Disposal of Grey Water in Jabalpur Municipal Corporation Area 2011



Grey water for most of the city is carried away by open and closed drains which empty into nalas. The slums located on the hills do not have any drains. The bigger houses on the hills have improvised means of emptying their grey water through pipes to the open drains running below. **Jabalpur is ranked 21st in Swachh Sarvekshan 2017.**

III. SEPTAGE MANAGEMENT

The ground survey of septage management was done by conducting group discussions with the residents and inspecting the septage management procedures in a selected sample of ten wards. These wards were selected in consultation with the help of a local expert in sanitation, Mr Netraj Parihar, who was earlier involved in a Wateraid project for sanitation improvement in the city. Wards were chosen in the main congested areas of the town and from those areas where there is a high concentration of Scheduled Castes and Scheduled Tribes residing in slums. Discussions were held with people living in slums and also in regularised built up colonies.

The slums had mostly single pit latrines which had been built recently with grants from the municipal corporation under the Swachh Bharat Mission.

Many residents complained that despite their names having been enrolled for toilets, they had not got the same. The built up houses in the colonies nearby had septic tanks which released their outflow into the open drains. Due to the inadequacy of the pit latrines in some slums there are community toilets but even in these the septic tanks have outflows going into the nalas. The closed drains in the city centre get clogged and they have to be cleaned from time to time. This cleaning is done by Dalit staff of the Jabalpur Municipal Corporation and like elsewhere in India they clean out the drains and leave the waste on the road.

The Jabalpur Municipal Corporation has three big septic tank cleaning vehicles of 9,000 litre capacity each and 5 smaller ones of 4500 litres capacity. The charge is a uniform Rs 1,505 per trip and there are on an average 7 requests per day. There is also a private agency named Narmada Safai Samrakshak Enterprises which is Dalit owned and has three six thousand litre capacity vehicles. This agency charges anything between Rs 1,000 and Rs 2000 depending on the distance and the size of the septic tank to be cleaned. Earlier the septage from the septic tanks were being emptied into the nalas but now three septage treatment plants have been set up in Awadhpuri, Adhartal and Tilwara. Each of these has a daily capacity of 50,000 litres and has been set up by a firm called Mecotechnologies which has been given the contract for installation, operation and maintenance for five years for Rs 69 lakhs from 2017 onwards. These treatment plants use the Moving Bed Biofilm Reactor technology which is economical both in terms of space and energy utilisation. The Jabalpur Municipal Corporation vehicles empty their load into these plants but the private operators are not doing so though the claim of 7 tanks being emptied by the JMC per day is belied by the actual income from such emptying as given in the budget data. They are saying that these plants are far away from their area of operation so unless the transport cost is subsidised, they will continue to empty septage into the nalas.

IV. SEWERAGE MANAGEMENT

Currently some of the sewerage from Zone 1 is being carried through a sewer system to the sewerage treatment facility in Kathonda which consists of two facultative ponds of one km length and about 50 meters width each. The capacity of the plant is 50 million litres (MLD) per day but the actual flow that was observed was a few kilolitres per day only. The initial structure for distributing the wastewater to the facultative ponds was lying idle. A tender for Rs 1.95 crores for operation and maintenance of this plant for five years has now been floated so as to treat the wastewater from zone I but it is yet to be awarded. There is a much smaller sewerage treatment plant at Gwari Ghat on the banks of the Narmada to treat the wastewater being generated near the Ghat. This has a capacity of only 150 kilolitres per day and has been

installed and is being operated by the Jal Shree Corporation of Pune using the fluidised aerobic bio-reactor technology which has a treatment cost of Rs. 20 per kilolitre.

V. WASTEWATER QUALITY

The polluted water from the open drains and the septage not only contaminates the surface water but also the ground water. Tests were carried out on various surface water and ground water sources and the results are given in Table 3. The various parameters that have been tested are –

BOD – Biochemical Oxygen Demand, TDS – Total Dissolved Solids, TSS – Total Suspended Solids, DO – Dissolved Oxygen, TC – Total Coliform, FC – Faecal Coliform, FS – Faecal Streptococci, AN – Ammoniacal Nitrogen, TN – Total Nitrogen

Table 3: Test Results of Water

Test	BOD mg/l	TDS mg/l	TSS mg/l	DO mg/l	TC	FC	FS	AN mg/l	TN mg/l
					Most Probably No/100 ml				
Gorakhpur Open Well	1	210	8	0	TNTC*	TNTC	TNTC	0	9.4
Avadhpuri Borewell	1	200	15	2.8	TNTC	TNTC	TNTC	0	5.4
Rani Tal Pond	30	260	35	0	TNTC	TNTC	TNTC	1.4	20
Robertson Lake	50	140	50	0.9	TNTC	TNTC	TNTC	0.6	19.4
Khandari Nala	1	200	15	2.8	TNTC	TNTC	TNTC	0	5.4
Omti Nala	20	230	28	1	TNTC	TNTC	TNTC	0.3	4
Narmada River	5	80	8	7.9	TNTC	TNTC	TNTC	0.3	4.6
Permissible Value (IS:2296)	3	500	20	>5	50	50	50	Absent	Absent

*Too Numerous to Count

The water samples were collected during the monsoon season when it was raining, so there was a considerable flow in the Khandari and Omti Nalas and the Narmada River from rainfall runoff and ground water inflow which diluted the contamination due to the wastewater flowing into these drainages. Nevertheless, the surface and ground water was heavily polluted with very high values away from the permissible limits for most of the parameters.

VI. STAFFING OF SANITATION DEPARTMENT OF JABALPUR MUNICIPAL CORPORATION

The staff strength of the Health and Sanitation Department of the Jabalpur Municipal Corporation is given in Table 4 below.

Table 4: Staffing of Health and Sanitation Department of Jabalpur Municipal Corporation

Post	Sanctioned	Actual
Chief Health Officer	1	0
Health Officer	2	1
Assistant Health Officer	8	2
Chief Sanitation Inspector	23	15
Sanitation Inspector	45	17
Assistant Sanitation Inspector	89	30
Sanitation Supervisor	150	40
Sanitation Workers (Permanent)	2256	1154
Sanitation Workers (Contractual)		440

Source Jabalpur Municipal Corporation

Clearly there is a very high rate of understaffing in the corporation with less than half of the sanctioned posts having been filled. The sanitation work of 38 of the 79 wards has been outsourced to a contractor who also collects the solid waste from all the wards and transports it to the landfill at Kathonda. As mentioned earlier the sanitation work is not being done properly as not only are the drain sludge being deposited on the roads, due to lack of adequate door to door collection there is considerable amount of waste on the roads. There is also a waste to energy incineration plant in Kathonda but it is not in operation because it is not getting segregated dry waste that it requires.

VII. REVIEW OF MUNICIPAL FINANCES

The overall finances of the Jabalpur Municipal Corporation 2017-18 are given in Table 5 below.

Table 5: Overall Finances of Jabalpur Municipal Corporation 2015-16 to 2017-18 (Rs Lakhs)

Item	2015-16 Estimates	2015-16 Actuals	2015-16 Shortfall of Act. to Est. (%)	2016-17 Estimates	2017-18 Estimates	Per Capita for 2017-18* (Rs)
Revenue Receipts	38808.89	27498.87	29.1	48622.76	60400.13	5135
Revenue Expenditure	29802.16	24230.96	18.7	36349.74	39008.81	3316
Revenue Surplus	9006.73	3267.91	10.4	12273.02	21391.32	
Cap Receipts	25459.35	19511.24	23.4	31582.52	45778.56	3892
Cap Expenditure	34453.20	13759.21	60.1	43782.25	67133.77	5708
Cap Deficit	8993.85	-5752.03		12199.73	21355.21	

Source: Jabalpur Municipal Corporation

*Calculated by assuming a cumulative population growth rate of 10% from 2011-2017 There was a higher budget estimate for Revenue Receipts in 2015-16 with the actual receipts falling short by 29.1 percent. Nevertheless the estimates for 2016-17 and 2017-18 have still been kept unrealistically high. There is a shortfall of 18.7 percent in revenue expenditure too for 2015-16 resulting in a shortfall in revenue surplus of 10.4 percent. The Capital Receipt for 2015-16 shows a shortfall of 23.4 percent while for Capital Expenditure the shortfall is as high as 60.1 percent resulting in a capital surplus instead of a deficit. The per capita receipts and expenditures are low in comparison to what it should be for a city like Jabalpur and this is reflected in the poor quality of infrastructure. A break up of the revenue receipts is given in Table 6.

Table 6: Revenue Receipts of Jabalpur Municipal Corporation 2015-16 to 2017-18 (Rs Lakhs)

Item	2015-16 Estimates	2015-16 Actuals	2015-16 Shortfall of Act. to Est. (%)	2016-17 Estimates	2017-18 Estimates
Taxes	10809.50	5357.02	50.4	11541.43	15473.50
Leases and Rentals	877.27	703.80	19.8	984.02	1124.67
Licences, Permissions & Cesses	8849.30	5330.08	39.8	17212.16	24488.21
Interest	115.81	0	100.0	126.15	126.15
Octroi and other Compensation	15500.00	14922.43	3.7	15854.76	15850.27
State and Central Govt. Grants	2011.02	949.14	52.8	1876.02	2231.01
Others	645.99	236.40	63.4	1028.22	1106.32
Total	**38808.89**	**27498.87**	**29.1**	**48622.76**	**60400.13**

Source: Jabalpur Municipal Corporation

There is a substantial shortfall of 50.4 percent in the actual amount of Taxes collected for 2015-16 but yet the estimates for taxes for 2016-17 and 2017-18 have further increased regardless of this actual shortfall. Among taxes, property taxes constituted the major component. In 2015-16 the actual collection was Rs 3,111 lakhs but this is a huge shortfall of 58 percent from the estimate for 2015-16 of 7,375 lakhs. What is of major concern is that property tax constituted just 11 percent of the total actual revenue receipts for 2015-16 when it should be at least 25 percent as mandated by the guidelines for urban local bodies that had been prescribed by the Jawaharlal Nehru Urban Renewal Mission. The actual per capita property tax collection in 2015-16 was a dismal Rs 265 when it should be at least Rs 500 as per the guidelines of the JNNURM. The revenue expenditure details are given in Table 7.

Table 7: Revenue Expenditure of Jabalpur Municipal Corporation 2015-16 to 2017-18

Item	2015-16 Estimates (Rs Lakhs)	2015-16 Actuals (Rs Lakhs)	2015-16 Shortfall of Act. to Est. (%)	2016-17 Estimates (Rs Lakhs)	2017-18 Estimates (Rs Lakhs)
Establishment	12494.21	11506.04	7.9	13669.72	16039.22
Administration	1478.38	1268.49	14.2	1719.48	1874.96
Operation & Maintenance	13827.55	9569.16	30.8	19059.52	19194.61
Interest	2002.02	1887.27	5.7	1901.02	1900.02
Total	**29802.16**	**24230.96**	**18.7**	**36349.74**	**39008.81**

Source: Jabalpur Municipal Corporation

There is a fairly high shortfall of 30.8 percent in the actual O&M expenditures for 2015-16 from the estimates followed by the 7.9 percent shortfall in the establishment expenditures indicating that there is understaffing of the Jabalpur Municipal Corporation accompanied by poor operation and maintenance. The capital receipts consist of loans from organisations like ADB and HUDCO and grants from the Central and State Governments as shown in Table 8 below. As mentioned earlier for 2015-16 the JMC was not able to spend all the capital amount received and yet the receipts and grants have been increased in the estimates for 2016-17 and 2017-18.

Table 8: Capital Receipts of Jabalpur Municipal Corporation 2015-16 to 2017-18

Item	2015-16 Estimates (Rs Lakhs)	2015-16 Actuals (Rs Lakhs)	2015-16 Shortfall of Act. to Est. (%)	2016-17 Estimates (Rs Lakhs)	2017-18 Estimates (Rs Lakhs)
State Govt. Grants	8752.13	4931.88	43.6	5445.22	13978.07
Central Govt. Grants	2500.35	6093.23	-143.7	11797.01	16163.01
Loans	12405.01	7633.28	38.5	14205.00	14200.00
Others	1801.86	852.85	52.7	135.29	1437.48
Total	**25459.35**	**19511.24**	**23.4**	**31582.52**	**45778.56**

Source: Jabalpur Municipal Corporation

There was a substantial increase in actual disbursement of Central Government Grants over the estimates for 2015-16 but this was not enough to cover the

shortfalls in State Government Grants, loans and other sources so overall there is a shortfall.

The breakup of the Capital Expenditure is shown in Table 9 below.

Table 9: Capital Expenditure of Jabalpur Municipal Corporation 2015-16 to 2017-18

Item	2015-16 Estimates (Rs Lakhs)	2015-16 Actuals (Rs Lakhs)	2015-16 Shortfall of Act. to Est. (%)	2016-17 Estimates (Rs Lakhs)	2017-18 Estimates (Rs Lakhs)
Water Supply	1125.71	1440.62	-28.0	7680.00	8988.00
Sanitation	15489.02	5252.58	66.1	13159.01	13776.00
Slum Development	5146.90	2532.08	50.8	7494.50	8879.15
Other Infrastructure	7640.51	14509.26	-89.9	6641.23	5990.66
Loan Repayment	400.02	496.42	-24.1	1375.00	1375.00
Total	**29802.16**	**24230.96**	**18.7**	**36349.74**	**39008.81**

Source: Jabalpur Municipal Corporation

There is an increase in the actual capital expenditures in water supply, other infrastructure and loan repayment for the year 2015-16 over the estimates but these are not enough to compensate for the huge shortfalls in expenditure in sanitation and slum development so overall there is a shortfall in capital expenditure.

Finally, it would be worthwhile to look more closely at the actual revenue receipts and capital and revenue expenditures for 2015-16 for the water supply and sanitation (WSS) sectors to get an idea of the financial sustainability of these sectors. These are given in Table 10 below.

Table 10: WSS Receipts and Expenditures of Jabalpur Municipal Corporation 2015-16

Item	Revenue Receipts (Rs Lakhs)	Capital Expend-iture (Rs Lakhs)	Revenue Expenditure (Rs Lakhs)			Under Recovery of costs* (%)
			O&M	Salaries	Total	
Water Supply	2694.98	1440.62	4137.11	1225.53	5362.64	51.4
Sanitation	229.27	5252.58	1774.43	3826.46	5600.89	96.4

Source: Jabalpur Municipal Corporation

*Assuming Capital Expenditure is to be Recovered in Ten years @ 5 % annual interest

Affordability Analysis of Sanitation Services

The Jabalpur Municipal Corporation is not recovering the costs of water supply and sanitation and especially so in the case of the latter. If the JMC were to recover the sanitation costs, then assuming total number of surcharge paying households to be 1.6 lakhs in 2015 (70 percent of total households, as 30 percent live in slums and are too poor to pay charges), the per household sanitation charge per month would be Rs 327. The Average urban monthly per capita consumer expenditure in the 66th round of the National Sample Survey Organisation survey for Madhya Pradesh in 2010-11 was Rs 1666 (NSSO, 2011). Assuming a household of five persons this gives an average monthly household consumer expenditure in 2010-11 of Rs 8330. Assuming an average annual consumer price inflation rate of 6% from 2010-11 to 2016 the average monthly household consumer expenditure in 2015-16 will be Rs 11147. Thus, the proportion of the cost recovery sanitation surcharge works out to 3 percent of the average monthly household expenditure which is an unacceptably high proportion. The proportion of households who had a monthly per capita consumer expenditure less than the average is 70 percent of whom the bottom 30 percent have been exempted as being too poor to pay. Thus, as much as 40 percent of the population would have to spend 3 percent or more of their monthly expenditure on sanitation which is not affordable by any means. This, when the services are grossly inadequate.

The budgeting has been done in a very unprofessional manner so considerable time has had to be expended to collate the data for the above financial analysis. Not surprisingly the administration cannot easily draw any conclusions for better financial performance from the budget exercise and this is done mechanically year after year. The above analysis shows that the finances of the JMC are unsustainable and inadequate.

VIII. CONCLUSIONS

The sanitation situation with respect to faecal sludge and septage management in the town of Jabalpur is currently in a sorry state with inadequate provision of services. The setting up of septage treatment plants has led to some improvement. The tests carried out on water samples clearly indicate that both the surface water and ground water are contaminated. The situation may improve further with the implementation of the sewerage project but given the very precarious finances of the Jabalpur Municipal Corporation it is unlikely that the new system will be properly maintained or even operationalised. The state of finances also precludes equity for the poor.

Septage Management in **Jabalpur**

I. INTRODUCTION

The general information about the city of Jabalpur is as follows -

1. **Location:** Jabalpur is the main town of the Mahakoshal region in the Eastern part of Madhya Pradesh located at 23^{0}10'N latitude and 79^{0}57'E longitude. It is situated 330 kms away from the capital city of Bhopal and is connected to it by road and rail. It is the headquarters of both the eponymous Division and District.
2. **Terrain, Geology and Climate:** The town is situated on the banks of the Narmada River which forms the southern boundary. The topography is undulating with low hills and is surrounded by the Kariapather hills to the North East, Sitapahar and Kandhari hills to the East and the Madanmahal hills to the Southwest. The soil is sandy clay and silt with gravelly variants in parts. The underlying rock structure is of granite and sandstone with some basaltic traps. The major groundwater bearing formations are sandstone and fractured granites. The premonsoon water level is about 2.5 m below ground level while the post monsoon water level is about 1.0 m below ground level.

   The climate is characterized by a hot summer and dryness except for the south west monsoon season. The normal annual rainfall is 1279 mm with 94% in the period from June to September. Thus, water for ground water recharge is available only during the south west monsoon period.
3. **Demography:** The population characteristics of Jabalpur town for all the 79 wards are given in Table 1 below.

Table 1: Demographic Characteristics of Jabalpur Municipal Corporation Area 2011

Area	Number of House-holds	Total Popu-lation	Male (%)	Female (%)	SC (%)	ST (%)	Lite-rate (%)	Male Lite-rate (%)	Female Lite-rate (%)	Wor-kers (%)	Male Wor-kers (%)	Female Wor-kers (%)
Jabalpur Municipal Cooporation	222613	1069292	51.7	48.3	14.3	4.2	87.4	90.8	83.7	36.2	53.3	18.0

Source: Census 2011

The decadal growth rate of population is 12.4 % which is very moderate and below the average population growth rate for the district of 14.5%. The proportion of Scheduled Tribes in the population is comparatively low

while the literacy rate is quite high. There is a very high difference in the work participation rate among males and females with the former being three times that of the latter. The overall work participation rate is slightly higher at 36.2 percent as compared to the National rate of 35.3 percent. The population density in the Jabalpur Municipal Corporation Area spread over 129.2 sq. kms is 83 persons per hectare. The Jabalpur Development Plan 2021 specifies four different density areas for planning and development -

a. Low Density - 0 to 99 persons per hectare in the periphery
b. Low to Medium Density - 100 - 299 persons per hectare also in the periphery
c. Medium to High Density - 300 - 399 persons per hectare in the inner city areas
d. High Density - 400 or more persons per hectare in the city centre.

The wardwise population details are given in Table 2 below and the ward map of Jabalpur in Figure 1. The wards having a high proportion of Scheduled castes in excess of 20 percent have been marked in pink. The wards having a high proportion of Scheduled Tribes in excess of 10 percent have been marked in blue while the wards having high concentrations of both Scheduled Castes and Scheduled Tribes have been marked in green. Three wards have a high concentration of Scheduled Tribes. Sixteen wards have a high concentration of Scheduled Castes. Five wards have a high concentration of both Scheduled Castes and Scheduled Tribes.

Table 2: Wardwise Demographic Characteristics of Jabalpur Municipal Corporation Area 2011

Zone No. & Name	Ward No.	Ward Name	No. of Hhds	Pop.	SC (%)	ST (%)
Zone 1 Gadha Bazaar	1	Gadha	2722	12306	4.3	5.9
	3	Tripuri	2881	12907	4.5	1.6
	5	Sardar Patel	2255	11112	13.2	18.9
	6	Indira Gandhi	2893	13093	24.4	6.8
	16	Maharana Pratap	1617	8890	12.2	0.5
	71	New	892	3928	3.2	5.8
Zone 2 Kachhpura	2	Swami Virendrapuri	2671	11834	3.4	2.7
	7	Veer Savarkar	2154	10966	28.8	0.9
	15	Madan Mahal	1829	8816	4.6	1.4
	17	Rani Durgavati	2154	10922	23.3	3.1
	19	Kamla Nehru	2333	11920	29.9	1.7
	21	Swami Vivekananda	1502	7671	4.5	0.2

Zone No. & Name	Ward No.	Ward Name	No. of Hhds	Pop.	SC (%)	ST (%)
Zone 3 Rampur	4	Shankar Shah	1734	9158	0.9	0.5
	8	Gwarighat	1736	8683	8.0	0.4
	9	Baburao Paranjpe	1894	8039	3.2	1.4
	11	Giriraj Kishore Kapur	5938	26114	6.1	3.4
	18	Shahid Gulab Singh	2339	11874	62.8	3.1
Zone 4 Chhoti Line Phatak	10	Gupteshwar	2649	12073	11.1	7.0
	12	George D'Silva	4676	21910	7.0	1.4
	13	Banarasidas Bhanot	3221	14585	9.4	4.6
	14	Narsingh	2033	10059	7.6	0.7
Zone 5 Sanjay Gandhi Market	20	Kasturba Gandhi Market	1728	8600	2.6	0.0
	22	Jawaharganj	1852	8802	3.6	0.7
	25	Mahatma Gandhi	3576	17642	21.1	1.8
Zone 6 Regional Bus Stand	26	Govind Ballabh Pant	2417	12674	4.9	0.7
	29	Dr. Rammanohar Lohia	2367	11472	31.9	3.1
	30	Pandit Deendayal	2516	11558	21.1	1.6
	31	Rajiv Gandhi	2476	12404	30.1	4.2
	37	Rajendra Prasad	4631	26537	3.1	0.0
	37	Rajendra Prasad	4631	26537	3.1	0.0
Zone 7 Adhaartaal	42	Subhashchandra Bose	2899	13501	3.2	1.6
	56	Shahid Abdul Hamid	3493	15075	11.3	4.1
	57	Maharshi Mahesh Yogi	3419	16000	8.2	2.3
	60	Nirmal Chandra Jain	3177	13795	4.3	2.6
	61	Diwan Adharsingh	3634	16258	12.6	5.5
Zone 8 Bhan Talaiya	24	Hanuman Tal	6342	30453	16.0	4.2
	36	Moulana Abdul Kalam	2879	14486	7.0	1.9
	41	Sanjay Gandhi	4777	24587	5.2	1.5
	45	Sheetal Mai	3081	14851	14.5	9.6
	49	Lal Bahadur Shastri	3235	15434	14.7	3.3
	50	Thakkargram	2332	10026	9.9	4.8
	51	Rabindranath Tagore	2211	9129	6.1	3.7
	55	Khermai	5651	25946	12.2	3.7
	58	Dr. Sarvepalli Radhakrishnan	3641	17707	19.4	3.0
	59	Shahid Ashfaqulla	4377	19525	12.8	7.4

Zone No. & Name	Ward No.	Ward Name	No. of Hhds	Pop.	SC (%)	ST (%)
Zone 9 Lalmati	44	Acharya Vinoba Bhave	2554	11716	4.8	5.1
	46	Pandit Dwarka Prasad	2333	11322	18.9	10.1
	47	Seth Govind Das	2519	12035	26.3	10.6
	48	Siddh Baba	4324	20562	30.6	15.6
Zone 10 Ranjhi	62	Dr. Bhimrao	4384	20074	11.0	4.4
	63	Shahid Bhagat Singh	4174	17444	9.1	4.8
	64	Maharshi Sudarshan	6130	27693	18.8	6.3
	68	Gokalpur	4697	20718	25.7	7.3
	69	Chandrashekhar Azad	2808	14368	31.9	10.2
	70	Lala Lajpat Rai	2637	12537	21.1	9.7
Zone 11 Gokuldas Dharmashala	43	Shyamaprasad Mukherjee	3357	15961	8.3	8.3
	54	Jawarlal Nehru	4060	18375	9.2	3.4
	65	Subhashchandra Banerjee	2131	9661	20.6	6.0
	66	Rani Lakshmibai	5061	23384	16.1	5.2
	67	Veerangana Avantibai	3323	15216	12.8	6.6
	79	New				
Zone 12 Ghantaghar	23	Lokmanya	2359	11404	1.5	0.5
	52	Madanmohan Malviya	2852	12782	14.3	2.9
	53	Maharshi Arvind	3195	14301	11.2	11.3
Zone 13 Headquarters	32	Subhadrakumari Chouhan	2590	13181	14.9	2.3
	33	Swami Dayanand	2575	12971	23.3	4.3
	34	Bhavaniprasad Tiwari	3039	14725	32.9	3.4
Zone 14 Vijaynagar (Madhotal)	27	Cherital	2326	13567	3.6	0.1
	28	Jaiprakash Narayan	3413	16436	53.6	1.6
	35	Maharaja Agrasen	5765	29814	7.8	2.2
	38	Pandit Motilal Nehru	3811	22265	24.5	0.0
	40	Dr. Zakir Hussain	3022	19087	0.0	0.0
	39	Chittaranjan	2261	14532	0.1	0.0

Zone No. & Name	Ward No.	Ward Name	No. of Hhds	Pop.	SC (%)	ST (%)
Zone 15 Suhagi	72	New	825	3749	14.7	9.2
	73	New	441	2283	17.4	7.8
	74	New	290	1333	27.7	18.1
	75	New	111	583	40.8	56.9
	76	New	412	1891	17.2	9.2
	77	New				
	78	New				

Source: Census 2011, Jabalpur Municipal Corporation, 2011

There is a considerable area towards the Northeast of the city which constitutes the army cantonment and is governed by the Cantonment Board. Its 2011 population was also quite large at 72,261. However, this area is not part of the present study. The city centre shown in white in the ward map below is highly congested some of the ponds in this area, the most prominent being the Madotal have been filled in and reclaimed for development.

Figure 1: Ward Map of Jabalpur

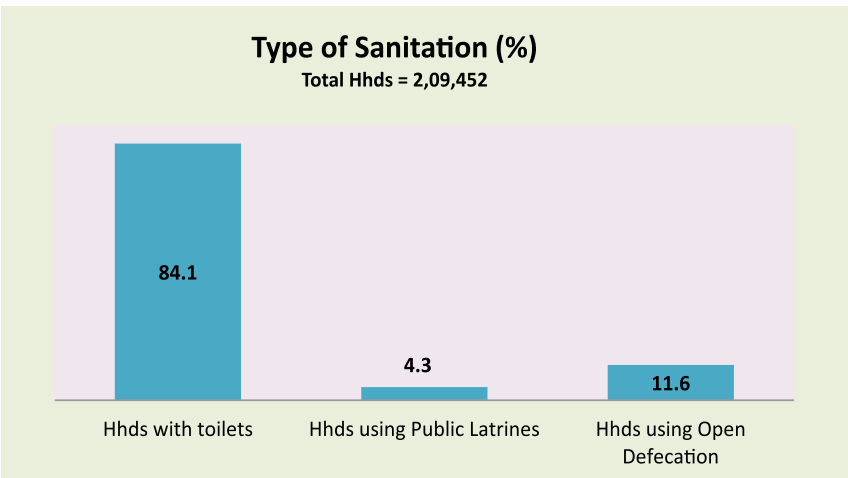
4. **Drainage:** There are lined open drains in the city which cover the whole of the municipal area. These drains empty into nalas which flow on both sides of the central ridge running through the city. The nalas on the south of the ridge empty into the Narmada River downstream of the city while the nalas north of the ridge empty into the Pariyat River which in turn joins the Hiran

river which is a tributary of the Narmada River. There are also a number of ponds in the city which too are connected to these nalas and drains. Both the storm water and the wastewater are drained by these drains and nalas. Consequently, during monsoons when there is heavy rain, the inner city areas get inundated by a mixture of rain and wastewater.

II. SANITATION SITUATION

There is a minimal sewerage system in the northern areas of the city in Zone 1 covering about 11 percent of the households which is connected to a sewerage treatment plant at Kathonda in the northern part of the city but this STP is not working properly as will be detailed later. A project for laying of sewer lines in zones II to V along the Omti Nala in the city centre which is to be covered for non-motorised transport has been sanctioned under the Smart City Programme but work has not started yet. Thus, in some houses and even in the newer colonies being developed, sewerage is being released directly into the open drains whereas in most houses this is being directed into septic tanks and the outflow is being emptied into the open drains. There are some private and Government residential colonies in which there are sewerage lines but these are emptied into one of the many drains. There is no current data with the Jabalpur Municipal Corporation on how much of the sewerage is being discharged directly into open drains and how much of it is being directed first into septic tanks. The outlets of the septic tanks, being at a lower level than the sewerage lines, cannot be connected to them. The Census 2011 data on sanitation in the town are given in Figure 2 below.

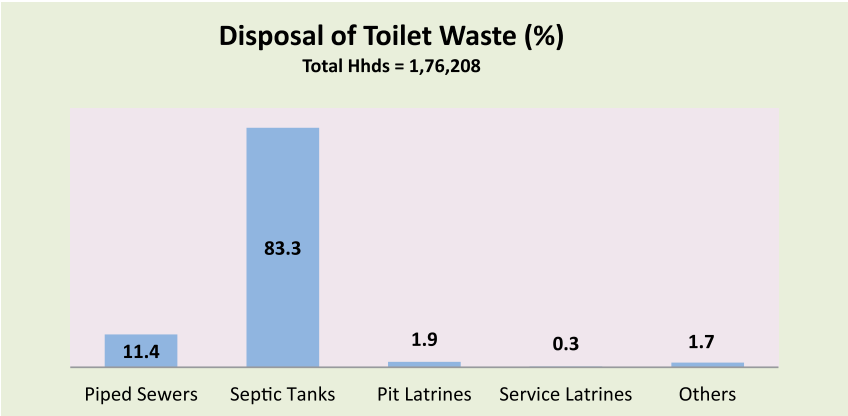
Figure 2. Type of Sanitation Available in Jabalpur Municipal Corporation Area 2011



The proportion of households using open defecation has gone down to some

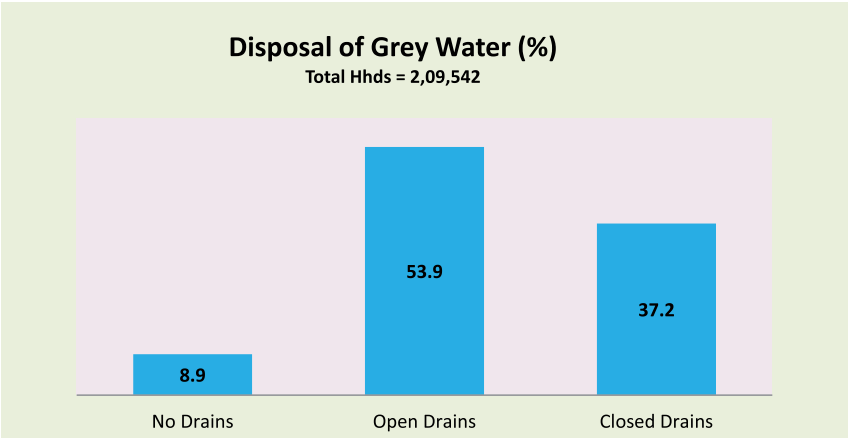
extent due to the implementation of the Swachh Bharat Mission under which 40,000 single leach pit latrines have been constructed in 360 slums of the city. **Jabalpur is ranked 21st in Swachh Sarvekshan 2017.** However, due to poor construction a substantial number of these latrines are not being used. Many slums are situated on hillocks so the extra water for latrine use and then the disposal of wastewater is a problem. The census 2011 data on disposal of toilet waste are given in Figure 3 below.

Figure3: Disposal of Toilet Waste in Jabalpur Municipal Corporation Area 2011



Most of the toilet waste is disposed into septic tanks and then the outflow goes into open drains and as mentioned earlier the little that is going into sewers is also not being treated properly. The Census 2011 data on disposal of grey water is given in Figure 4 below.

Figure 4: Disposal of Grey Water in Jabalpur Municipal Corporation Area 2011



Grey water for most of the city is carried away by open and closed drains which empty into nalas. The slums located on the hills do not have any drains. The bigger houses on the hills have improvised means of emptying their grey water through pipes to the open drains running below as shown in Figure 5 below.

Figure 5: Wastewater pipe from house on top of hill to the open drain below

III. SEPTAGE MANAGEMENT

The ground survey of septage management was done by conducting group discussions with the residents and inspecting the septage management procedures in a selected sample of ten wards. These wards were selected in consultation with the help of a local expert in sanitation, Mr Netraj Parihar, who was earlier involved in a Wateraid project for sanitation improvement in the city. Wards were chosen as follows -

- From the main congested areas of the city
- From those areas where there is a high concentration of Scheduled Castes and Scheduled Tribes residing in slums.

Discussions were held with people living in slums and also in regularised built up colonies. The wards chosen are given in Table 3:

Table 3: Sample Wards Chosen for Survey

Ward No.	Ward Name	Locality Name
5	Sardar Patel	Ghoda Nakkash
18	Shahid Gulab Singh	Danav Baba Basti
19	Kamla Nehru	Kumar Mohalla
29	Ramm Manohar Lohia	Badi Omti
34	Bhavani Prasad Tiwari	Sahu Mohalla
38	Pt. Motilal Nehru	Khatik Mohalla
48	Siddh Baba	Ramlila Maidan
53	Maharshi Arvind	Bhan Talaiya School
62	Ambedkar Nagar	Ramnagar Basti
69	Chandrashkehar Azad	Ganeshganj Aminali

Source: Census 2011

The slums had mostly single pit latrines which had been built recently with grants from the municipal corporation under the Swachch Bharat Mission. Many residents complained that despite their names having been enrolled for toilets, they had not got the same. The built up houses in the colonies nearby had septic tanks which released their outflow into the open drains. Consequently these drains carry contaminated water which is a breeding ground for pigs as shown in Figure 6 below.

Figure 6. Open drain with Pigs feeding in Gupteshwar Area

Due to the inadequacy of the pit latrines in some slums, like in the congested

one in Kachhpura, there are community toilets but even in these the septic tanks have outflows going into the nala behind the slum as shown in Figure 7 below.

Figure 7: Outflow of Community Toilet in Kacchpura being released into open

The closed drains in the city centre get clogged and they have to be cleaned from time to time. This cleaning is done by Dalit staff of the Jabalpur Municipal Corporation and like elsewhere in India they clean out the drains and leave the waste on the road as shown in Figure 8 below of one such dump on the road in the central Madtal area of the city.

Figure8. Drain Sludge left on the Road in Madtal City Centre

The Jabalpur Municipal Corporation has three big septic cleaning vehicles of

9,000 litre capacity each and 5 smaller ones of 4500 litres capacity. The charge is a uniform Rs 1,505 per trip and there are on an average 7 requests per day. However, the actual recovery of charges from septic tank cleaning as mentioned in the budget for the year 2015-16 was only Rs 2,66,160 which works out to one septic tank cleaning in two days. Even if the rate of tank cleaning may have gone up subsequently it is unlikely that it would be as high as 7 per day. There is also a private agency named Narmada Safai Samrakshak Enterprises which is Dalit owned and has three six thousand litre capacity vehicles. This agency charges anything between Rs 1,000 and Rs 2,000 depending on the distance and the size of the septic tank to be cleaned. Apart from this there are still groups of Dalits who clean septic tanks by hand in the more congested areas where the cleaning vehicles are not able to go even though this is in clear violation of The Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013.

Earlier the septage from the septic tanks were being emptied into the nalas but now three septage treatment plants have been set up in Awadhpuri, Adhartal and Tilwara. Each of these has a daily capacity of 50,000 litres and has been set up by a firm called Mecotechnologies which has been given the contract for installation and operation and maintenance for five years for Rs 69 lakhs from 2017 onwards. These treatment plants use the Moving Bed Biofilm Reactor technology which is economical both in terms of space and energy utilisation. The Septage Treatment Plant in Awadhpuri is shown in Figure 9 below.

Figure9: Septage Treatment Plant in Awadhpuri

The Jabalpur Municipal Corporation Vehicles are emptying their load into these plants but the private operators are not doing so. They are saying that these plants are situated far away from their area of operation so unless the Corporation subsidises the transport cost they will continue to empty septage into the nalas. This high cost of transportation seems to be affecting the Jabalpur Municipal Corporation tankers also since they too are not emptying enough septage into the treatment plants to keep them running continuously so they are mostly lying idle.

IV. SEWERAGE MANAGEMENT

Currently some of the sewerage from Zone 1 is being carried through a sewer system to the sewerage treatment facility in Kathonda which consists of two facultative ponds of one km length and about 50 meters width each. The capacity of the plant is 50 million litres per day (MLD) but the actual flow that was observed was a few kilolitres per day only. The initial structure for distributing the wastewater to the facultative ponds was lying idle as shown in Figure 10 below. A tender for Rs 1.95 crores for operation and maintenance of this plant for five years has now been floated so as to treat the wastewater from Zone 1 but it is yet to be awarded.

Figure 10: Structure for distributing wastewater to facultative Pond in Kathonda lying idle

There is a much smaller sewerage treatment plant at Gwari Ghat on the banks of the Narmada to treat the wastewater being generated near the Ghat as shown in Figure 11 above. This has a capacity of only 150 kilolitres per day. It has been installed and is being operated by the Jal Shree Corporation of Pune

using the fluidised aerobic bio-reactor technology which has a low all inclusive treatment cost of about Rs 20 per kilolitre.

Figure11: The Fluidised Aerobic Bio-reactor STP at Gwari Ghat

V. SANITATION PLANNING

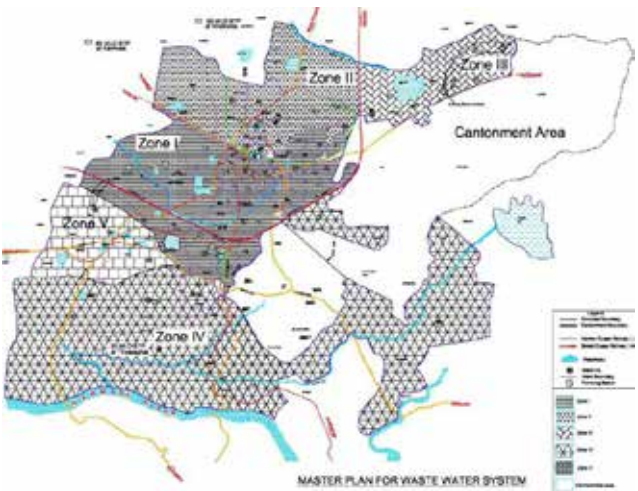
The Jabalpur Town Plan 2021 (DTCPMP, 2009) says that in 2009 when it was prepared, the total sewerage and wastewater generated is 140 MLD but there was no sewerage system and treatment facility and all the wastewater was being discharged untreated into nalas and other water bodies. The town plan proposed the construction of three STPs at Karmeta (85 MLD), Kathonda (50 MLD) and Tilwara (35 MLD) for a total capacity of 170 MLD at a cost of Rs 227.5 crores. This was prepared by the Madhya Pradesh Public Health Engineering Department (PHED) but the details are not given in the plan document. The City Development Plan for Jabalpur prepared under the JNNURM (MCJ, n.d.) has given the details of the earlier plan prepared by the MPPHED which are as shown in Table 4 below. Three STPs are to be constructed to treat the sewerage generated from the five zones.

Table 4: Details of Proposed Sewerage Treatment Plan for Jabalpur

Sl. No	STP Location	Sewerage Collection Zones	Capacity Required by 2024 (MLD)	Capacity Required by 2039 (MLD)
1.	Karmeta	Zone 1 which covers the central city area and currently empties into the Omti Nala and Zone 5 which covers the western part of the town.	70	85
2.	Kathonda	Zone 2 which covers the rainage in the northern and parts of the central area of the city and Zone 3 covers the Ranjhi area of the city to the north.	40	50
3.	Tilwara	Zone 4 which covers the area of the city south of the central ridge upto the Narmada River.	30	35
Total	STP Capacity		140	170

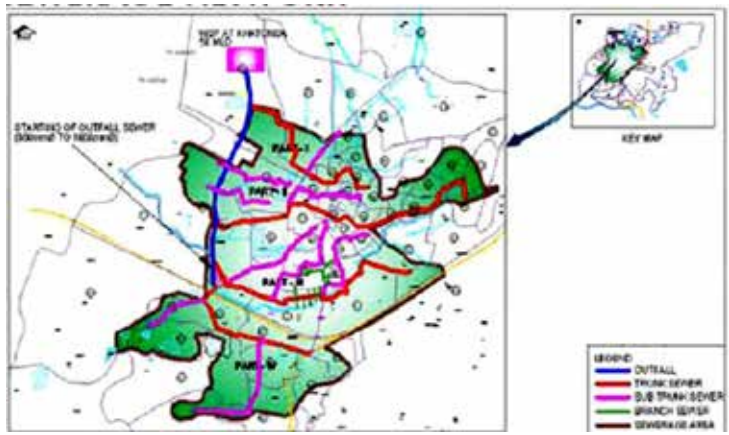
The wastewater conveyance and treatment map is shown in Figure 12 below.

Figure 12. Wastewater Master Plan Map of Jabalpur



A plant at Kathonda of 50 MLD capacity has been constructed but sewerage lines have not been properly laid through the collection zones. The Smart City Proposal has now begun implementing a revised plan by constructing and connecting the sewers in Zones One and Five to the Kathonda STP as shown in Figure 13 below at a cost of Rs 34 crores.

Figure 13: Jabalpur Smart City Sewerage Map



VI. WASTEWATER QUALITY

The polluted water from the open drains and the septage not only contaminates the surface water but also the ground water. Tests were carried out on various surface water and ground water sources and the results are as follows –

a. Open Well in Gorakhpur locality. There are many open wells in the city including some that are big step wells of the medieval era like the Vishkanya Baoli in the Sagra locality which is shown in Figure 14 below.

Figure 14: Vishkanya Baoli in Sagra Locality

The results of the tests of the water in the open well in Gorakhpur are given in Table 5. The various parameters that have been tested are –

BOD – Biochemical Oxygen Demand, TDS – Total Dissolved Solids, TSS – Total Suspended Solids, DO – Dissolved Oxygen, TC – Total Coliform, FC – Faecal Coliform, FS – Faecal Streptococci, AN – Ammoniacal Nitrogen, TN – Total Nitrogen

Table 5: Test Results of Open Well Water in Gorakhpur

Test	BOD	TDS	TSS	DO	TC	FC	FS	AN mg/l	TN mg/l
	mg/l	mg/l	mg/l	mg/l	Most Probably No per 100 ml				
Observed Value	1	210	8	0	TNTC*	TNTC	TNTC	0	9.4
Permissible Value for Class A Water Sources (IS:2296) except for TSS	3	500	20	>5	50	50	50	Absent	Absent

*Too Numerous to Count

Clearly, the ground water in the unconfined phreatic aquifer is contaminated and not fit for drinking as it does not meet the permissible standards with regard to coliform, streptococci and nitrogen which are all present when they shouldn't be. Dissolved Oxygen is also complete absent.

b. Borewell in Avadhpuri south of the ridge and on the way to the Narmada River in an area that is a combination of commercial and residential development. The water test results are given in Table 6 below.

Table 6: Test Results of Bore Well Water in Avadhpuri

Test	BOD	TDS	TSS	DO	TC	FC	FS	AN mg/l	TN mg/l
	mg/l	mg/l	mg/l	mg/l	Most Probably No per 100 ml				
Observed Value	1	200	15	2.8	TNTC	TNTC	TNTC	0	5.4
Permissible Value for Class A Water Sources (IS:2296) except for TSS	3	500	20	>5	50	50	50	Absent	Absent

The confined aquifer water quality is also bad as faecal coliform and faecal streptococci are present along with nitrogen and dissolved oxygen is less than the permissible value.

c. Ranital Pond in the centre of the city is one of the bigger water bodies surrounded by built up areas releasing sewerage into it and it also has a nala flowing into it and then out of it as shown in Figure 15 below. It is surrounded by slums in which the residents mostly do not have latrines so practice open defecation on its banks. It is heavily eutrofied due to this excessive contamination.

Figure 15: Rani Tal Pond

The water quality parameters for the Rani Tal pond water are given in Table 7 below

Table 7: Test Results of Rani Tal Pond Water

Test	BOD	TDS	TSS	DO	TC	FC	FS	AN mg/l	TN mg/l
	mg/l	mg/l	mg/l	mg/l	Most Probably No per 100 ml				
Observed Value	30	260	35	0	TNTC	TNTC	TNTC	1.4	20
Permissible Value for Class A Water Sources (IS:2296) except for TSS	3	500	20	>5	50	50	50	Absent	Absent

The pond water has high values of BOD, suspended solids and Nitrogen and dissolved oxygen is absent. Total coliforms, faecal coliforms, faecal streptococci and ammonia are present also so the water is heavily contaminated.

The smart city plan (SCP) intends to beautify the surroundings of this pond and connect it to the sports centre that has been built nearby and make it a major recreation area by displacing all the slums as shown in Figure 16. However, unless the nala water flowing into it is treated, there is little possibility of proper beautification.

The satellite map of the existing surroundings of the Rani Tal show a dense habitation of slums and low income colonies who are mostly without legal title to the land which they are living on. Thus, the development of this area will lead to large scale displacement of the poorest citizens of the city and disruption of their livelihoods. The habitations of the poor are to be replaced by high value residential and commercial real estate for the use of

the richer sections. The residents of the slums around Rani Tal are aware of this plan but said that they would oppose it tooth and nail because they would be displaced from this central location to some remote outskirt area.

Figure 16: Ranital Improvment Plan

d. Robertson Lake is another major water body in the city situated on the northern periphery behind the Engineering College as shown in Figure 17 below.

Figure 17 : Robertson Pond behind Engineering College

The test results for the pond water are given in Table 8 below.

Table 8: Test Results of Roberson Lake Water

Test	BOD	TDS	TSS	DO	TC	FC	FS	AN	TN
	mg/l	mg/l	mg/l	mg/l	Most Probably No per 100 ml			mg/l	mg/l
Observed Value	50	140	50	0.9	TNTC	TNTC	TNTC	0.6	19.4
Permissible Value for Class A Water Sources (IS:2296) except for TSS	3	500	20	>5	50	50	50	Absent	Absent

Here too the water is highly polluted with the BOD being a very high 50 mg/l along with the suspended solids. Dissolved oxygen is a low 0.9 mg/l.

e. The Khandari Nala is the main drain in the southern part of the city and it carries most of the drainage of this part into the Narmada River. The results of the testing of the water in the nala are given in Table 9 below.

Table 9: Test Results of Khandari Nala Water

Test	BOD	TDS	TSS	DO	TC	FC	FS	AN	TN
	mg/l	mg/l	mg/l	mg/l	Most Probably No per 100 ml			mg/l	mg/l
Observed Value	1	200	15	2.8	TNTC	TNTC	TNTC	0	5.4
Permissible Value for Class A Water Sources (IS:2296) except for TSS	3	500	20	>5	50	50	50	Absent	Absent

The dissolved oxygen level is low and both coliform and streptococci are present as is nitrogen thus indicating that the water is contaminated.

f. The Omti Nala is the main drain of the part of the town to the north of the ridge which carries most of the wastewater in the central congested area into the Pariyat River as shown in Figure 18 below. the wastewater outfall from the buildings on its banks into the nala are clearly visible and this is its fate right through the city upstream. Consequently this nala is heavily contaminated.

Figure18 Omti Nala near Kachpura

The water test results for Omti Nala are given in Table 10 below.

Table 10: Test Results of Omti Nala Water

Test	BOD	TDS	TSS	DO	TC	FC	FS	AN	TN
	mg/l	mg/l	mg/l	mg/l	Most Probably No per 100 ml			mg/l	mg/l
Observed Value	20	230	28	1	TNTC	TNTC	TNTC	0.3	4
Permissible Value for Class A Water Sources (IS:2296) except for TSS	3	500	20	>5	50	50	50	Absent	Absent

Once again except for the dissolved solids all the other parameters show heavy contamination of the water.

g. Narmada River Water at Gwari Ghat. This is a very holy place and people come to take a holy dip in the river here. A small STP has been installed here to treat some of the wastewater from the immediate vicinity but even so there is one drain that empties into the river as shown in Figure 19.

Figure 19 : Open Drain near Gwari Ghat on the Narmada River

While the water in the drain on the top is collected in the tank ahead of it and then pumped up to the STP, the wastewater in the drain next to it goes untreated into the River. The test results for the Narmada River water are given in Table 11 below. The results show that the water is heavily contaminated.

Table 11: Test Results of Narmada River Water at Gwari Ghat

Test	BOD	TDS	TSS	DO	TC	FC	FS	AN	TN
	mg/l	mg/l	mg/l	mg/l	Most Probably No per 100 ml			mg/l	mg/l
Observed Value	5	80	8	7.9	TNTC	TNTC	TNTC	0.3	4.6
Permissible Value for Class A Water Sources (IS:2296) except for TSS	3	500	20	>5	50	50	50	Absent	Absent

The water samples were collected during the monsoon season when it was raining so there was a considerable flow in the Khandari and Omti Nalas and the Narmada River from rainfall runoff and ground water inflow which diluted greatly the contamination due to the wastewater flowing into these drainages. Nevertheless, nala and river water was heavily polluted with very high values away from the permissible limits for most of the parameters indicating that the environmental situation was highly unsustainable with respect to septage management in Jabalpur. Moreover,

the situation of the poor living in slums was worse than the rest of the citizens because in the absence of proper sanitation services they do not have the resources to access them on their own.

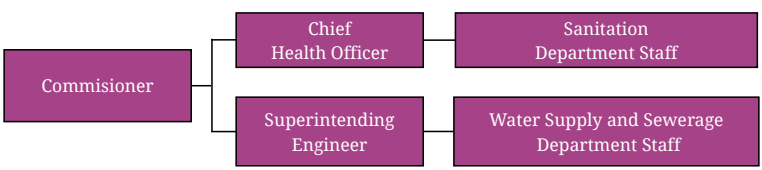
There is also a waste to energy incineration plant in Kathonda as shown in Figure20 below but it is not in operation because the solid waste that is collected is not segregated into dry and green waste. Consequently, the plant does not get adequate quantities of segregated dry waste that it requires.

Figure 20 Waste to Energy Incineration Plant in Kathonda

VII. STAFFING OF SANITATION DEPARTMENT OF JABALPUR MUNICIPAL CORPORATION

The Jabalpur Municipal Corporation is headed by a Commissioner. There is a superintending engineer who is in charge of the water supply and sewerage department which is responsible for the laying and maintenance of sewers and the operation of the STP. A chief health officer is in charge of the sanitation functions which are carried out by various staff of the sanitation department. This has been shown in an organogram in Figure21 below.

Figure21: Organogram of Jabalpur Municipal Corporation Related to Sanitation



The staff strength of the Health and Sanitation Department of the Jabalpur Municipal Corporation is given in Table 12 below.

Table 12: Staffing of Health and Sanitation Department of Jabalpur Municipal Corporation

Post	Sanctioned	Actual
Chief Health Officer	1	0
Health Officer	2	1
Assistant Health Officer	8	2
Chief Sanitation Inspector	23	15
Sanitation Inspector	45	17
Assistant Sanitation Inspector	89	30
Sanitation Supervisor	150	40
Sanitation Workers (Permanent)	2256	1154
Sanitation Workers (Contractual)		440

Source: Jabalpur Municipal Corporation

Clearly there is a very high rate of understaffing in the corporation with less than half of the sanctioned posts having been filled. The sanitation work of 38 of the 79 wards has been outsourced to a contractor who also collects the solid waste from all the wards and transports it to the landfill at Kathonda. As mentioned earlier the sanitation work is not being done properly as not only are the drain sludge being deposited on the roads but due to lack of adequate door to door collection there is considerable amount of waste deposited on the roads. The rank of Jabalpur in the Swachh Sarvekshan 2017 was 21st.

VIII. REVIEW OF MUNICIPAL FINANCES

The overall finances of the Jabalpur Municipal Corporation for the years 2016-17 and 2017- 18 are given in Table 13 below.

Table 13: Overall Finances of Jabalpur Municipal Corporation 2015-16 to 2017-18

Item	2015-16 Estimates (Rs Lakhs)	2015-16 Actuals (Rs Lakhs)	2015-16 Shortfall of Act. to Est. (%)	2016-17 Estimates (Rs Lakhs)	2017-18 Estimates (Rs Lakhs)	Per Capita for 2017-18* (Rs)
Revenue Receipts	38808.89	27498.87	29.1	48622.76	60400.13	5135
Revenue Expenditure	29802.16	24230.96	18.7	36349.74	39008.81	3316

Item	2015-16 Estimates (Rs Lakhs)	2015-16 Actuals (Rs Lakhs)	2015-16 Shortfall of Act. to Est. (%)	2016-17 Estimates (Rs Lakhs)	2017-18 Estimates (Rs Lakhs)	Per Capita for 2017-18* (Rs)
Revenue Surplus	9006.73	3267.91	10.4	12273.02	21391.32	
Cap Receipts	25459.35	19511.24	23.4	31582.52	45778.56	3892
Cap Expenditure	34453.20	13759.21	60.1	43782.25	67133.77	5708
Cap Deficit	8993.85	-5752.03		12199.73	21355.21	

Source: Jabalpur Municipal Corporation

*Calculated by assuming a cumulative population growth rate of 10% from 2011-2017

There was a higher budget estimate for Revenue Receipts in 2015-16 with the actual receipts falling short by 29.1 percent. Nevertheless the estimates for 2016-17 and 2017-18 have still been kept unrealistically high. There is a shortfall of 18.7 percent in revenue expenditure too for 2015-16 resulting in a shortfall in revenue surplus of 10.4 percent. The Capital Receipt for 2015-16 shows a shortfall of 23.4 percent while for Capital Expenditure the shortfall is as high as 60.1 percent resulting in a capital surplus instead of a deficit. The per capita receipts and expenditures are low in comparison to what it should be for a city like Jabalpur and this is reflected in the poor quality of infrastructure.

A break up of the revenue receipts is given in Table 14 below.

Table 14: Revenue Receipts of Jabalpur Municipal Corporation 2015-16 to 2017-18

Item	2015-16 Estimates (Rs Lakhs)	2015-16 Actuals (Rs Lakhs)	2015-16 Shortfall of Act. to Est. (%)	2016-17 Estimates (Rs Lakhs)	2017-18 Estimates (Rs Lakhs)
Taxes	10809.50	5357.02	50.4	11541.43	15473.50
Leases and Rentals	877.27	703.80	19.8	984.02	1124.67
Licences, Permissions & Cesses	8849.30	5330.08	39.8	17212.16	24488.21
Interest	115.81	0	100.0	126.15	126.15
Octroi and other Compensation	15500.00	14922.43	3.7	15854.76	15850.27
State and Central Govt. Grants	2011.02	949.14	52.8	1876.02	2231.01
Others	645.99	236.40	63.4	1028.22	1106.32

Item	2015-16 Estimates (Rs Lakhs)	2015-16 Actuals (Rs Lakhs)	2015-16 Shortfall of Act. to Est. (%)	2016-17 Estimates (Rs Lakhs)	2017-18 Estimates (Rs Lakhs)
Total	**38808.89**	**27498.87**	**29.1**	**48622.76**	**60400.13**

Source: Jabalpur Municipal Corporation

There is a substantial shortfall of 50.4 percent in the actual amount of taxes collected for 2015-16 but yet the estimates for taxes for 2016-17 and 2017-18 have been further increased regardless of this actual shortfall. Among taxes, property taxes constituted the major component. In 2015-16 the actual collection was Rs 3,111 lakhs but this is a huge shortfall of 58 percent from the estimate for 2015-16 of 7,375 lakhs. What is of major concern is that property tax constituted just 11 percent of the total actual revenue receipts for 2015-16 when it should be at least 25 percent as mandated by the guidelines for urban local bodies that had been prescribed by the Jawaharlal Nehru Urban Renewal Mission. The actual per capita property tax collection in 2015-16 was a dismal Rs 265 when it should be at least Rs 500 as per the guidelines of the JNNURM.

The revenue expenditure details are given in Table 15 below.

Table 15: Revenue Expenditure of Jabalpur Municipal Corporation 2015-16 to 2017-18

Item	2015-16 Estimates (Rs Lakhs)	2015-16 Actuals (Rs Lakhs)	2015-16 Shortfall of Act. to Est. (%)	2016-17 Estimates (Rs Lakhs)	2017-18 Estimates (Rs Lakhs)
Establishment	12494.21	11506.04	7.9	13669.72	16039.22
Administration	1478.38	1268.49	14.2	1719.48	1874.96
Operation & Maintenance	13827.55	9569.16	30.8	19059.52	19194.61
Interest	2002.02	1887.27	5.7	1901.02	1900.02
Total	**29802.16**	**24230.96**	**18.7**	**36349.74**	**39008.81**

Source: Jabalpur Municipal Corporation

There is a fairly high shortfall of 30.8 percent in the actual O&M expenditures for 2015-16 from the estimates followed by the 7.9 percent shortfall in the establishment expenditures indicating that there is understaffing of the Jabalpur

Municipal Corporation accompanied by poor operation and maintenance. The capital receipts consist of loans from organisations like ADB and HUDCO and grants from the Central and State Governments as shown in Table 16 below. As mentioned earlier for 2015-16 the JMC was not able to spend all the capital amount received and yet the receipts and grants have been increased in the estimates for 2016-17 and 2017-18.

Table 16: Capital Receipts of Jabalpur Municipal Corporation 2015-16 to 2017-18

Item	2015-16 Estimates (Rs Lakhs)	2015-16 Actuals (Rs Lakhs)	2015-16 Shortfall of Act. to Est. (%)	2016-17 Estimates (Rs Lakhs)	2017-18 Estimates (Rs Lakhs)
State Govt. Grants	8752.13	4931.88	43.6	5445.22	13978.07
Central Govt. Grants	2500.35	6093.23	-143.7	11797.01	16163.01
Loans	12405.01	7633.28	38.5	14205.00	14200.00
Others	1801.86	852.85	52.7	135.29	1437.48
Total	**25459.35**	**19511.24**	**23.4**	**31582.52**	**45778.56**

Source: Jabalpur Municipal Corporation

There was a substantial increase in actual disbursement of Central Government Grants over the estimates for 2015-16 but this was not enough to cover the shortfalls in State Government Grants, loans and other sources so overall there is a shortfall. The breakup of the Capital Expenditure is shown in Table 17 below.

Table 17: Capital Expenditure of Jabalpur Municipal Corporation 2015-16 to 2017-18

Item	2015-16 Estimates (Rs Lakhs)	2015-16 Actuals (Rs Lakhs)	2015-16 Shortfall of Act. to Est. (%)	2016-17 Estimates (Rs Lakhs)	2017-18 Estimates (Rs Lakhs)
Water Supply	1125.71	1440.62	-28.0	7680.00	8988.00
Sanitation	15489.02	5252.58	66.1	13159.01	13776.00
Slum Development	5146.90	2532.08	50.8	7494.50	8879.15
Other Infrastructure	7640.51	14509.26	-89.9	6641.23	5990.66
Loan Repayment	400.02	496.42	-24.1	1375.00	1375.00
Total	**29802.16**	**24230.96**	**18.7**	**36349.74**	**39008.81**

Source: Jabalpur Municipal Corporation

There is an increase in the actual capital expenditures in water supply, other infrastructure and loan repayment for the year 2015-16 over the estimates but these are not enough to compensate for the huge shortfalls in expenditure in sanitation and slum development so overall there is a shortfall in capital expenditure.

Finally, it would be worthwhile to look more closely at the actual revenue receipts and capital and revenue expenditures for 2015-16 for the water supply and sanitation (WSS) sectors to get an idea of the financial sustainability of these sectors. These are given in Table 18 below.

Table 18: WSS Receipts and Expenditures of Jabalpur Municipal Corporation 2015-16

Item	Revenue Receipts (Rs Lakhs)	Capital Expenditure (Rs Lakhs)	Revenue Expenditure (Rs Lakhs)			Under Recovery of costs* (%)
			O&M	Salaries	Total	
Water Supply	2694.98	1440.62	4137.11	1225.53	5362.64	51.4
Sanitation	229.27	5252.58	1774.43	3826.46	5600.89	96.4

Source: Jabalpur Municipal Corporation

*Assuming Capital Expenditure is to be Recovered in Ten years @ 5 % annual interest

Affordability Analysis of Sanitation Services

The Jabalpur Municipal Corporation is not recovering the costs of water supply and sanitation and especially so in the case of the latter. If the JMC were to recover the sanitation costs, then assuming total number of surcharge paying households to be 1.6 lakhs in 2015 (70 percent of total households, as 30 percent live in slums and are too poor to pay charges), the per household sanitation charge per month would be Rs 327. The Average urban monthly per capita consumer expenditure in the 66th round of the National Sample Survey Organisation survey for Madhya Pradesh in 2010-11 was Rs 1,666 (NSSO, 2011). Assuming a household of five persons this gives an average monthly household consumer expenditure in 2010-11 of Rs 8,330. Assuming an average annual consumer price inflation rate of 6% from 2010-11 to 2016 the average monthly household consumer expenditure in 2015-16 will be Rs 11,147. Thus, the proportion of the cost recovery sanitation surcharge works out to 3 percent of the average monthly household expenditure which is an unacceptably high proportion. The proportion of households who had a monthly per capita consumer expenditure less than the average is 70 percent of whom the bottom 30 percent have been exempted as being too poor to pay. Thus, as much as 40 percent of the population would have to spend 3 percent or more of their

monthly expenditure on sanitation which is not affordable by any means. This, when the services are grossly inadequate.

The budgeting has been done in a very unprofessional manner so considerable time has had to be expended to collate the data for the above financial analysis. Not surprisingly the administration cannot easily draw any conclusions for better financial performance from the budget exercise and this is done mechanically year after year. The above analysis shows that the finances of the JMC are unsustainable and inadequate.

IX. CONCLUSIONS

We can conclude as follows from the review of the overall sanitation situation in Jabalpur Municipal Corporation Area -

1. There is inadequate provision of sanitation services especially with regard to septage and faecal sludge management. There is gross violation of both the Water (Prevention and Control of Pollution) Act 1974 and The Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013 as some of the septic tanks are being cleaned manually and the septage being disposed of into nalas and surface water bodies and due to open drains the wastewater is also seeping into the ground.
2. The slums are badly served or not served at all. The pit latrines that have been built are all single pit ones that will not last very long. Open defecation is still going on because the latrines built on the hillocks are not serviceable due to difficulty of carrying water and disposing of the wastewater.
3. The tests carried out on water samples clearly indicate that both the surface water and ground water are highly contaminated so unhealthy. The situation may improve with the implementation of the sewerage project but it is unlikely that the new system will be properly maintained or even operationalised as the earlier one in Kathonda is not being operated properly. Thus, the septage and faecal sludge management systems currently in place are environmentally unsustainable.
4. The finances of the Jabalpur Municipal Corporation are in a precarious state and are highly unsustainable. There is almost no cost recovery and if there were cost recovery then the poor would be unable to afford the charges. This has led to both the provision of inadequate sanitation services and also as a result an inequitable situation for the poor who are unable to procure sanitation services themselves from private operators by paying for them.
5. The method of maintaining accounts of the municipal corporation is unprofessional so that it is not possible to get information immediately as to whether revenues and expenditures are sustainable and equitable. Consequently budgeting is done mechanically without taking into account the actual performance in revenue mobilisation and the ways in which it can be improved.

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Annexure II
Septage Management Factsheet
Rewa

1. **Location:** Rewa is the main town of the Baghelkhand region in the North Eastern part of Madhya Pradesh located at 24^{0}32'N latitude and 81^{0}15'E longitude. It is situated 500 kms away from the capital city of Bhopal and is connected to it by road and rail. It is the headquarters of both the eponymous Division and District.
2. **Terrain, Geology and Climate:** The town is situated on a plateau sloping northwards surrounded on three sides by hills. The town originally was situated to the east of the confluence of the Bichiya and Beehar Rivers but has now expanded to the west across the Beehar River which drains into the Tons River further north and is part of the Ganga Basin. The soil is mixed red and yellow formed from weathering of shale and sandstone. The underlying rock structure is Vindhyan with quartzite, shale, limestone and sandstone with jointed and fractured sandstone being the ground water bearing layer with limited porosity. The premonsoon water level is about 4.5 m below ground level while the post monsoon water level is about 1.5 m below ground level.

   The climate is characterized by a hot summer and general dryness except for the south west monsoon season. The normal annual rainfall is 1141.5 mm with 83% in the period from June to September. Thus, water for ground water recharge is available only during the south west monsoon period.
3. **Demography:** The population characteristics of Rewa town for all the 45 wards are given in Table 1 below.

Table 1: Demographic Characteristics of Rewa Municipal Corporation Area 2011

Area	Number of House-holds	Total Popu-lation	Male (%)	Female (%)	SC (%)	ST (%)	Lite-rate (%)	Male Lite-rate (%)	Female Lite-rate (%)	Wor-kers (%)	Male Wor-kers (%)	Female Wor-kers (%)
Rewa Municipal Cooporation	45275	235654	52.6	47.4	9.9	3.8	86.3	90.8	81.3	33.0	48.3	16.0

Source: Census 2011

The decadal growth rate of population is 28.6% which is fairly high and considerably above the average population growth rate for the district of 19.9% indicating that a lot of migration is taking place into the town burdening its infrastructure, especially the sanitation infrastructure. Table 2 below gives the details of the four congested wards out of the total 45 which have a high proportion of SCs. The corresponding ward map of Rewa is also shown subsequently in Figure 1.

Table 2: Wardwise Demographic Characteristics of Rewa Municipal Corporation Area 2011

Ward Number	Name	Area (Ha)	No. of Hhds	Pop.	Density (Person/Ha)	SC (%)	ST (%)
28	Dhobiya	4.0	326	1971	493	73.3	0.4
38	Lohiya	25.6	734	3784	148	33.7	1.3
39	Ranital	40.8	418	2309	57	30.7	0.0
40	Naya Talab	22.5	786	4211	187	55.5	2.8

Source: Census 2011, Rewa Municipal Corporation, 2011

Figure 1: Ward Map of Rewa

4. **Drainage:** There are lined open drains in the city which are mostly in bad shape and cover about 40 percent of the municipal area. These drains empty into nalas which finally empty into the Beehar River with the Jhiriya nala passing through the city centre being the biggest one. For the rest of the town there are only unlined drains. Both the storm water and the wastewater are drained by these drains and nalas. Consequently, during monsoons when there is heavy rain, the inner city areas get inundated by a mixture of rain and wastewater.
5. **Sanitation Situation:** There was no sewerage system in the town but one is now being laid under the Atal Mission For Rejuvenation and Urban Transformation (AMRUT) along with sewerage treatment plants (STP). One STP has already been constructed under the National River Conservation Plan (NRCP). Thus, in some houses sewerage was being released directly into the open drains whereas in most houses this was being directed into septic tanks and the outflow being emptied into the open drains. There is no current data with the Rewa Municipal Corporation on how much of the sewerage is being discharged directly into open drains and how much of it is being directed first into septic tanks. The Census 2011 data on sanitation services available in the town are given in Figure 2, 3 and 4. The number of households with latrine facility has gone up subsequently due to the implementation of the Swachh Bharat Mission but due to lack of space in the congested slums there are still a significant number of households without toilets who are either going to public toilets or are resorting to open defecation. **Rewa is ranked 38th in the Swachh Sarvekshan 2017.**

Figure 2. Type of Sanitation Available in Rewa Municipal Corporation Area 2011

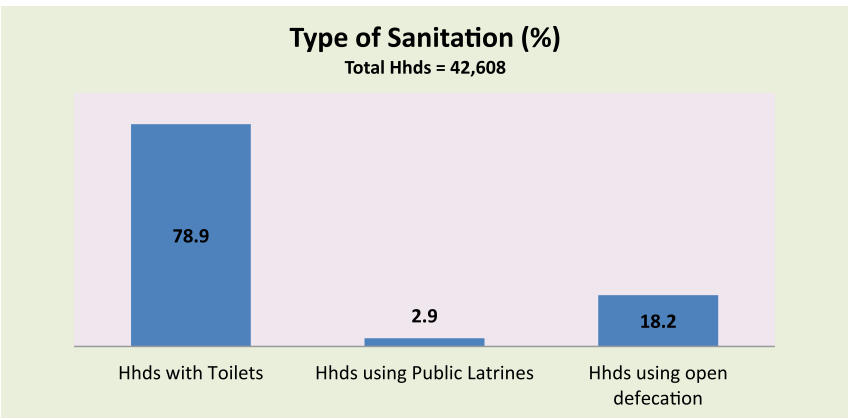


Figure3: Disposal of Toilet Waste in Rewa Municipal Corporation Area 2011

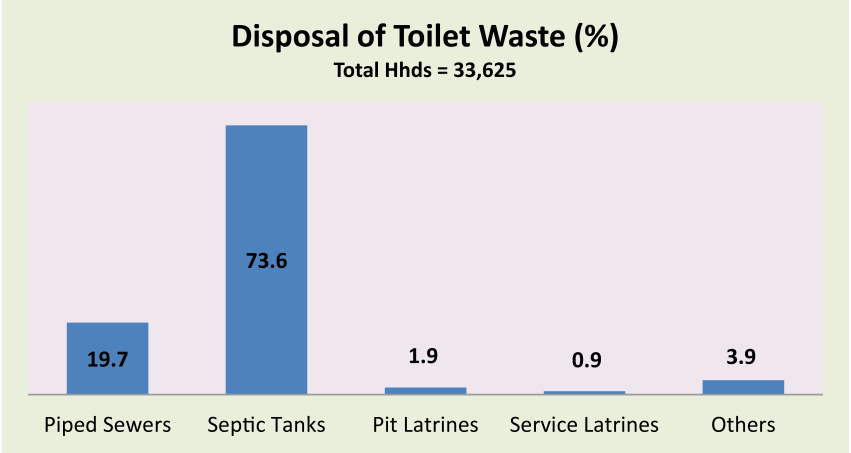
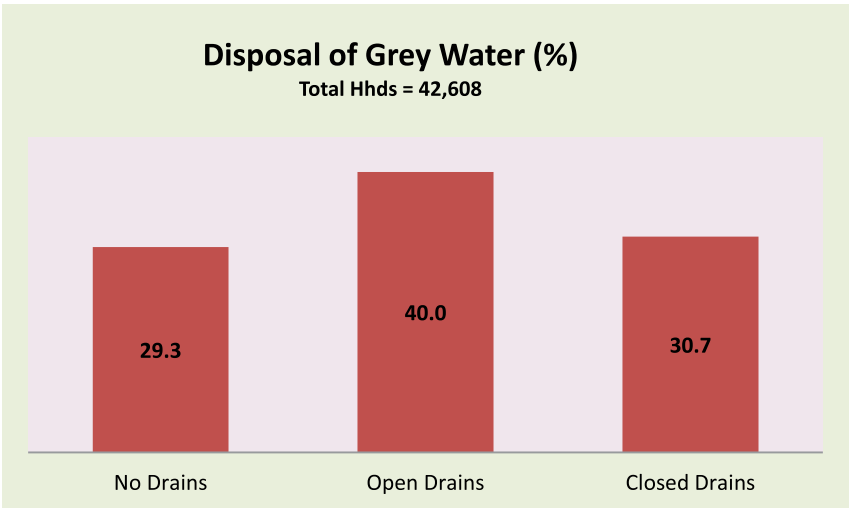


Figure 4: Disposal of Grey Water in Rewa Municipal Corporation Area 2011



6. **Septage Management**: The ground survey of septage management was done by conducting group discussions with the residents and inspecting the septage management procedures in a selected sample of ten wards. These wards were selected in consultation with staff of the NGO, Anupama Education Society, which is involved in implementing an HIV-AIDs support programme in the slums of the town. Wards were chosen in the main congested areas of the town and from those areas where there is a high

concentration of Scheduled Castes. The slums had mostly single pit latrines which had been built recently with grants from the Municipal Corporation under the Swachch Bharat Mission. Many residents complained that despite their names having been enrolled for toilets, they had not got the same. Some of the houses in the slums which had a little space had septic tanks with the outflow flowing into the gutters in front of the houses. This was also the case with the built up houses in the colonies nearby. In the slums many households do not have latrines so they have to depend on community toilets. Since these charge money there is still some open defecation going on by the very poor who cannot afford the charges. The community toilets too are not managed properly and release their outflow of faeces into open drains.

The Rewa Municipal Corporation has only one septic cleaning vehicle and it charges Rs 1500 per trip and is not easily available. So mostly people rely on groups of Dalit cleaners who clean the septic tank by hand and dump the septage in the open drains. The vehicle from the Rewa Municipal Corporation also empties its septage into one of the many nalas.

7. **Water Quality:** Thus, the polluted water from these open drains and the septage not only contaminate the surface water but also the ground water. Tests were carried out on various surface water and ground water sources and the results are given in Table 3 below. The various parameters that have been tested are –

   BOD – Biochemical Oxygen Demand, TDS – Total Dissolved Solids, TSS – Total Suspended Solids, DO – Dissolved Oxygen, TC – Total Coliform, FC – Faecal Coliform, FS – Faecal Streptococci, AN – Ammoniacal Nitrogen, TN – Total Nitrogen

Table 3: Test Results of Water in Rani Talab Basti

Test	BOD mg/l	TDS mg/l	TSS mg/l	DO mg/l	TC	FC	FS	AN mg/l	TN mg/l
Rani Tal Open Well	1	880	8	5.2	TNTC*	TNTC	Absent	1.7	6.2
Urrhat Borewell	3	670	8	5.7	TNTC	TNTC	TNTC	1.1	4.4
Ratahara Pond	3	80	18	4.9	TNTC	TNTC	TNTC	0.3	3.6
Chirahula Pond	2	112	6	6.9	TNTC	TNTC	TNTC	Absent	11
Rani Tal Pond	8	100	10	5.1	TNTC	TNTC	TNTC	0.3	4.7
Jhiriya Nala	24	550	60	0	TNTC	TNTC	TNTC	12.3	29.4
Beehar River	2	150	14	5.4	TNTC	TNTC	Absent	1.4	4.1
Permissible Value (IS:2296)	**3**	**500**	**20**	**>5**	**50**	**50**	**50**	**Absent**	**Absent**

*Too Numerous to Count

The water samples were collected during the monsoon season when it was raining so there was considerable flow in both the Jhiriya nala and the Beehar River from rainfall runoff and ground water inflow which diluted the contamination due to the wastewater flowing into these drainages. Nevertheless, the contamination of both surface and groundwater is quite high.

8. **Staffing of Rewa Municipal Corporation**: The staff strength of the Health and Sanitation Department of the Rewa Municipal Corporation is grossly inadequate. The sanctioned strength and the actual employment is given in Table 4 below.

Table 4: Staffing of Health and Sanitation Department of Rewa Municipal Corporation

Post	Sanctioned	Actual
Health Officer	1	0
Assistant Health Officer	3	0
Chief Sanitation Inspector	5	0
Sanitation Inspector	9	2
Sanitation Supervisor	9	2
Assistant Sanitation Supervisor	31	8
Sanitation Workers	471	471

Source: Rewa Municipal Corporation

There has been under posting of staff for quite some time now and whatever little posting is there, is also getting reduced further as no new appointments are being made as the existing staff retire. The charge of the Health and Sanitation Department is with an officer of another department and effectively the two sanitary inspectors are running the operations. Even though the full complement of Sanitation Workers are there, most of them have been employed on ad hoc basis replacing the permanent employees who have retired.

9. **Sewerage Project**: A project for laying sewerage and constructing sewerage treatment plants in Rewa has been sanctioned under the Atal Mission for Urban Rejuvenation and Transformation with a total budget of Rs 214 Crores to be implemented between June 2017 and June 2020 . This project has just started so it will take some time for it to be completed. The details are as follows –
    a. Main and Lateral Sewer Pipelines – 728 kms.
    b. House connection Pipelines – 228 kms.
    c. Manholes – 17240 numbers
    d. Sewerage Treatment Plants – 7 numbers with cumulative capacity of 25

Million Litres per Day (MLD). Apart from this another STP of capacity 12 MLD has been constructed under the National River Conservation Plan on the banks of the Beehar River near the Forest Range Office. This has been built with the Activated Sludge Technology which requires considerable space and much more energy for operation as shown in Figure 8 above. However, due to the lack of sewerage lines this plant is not being operated presently.

10. **Review of Municipal Finances:** The overall Finances of the Rewa Municipal Corporation for the years 2016-17 and 2017-18 are given in Table 6 below.

Table 5: Overall Finances of Rewa Municipal Corporation 2016-17 & 2017-18

Item	2016-17 (Rs Lakhs)	2017-18 (Rs Lakhs)	Per Capita for 2017-18* (Rs)
Revenue Receipts	12701.73	8075.76	3106
Revenue Expenditure	7503.31	7246.73	2787
Revenue Surplus	5198.42	829.23	
Cap Receipts	7353	33683.76	12955
Cap Expenditure	9169.24	37250.68	14327
Cap Deficit	1816.24	3566.92	

Source: Rewa Municipal Corporation

*Calculated by assuming a cumulative population growth rate of 10% from 2011-2017 There was a higher budget estimate for Revenue Receipts in 2016-17 with a high estimate for the Grant support from the State Government, which was not met by actuals so this was lowered to a more realistic estimate for 2017-18. The Capital Receipt and Expenditure estimates for 2017-18 are much higher because of the investment being made under the Atal Mission for Rejuvenation and Urban Transformation. While the capital expenditure is satisfactory for the time being due to the AMRUT investment, the revenue mobilisation and expenditure is very poor and insufficient for providing proper services and generating enough surpluses to fund capital expenditure in future.

A break up of the revenue receipts is given in Table 6 below.

Table 6: Revenue Receipts of Rewa Municipal Corporation 2016-17 & 2017-18

Item	2016-17 Estimates (Rs Lakhs)	2016-17 Actuals (Rs Lakhs)	2016-17 Shortfall of Actuals to Estimates (%)	2016-17 Shortfall of Estimates (%)
Taxes	1361.09	861	36.7	3063.09
State Government Grants	6735.95	345.8	94.9	899.98
Leases	692.55	311.55	55.0	492.53
Sales Cess	13.75	11.85	13.8	31.55
Other Grants	160	0.5	99.7	98.16
Interest	35	15	57.1	17.7

Item	2016-17 Estimates (Rs Lakhs)	2016-17 Actuals (Rs Lakhs)	2016-17 Shortfall of Actuals to Estimates (%)	2016-17 Shortfall of Estimates (%)
Octroi Compensation	2195.99	1719.17	21.7	1950
Electricity	533	201.64	62.2	820.5
Others	63.5			40

Source: Rewa Municipal Corporation

There is a huge shortfall in the actual amount of State Government Grants for 2016-17 so a more realistic amount has been budgeted for 2017-18 though even that is not likely to be met. Octroi compensation given by the State Government in lieu of the Municipal Corporation foregoing the levying of Octroi is the biggest source of revenue being double of taxes collected. Among taxes, property taxes at Rs 580 lakhs constituted the biggest revenue earner in 2016-17 but there was a shortfall of 24.3 percent in this. There was also a shortfall of 61 percent in water tax collection. What is of major concern is that property tax constitutes just 10.8 percent of the total budgeted revenue receipts for 2017-18 when it should be at least 25 percent as mandated by the guidelines for urban local boides that had been prescribed by the Jawaharlal Nehru Urban Renewal Mission. The actual per capita property tax collection in 2016-17 was a dismal Rs 168 when it should be at least Rs 500 as per the guidelines of the JNNURM.

The revenue expenditure details are given in Table 7 below.

Table 7: Revenue Expenditure of Rewa Municipal Corporation 2016-17 & 2017-18

Item	2016-17 Estimates (Rs Lakhs)	2016-17 Actuals (Rs Lakhs)	2016-17 Shortfall of Actuals to Estimates (%)	2016-17 Shortfall of Estimates (%)
Establishment	2949.35	2305.5	21.8	2858.21
Administration	426.7	156.86	63.2	312.7
Operation & Maintenance	3741.05	783.72	79.1	3645.1
Interest	97	85.76	11.6	196.92
Others.	289	34.5	88.1	21.8

Source: Rewa Municipal Corporation

Most notable here is the huge shortfall of 79.1 percent in the O&M expenditures followed by the 63.2 percent shortfall in the administration expenditures indicating that there is heavy understaffing of the leadership

of the organisation accompanied by poor operation and maintenance. The budgeting has been done in a very unprofessional manner so that the administration cannot easily draw any conclusions for better financial performance. This clearly shows that the finances of the corporation are unsustainable and inadequate.

11. **Conclusions:** The sanitation situation with respect to faecal sludge and septage management in the town of Rewa is currently in a sorry state with inadequate provision of services. The tests carried out on water samples clearly indicate that both the surface water and ground water are contaminated and unhealthy. The situation may improve with the implementation of the sewerage project but given the very precarious finances of the Rewa Municipal Corporation it is unlikely that the new system will be properly maintained or even operationalised.

Septage Management in **Rewa**

I. INTRODUCTION

The general information about the town of Rewa, Madhya Pradesh is as follows

1. **Location:** Rewa is the main town of the Baghelkhand region in the North Eastern part of Madhya Pradesh located at 24°32'N latitude and 81°15'E longitude. It is situated 500 kms away from the capital city of Bhopal and is connected to it by road and rail. It is the headquarters of both the eponymous Division and District.
2. **Terrain, Geology and Climate:** The town is situated on a plateau sloping northwards surrounded on three sides by hills. The town originally was situated to the east of the confluence of the Bichiya and Beehar Rivers but has now expanded to the west across the Beehar River which drains into the Tons River further north and is part of the Ganga Basin. The soil is mixed red and yellow formed from weathering of shale and sandstone. The underlying rock structure is Vindhyan with quartzite, shale, limestone and sandstone with jointed and fractured sandstone being the ground water bearing layer with limited porosity. The premonsoon water level is about 4.5 m below ground level while the post monsoon water level is about 1.5 m below ground level.

   The climate is characterized by a hot summer and general dryness except for the south west monsoon season. The normal annual rainfall is 1141.5 mm with 83% in the period from June to September. Thus, water for ground water recharge is available only during the south west monsoon period.
3. **Demography:** The population characteristics of Rewa town for all the 45 wards are given in Table 1 below.

Table 1: Demographic Characteristics of Rewa Municipal Corporation (RMC) Area 2011

Area	Number of House-holds	Total Popu-lation	Male (%)	Female (%)	SC (%)	ST (%)	Lite-rate (%)	Male Lite-rate (%)	Female Lite-rate (%)	Wor-kers (%)	Male Wor-kers (%)	Female Wor-kers (%)
Rewa Municipal Cooporation	45275	235654	52.6	47.4	9.9	3.8	86.3	90.8	81.3	33.0	48.3	16.0

Source: Census 2011

The decadal growth rate of population is 28.6% which is fairly high and considerably above the average population growth rate for the district of 19.9% indicating that a lot of migration is taking place into the town burdening its infrastructure, especially the sanitation infrastructure. proportion of Scheduled Castes and Scheduled Tribes in the population is comparatively low while the literacy rate is quite high. There is a very high difference in the work participation rate among males and females with the former being three times that of the latter. The overall work participation rate is slightly lower at 33 percent as compared to the National rate of 35.3 percent. A more detailed demographic picture of the town comes from the ward wise density of population and distribution of the SCs and STs given in Table 2 below. The corresponding ward map of Rewa is also shown subsequently in Figure 1. Correlating the two it becomes clear that the area just east of the confluence of the Bichiya and Beehar Rivers in the centre of the town, is the most congested area. Four wards in this congested zone, Dhobia, Lohia, Rani Tal and Naya Talab shaded in pink in the table have the highest concentration of Scheduled Caste population living in highly congested slums.

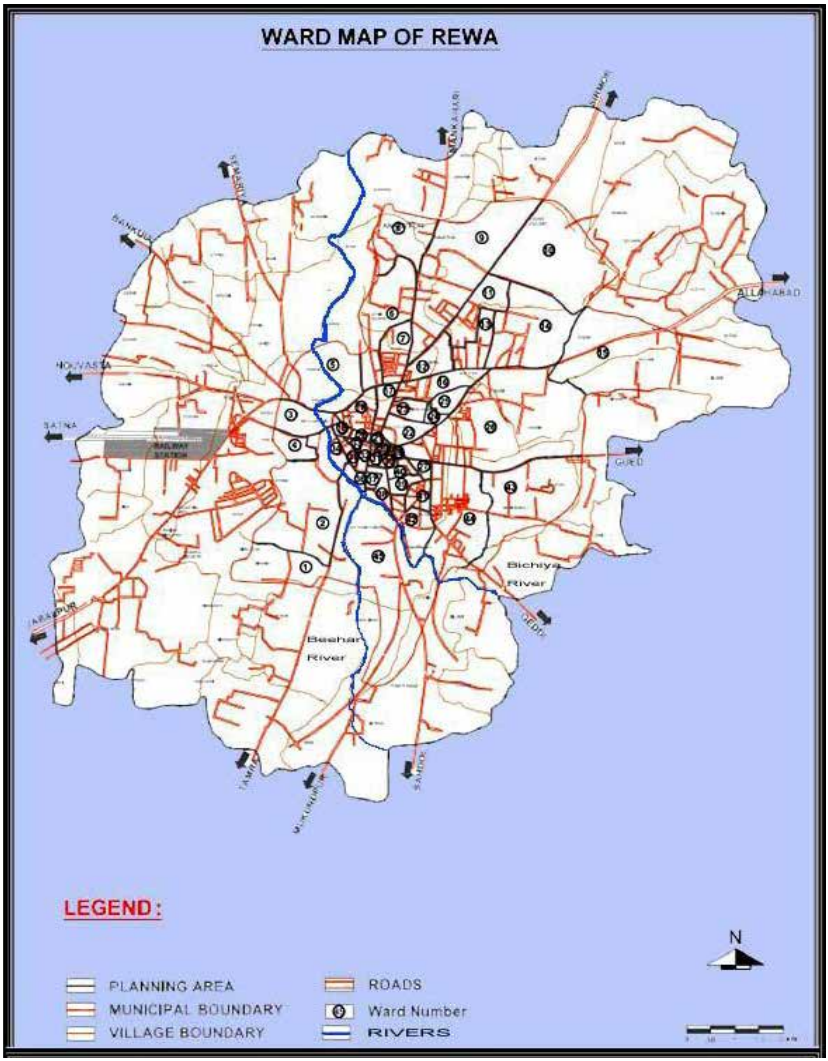
Table 2: Wardwise Demographic Characteristics of Rewa Municipal Corporation Area 2011

Ward Number	Name	Area (Ha)	No. of Hhds	Pop.	Density (Person/ Ha)	SC (%)	ST (%)
1	Nipaniya	263.8	1117	5576	21	18.0	16.6
2	Lakhouri	186.6	1330	6864	37	12.2	3.4
3	Pushpraj	160.0	1178	5932	37	12.6	6.4
4	Kushi College	1450.0	2728	13280	9	13.8	12.3
5	Jawahar	250.3	1772	8676	35	7.0	0.4
6	Sanjay	260.0	960	5261	20	6.5	2.5
7	Ranmat Singh	84.0	1078	5043	60	2.6	1.9
8	Chanakya	430.0	989	5325	12	9.8	6.1
9	Nirala Nagar	400.0	1684	8848	22	17.8	2.2
10	Anant Nagar	380.0	1468	7007	18	4.6	4.5
11	Indra Nagar	38.7	1186	5694	147	2.8	0.4
12	Bajrang Nagar	84.1	1265	6438	77	2.0	0.4
13	Nehru Nagar	49.9	1037	5015	101	2.1	1.0
14	Gangobhi	120.2	1457	6955	58	10.3	2.8
15	Shiv Nagar	575.0	2773	13714	24	11.0	4.4
16	Ravindra	71.4	1663	8354	117	2.4	4.3
17	Narendra	38.2	734	3711	97	6.0	1.1

Ward Number	Name	Area (Ha)	No. of Hhds	Pop.	Density (Person/ Ha)	SC (%)	ST (%)
18	Kothi	101.2	448	2386	24	11.3	6.9
19	Vivekananda	24.1	821	4253	176	2.7	0.7
20	Raniganj	25.2	399	2269	90	0.5	0.0
21	Rajiv	9.7	574	3262	336	7.9	0.2
22	Kasturba	35.0	612	3349	96	6.7	2.3
23	Tamhiya	16.6	703	4101	247	2.0	1.0
24	Kamsariyat	60.9	923	4681	77	3.3	10.2
25	Ekta	55.2	1125	5778	105	11.3	4.2
26	Ambedkar	370.0	1768	9202	25	9.2	7.5
27	Arjun Singh	60.0	913	5815	97	11.1	6.9
28	Dhobiya	4.0	326	1971	493	73.3	0.4
29	Pandayen	10.0	802	4515	452	5.5	0.3
30	Maulana Azad	10.5	664	4086	389	4.6	0.0
31	Tarhati	8.0	711	4029	504	2.5	0.9
32	Maliana Tola	10.5	530	3075	293	6.3	0.0
33	Mukatir	11.0	450	2504	228	0.0	0.0
34	Takiya	41.1	646	3806	93	3.7	0.7
35	Lakshmibai	25.0	530	2889	116	1.1	0.0
36	Kotwali	18.2	568	3138	172	0.8	0.8
37	Upparhati	20.0	449	2425	121	0.3	0.2
38	Lohiya	25.6	734	3784	148	33.7	1.3
39	Ranital	40.8	418	2309	57	30.7	0.0
40	Naya Talab	22.5	786	4211	187	55.5	2.8
41	Hazrat	30.5	733	3998	131	3.3	0.7
42	Jagannathji	68.5	735	4044	59	7.6	1.6
43	Chirahula	340.4	1026	5330	16	13.7	7.6
44	Lakshman	300.6	1963	9820	33	7.5	3.3
44	Kuthuliya	340.1	499	2931	9	17.0	3.6

Source: Census 2011, Rewa Municipal Corporation, 2011

Figure 1: Ward Map of Rewa



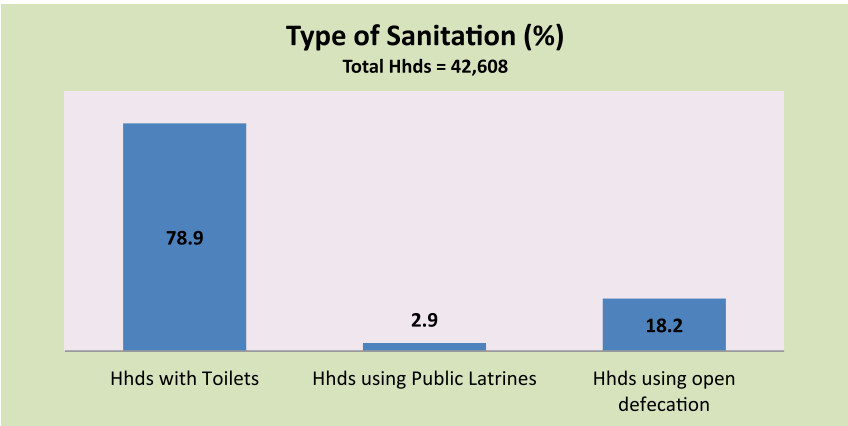
4. **Drainage:** There are lined open drains in the city which are mostly in bad shape and cover about 40 percent of the municipal area. These drains empty into nalas which finally empty into the Beehar River with the Jhiriya nala passing through the city centre being the biggest one. For the rest of the town there are only unlined drains. Both the storm water and the wastewater are drained by these drains and nalas. Consequently, during monsoons when there is heavy rain, the inner city areas get inundated by a mixture of rain and wastewater.

II. SANITATION SITUATION

There is only a limited sewerage system in the town which is not connected to any STP. One is now being laid under the Atal Mission For Rejuvenation and Urban Transformation (AMRUT) along with sewerage treatment plants (STP). One STP has already been constructed under the National River Conservation Plan (NRCP) but is yet to be operationalised. Thus, in some houses sewerage is being released directly into the open drains whereas in most houses this was being directed into septic tanks. Those septic tanks which have a concrete floor are emptying their outflow into the open drains. There are some private and Government residential colonies with sewerage lines but these are also emptying into one of the many nalas and have not been connected to an STP.

There is no current data with the Rewa Municipal Corporation on how much of the sewerage is being discharged directly into open drains and how much of it is being directed first into septic tanks. The number of households with latrine facility has gone up subsequently due to the implementation of the Swachh Bharat Mission from 2015 onwards with 5,239 idividual household toilets having been constructed and 46 under construction out of a total sanction of 7,457 (SBM, 2017). Due to lack of space in the congested slums there are still a significant number of households without toilets who are going to public toilets or are resorting to open defecation. Rewa was ranked 38th in India in the Swachh Sarvekshan Survey 2017. The Census 2011 Household data are given in the following charts.

Figure 2. Type of Sanitation Available in Rewa Municipal Corporation Area 2011



A very high proportion of 78.9 percent of households were being served by toilets in 2011 and as mentioned earlier, this proportion has increased due

to the implementation of the SBM since 2015 with the construction of 5,239 household toilets. The data with regard to the disposal of the wastes from the households that have toilets is given in Figure 3 below. A high proportion of 73.6 percent of the households relied on septic tanks while there was sewerage for 19.6 percent of households. Figure 4 below gives the data on the disposal of the wastewater from the kitchen and bathroom. Only 30.7 percent of households were disposing their wastewater into closed drains. Most households, 40 percent, were disposing the wastewater into open drains while 29.3 percent had no drains for disposing their wastewater and it was collecting near their houses to seep into the ground. These drains as mentioned earlier are also carrying away the septic tank effluent outflow.

Figure3: Disposal of Toilet Waste in Rewa Municipal Corporation Area 2011

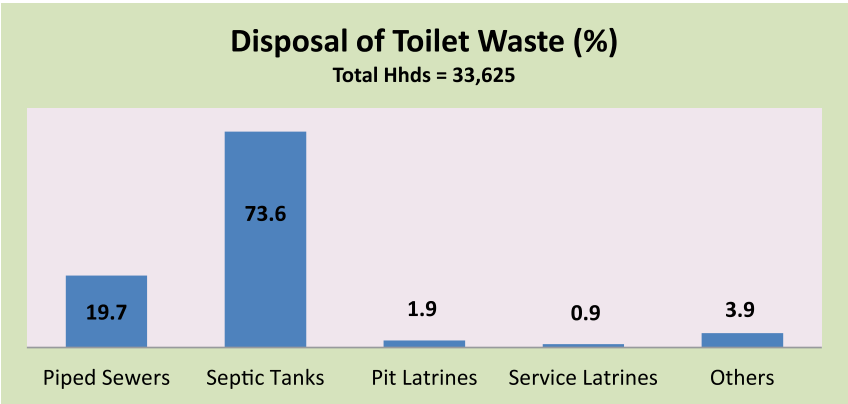
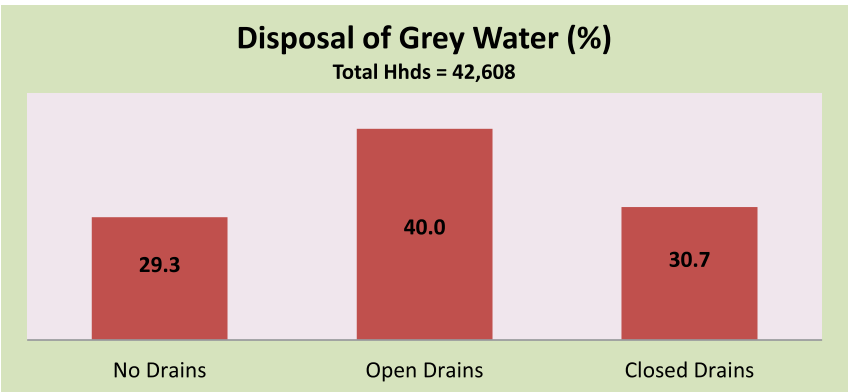


Figure 4: Disposal of Grey Water in Rewa Municipal Corporation Area 2011



The sanitation situation in Rewa is thus a matter for concern and needs appropriate interventions for its proper amelioration.

III. EXISTING SANITATION PLANNING

The Rewa Town Plan 2021 (DTCPMP, 2010) has a brief paragraph that states that there is no sewerage system in the town and does not have any provisions for improvement of the sanitation situation. The City Development Plan prepared as part of the JNNURM (DMGC, 2011) has the following provisions -

1. The current wastewater generation is estimated at 30 MLD rising to 60 MLD by 2035.
2. Development of a sewerage network and STPs for treating the collected sewerage.
3. Interception of all drains flowing into the Beehar and Bichiya Rivers and direction of their flow to the STPs for proper treatment along with river front development.
4. Use of biochemical treatment technologies for STPs which require less land and less operation and maintenance costs.
5. Provision of individual toilets for all households within five years.
6. Provision of community toilets in all busy public locations and also congested slum areas where individual toilets may not be feasible and have these managed by communities with greater awareness and mobilisation.
7. Costs of wastewater collection and treatment should be met by a combination of the sale of treated water and the levying of adequate user charges.

IV. SEPTAGE MANAGEMENT

The ground survey of septage management was done by conducting group discussions with the residents and inspecting the septage management procedures in a selected sample of ten wards. These wards were selected in consultation with staff of the NGO, Anupama Education Society, which is involved in implementing an HIV-AIDs support programme in the slums of the town. Wards were chosen keeping in mind the following criteria -

1. They are located in the main congested areas of the town
2. There is a high concentration of Scheduled Castes living in the slums.

Discussions were held with people living in slums and also in regularised built up colonies. The wards chosen were as follows –

Table 4: Sample Wards Chosen for Survey

Ward No.	Ward Name	Locality Name
5	Jawahar	Dekha Mohalla
7	Ranmat Singh	Khutehi
10	Anant Nagar	Shivnagar
19	Vivekanand Nagar	Narendra Nagar
26	Ambedkar Nagar	Pokhri Tola
28	Dhobia	Dhobia Basti
39	Rani Tal	Rani Tal Basti
40	Naya Talab	Banso d Basti
41	Hazrat	Takiya Mohalla
43	Chirahula	Chirahula Basti

The slums had mostly single pit latrines which had been built recently with grants from the Municipal Corporation under the Swachch Bharat Mission and which are not likely to last very long given their small size. Many residents complained that despite their names having been enrolled for toilets, they had not got the same. Some of the houses in the slums which had a little space had septic tanks without concrete floors with the outflow flowing into the gutters in front of the houses. This was also the case with the built up houses in the colonies nearby with only a few having concrete floors for the septic tanks and none having soakpits.

In the slums many households do not have latrines so they have to depend on community toilets. Since these charge money at Rs 5 per use, there is still some open defecation going on by the very poor who cannot afford the charges. The community toilets too are not managed properly and release their outflow of faeces and wastewater into open drains. Consequently the gutters and open drains are filled with sewerage and pigs are roaming in them feasting on the faeces as shown in Figure 5.

Figure 5. Open drain with Pigs feeding on faeces in Rani Tal Ward

The Rewa Municipal Corporation has only one septic tank cleaning vehicle and it charges Rs 1500 per trip and is not easily available. So mostly people rely on groups of Dalit cleaners who clean the septic tank by hand and dump the septage in the open drains which is in clear violation of The Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013. One such group of Dalits have a tractor cum tanker system fitted with a suction pump for cleaning purposes. These vehicles including the one from the Rewa Municipal Corporation also empties its septage into one of the many nalas.

Thus, the polluted water from these open drains and the septage not only contaminates the surface water but also the ground water. Tests were carried out on various surface water and ground water sources for the following nine parameters –

BOD – Biochemical Oxygen Demand, TDS – Total Dissolved Solids, TSS – Total Suspended Solids, DO – Dissolved Oxygen, TC – Total Coliform, FC – Faecal Coliform, FS – Faecal Streptococci, AN – Ammoniacal Nitrogen, TN – Total Nitrogen

The results of these tests are given below -

a. Table 5 gives the water test results for the Open Well in Rani Tal slum which has an open drain going near it as shown in Figure 6.

Table 5: Test Results of Open Well Water in Rani Talab Basti

Test	BOD mg/l	TDS mg/l	TSS mg/l	DO mg/l	TC	FC	FS	AN mg/l	TN mg/l
					Most Probably No per 100 ml				
Observed Value	1	880	8	5.2	TNTC*	TNTC	Absent	1.7	6.2
Permissible Value for Class A Water Sources (IS:2296) except for TSS	3	500	20	>5	50	50	50	Absent	Absent

*Too Numerous to Count

Clearly, the ground water in the unconfined phreatic aquifer is contaminated and not fit for drinking as it does not meet the permissible standards with regard to coliform, ammonia and nitrogen which are all present when they shouldn't be. Total Dissolved Solids are also above the permissible level.

Figure 6: Open Well in Rani Tal Basti

b. Borewell in Urrhat on National Highway 7 in an area that is an up market commercial and residential area. The water test results are given in Table 6 below.

Table 6: Test Results of Bore Well Water in Urrhat

Test	BOD mg/l	TDS mg/l	TSS mg/l	DO mg/l	TC	FC	FS	AN mg/l	TN mg/l
					Most Probably No per 100 ml				
Observed Value	3	670	8	5.7	TNTC	TNTC	TNTC	1.1	4.4
Permissible Value for Class A Water Sources (IS:2296) except for TSS	3	500	20	>5	50	50	50	Absent	Absent

The confined aquifer water quality is even worse than that of the unconfined aquifer as even faecal streptococci are present in addition to all the other pollutants that were there in the open well water.

c. Ratahara Pond on National Highway 7 is one of the bigger water bodies of the town surrounded by built up areas releasing sewerage into it and it also has a slum settled on its embankment with toilets constructed on this as shown in Figure 7.

Figure 7 : v on National Highway 7

The water quality parameters for the pond water are given in Table 7 below

Table 7: Test Results of Ratahra Pond Water

Test	BOD mg/l	TDS mg/l	TSS mg/l	DO mg/l	TC	FC	FS	AN mg/l	TN mg/l
					Most Probably No per 100 ml				
Observed Value	3	80	18	4.9	TNTC	TNTC	TNTC	0.3	3.6
Permissible Value for Class A Water Sources (IS:2296) except for TSS	3	500	20	>5	50	50	50	Absent	Absent

The pond water has dissolved solids within permissible limits but dissolved oxygen is slightly less than the permissible level. As before total coliforms, faecal coliforms, faecal streptococci, ammonia and nitrogen are present as pollutants contaminating the water considerably.

d. Chirahula Pond is another major water body in the town with a temple on its banks and situated in a densely populated area and with wastewater from a toilet flowing into it as shown in Figure 8.

Figure 8 : Chirahula Tank

The test results for the pond water are given in Table 8 below.

Table 8: Test Results of Chirahula Pond Water

Test	BOD mg/l	TDS mg/l	TSS mg/l	DO mg/l	TC	FC	FS	AN mg/l	TN mg/l
					Most Probably No per 100 ml				
Observed Value	2	112	6	6.9	TNTC	TNTC	TNTC	Absent	11
Permissible Value for Class A Water Sources (IS:2296) except for TSS	3	500	20	>5	50	50	50	Absent	Absent

Here the water is a little better as only Nitrogen and the coliform and streptococci are present but even so the water is contaminated.

e. Rani Tal Pond is the biggest water body in Rewa and it is also very well maintained. Due to a campaign carried out by the NGO React from 1998 onwards when 36 children died after drinking the water from the handpumps near the pond, which included petitioning the Governor, the Rewa Municipal corporation was forced to initiate action to improve the quality of the water in the pond. A boundary was constructed, nalas draining into the pond were diverted and plantation was taken up on the embankment to beautify it. Consequently, the pond is now well maintained and serves as a environmental recreation spot for the citizens as shown below in Figure 9. However, due to its location in a congested area, considerable amount of polluted water seeps in from the ground surrounding the pond and that contaminates the water.

Figure 9. Rani Tal Pond

The results of the testing of water are given in Table 9 below.

Table 9: Test Results of Rani Tal Pond Water

Test	BOD mg/l	TDS mg/l	TSS mg/l	DO mg/l	TC	FC	FS	AN mg/l	TN mg/l
					Most Probably No per 100 ml				
Observed Value	8	100	10	5.1	TNTC	TNTC	TNTC	0.3	4.7
Permissible Value for Class A Water Sources (IS:2296) except for TSS	3	500	20	>5	50	50	50	Absent	Absent

The biochemical oxygen demand is higher than the permissible limit and both coliform and streptococci are present as are ammonia and nitrogen thus indicating that despite all the efforts to the contrary, pollution of the water in the tank is still continuing.

f. The Jhiriya nala is the main drain of the town which carries most of the wastewater in the central congested area into the Beehar River as shown in Figure 10 below

Figure 10: Jhiriya Nala

The water test results for Jhiriya Nala are given in Table 10 below along with the water test results of the Beehar River into which the Jhiriya nala drains.

Table 10: Test Results of Jhiriya Nala and Beehar River Water

Test		BOD mg/l	TDS mg/l	TSS mg/l	DO mg/l	TC	FC	FS	AN mg/l	TN mg/l
						Most Probably No per 100 ml				
Observed Value	Jhiriya Nala	24	550	60	0	TNTC	TNTC	TNTC	12.3	29.4
	Beehar River	2	150	14	5.4	TNTC	TNTC	Absent	1.4	4.1
Permissible Value for Class A Water Sources (IS:2296) except for TSS		3	500	20	>5	50	50	50	Absent	Absent

The water samples were collected during the monsoon season when it was raining so there was a considerable flow in both the Jhiriya nala and the Beehar River from rainfall runoff and ground water inflow which diluted greatly the contamination due to the wastewater flowing into these drainages. Nevertheless, the Jhiriya nala water was heavily polluted with very high values away from the permissible limits for all the parameters. The Beehar River despite its huge flows still had contamination from coliform, ammonia and nitrogen indicating that the faecal pollution of this water source is quite high from all the sewerage that is flowing into it untreated. The results of these tests clearly establish that the sewerage and septage management is environmentally unsustainable at present and pose a serious health threat to the population of the town from the use of the ground and surface water for their daily needs.

V. ONGOING SEWERAGE PROJECT

A project for laying sewerage line and constructing sewerage treatment plants in Rewa has been sanctioned under the Atal Mission for Urban Rejuvenation and Transformation with a total budget of Rs 214 Crores to be implemented between June 2017 and June 2020 . This project has just started so it will take some time for it to be completed. The details are as follows –

a. Main and Lateral Sewer Pipelines – 728 kms.
b. House connection Pipelines – 228 kms.
c. Manholes – 17240 numbers
d. Sewerage Treatment Plants – 7 numbers with cumulative capacity of 25 Million Litres per Day (MLD) with details as given in Table 11 below. The two technologies being used are the Sequencing Batch Reactor (SBR) and

the Phytorid which both require less space and lesser energy and other inputs for operation.

Table 11: Details of STPs to be constructed under Rewa Sewerage Project

Zone No.	Location	STP No.	Capacity (MLD)	STP Type
1	Padhampur Colony	1	6	SBR
	Khairi Nayi Basti	2	1	Phytorid
	Bakiya Colony	3	1	Phytorid
2	Bakiya Colony	3	1	Phytorid
	Sirmour Road	4	1	Phytorid
	Bichhiya	5	6.5	SBR
3	Vivekanand Nagar	6	6.5	SBR
4	Azgarha	7	3	SBR

Source: Rewa Municipal Corporation

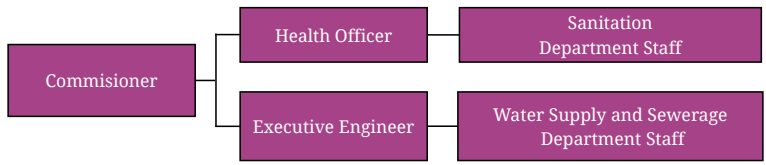
Figure 11 : 12 MLD Sewerage Treatment Plant near Forest Range Office Rewa

Apart from this another STP of capacity 12 MLD has been constructed under the National River Conservation Plan on the banks of the Beehar River near the Forest Range Office. This has been built with the Activated Sludge Technology which requires considerable space and much more energy for operation as shown in Figure 11. However, due to the lack of sewerage lines there is no inflow at present and this plant is not being operated.

VI. STAFFING OF SANITATION DEPARTMENT OF REWA MUNICIPAL CORPORATION

The Rewa Municipal Corporation is headed by a Commissioner. there is an executive engineer and an assistant engineer to look after the various engineering functions including the laying of sewers and the operation of the STP. A health officer is in charge of the sanitation functions which are carried out by various staff of the sanitation department. This has been shown in an organogram in Figure12 below

Figure 12: Organogram of Rewa Municipal Corporation Related to Sanitation



The staff strength of the Health and Sanitation Department of the Rewa Municipal Corporation is grossly inadequate. The sanctioned strength and the actual employment is given in Table 12 below. Clearly there is severe understaffing of the sanitation department which is affecting the provision of sanitation services, especially to the slum areas.

Table 12: Staffing of Health and Sanitation Department of Rewa Municipal Corporation

Post	Sanctioned Staff	Actual Posting
Health Officer	1	0
Assistant Health Officer	3	0
Chief Sanitation Inspector	5	0
Sanitation Inspector	9	2
Sanitation Supervisor	9	2
Assistant Sanitation Supervisor	31	8
Sanitation Workers (Permanent)	471	471
Sanitation Workers (Contractual)		287

Source: Rewa Municipal Corporation

There has been under posting of staff for quite some time now and what little posting is there is getting reduced further as no new appointments are being made as the old staff retire. The charge of the Health and Sanitation Department is with an officer of another department and effectively the two sanitary inspectors are running the operations. Even though the full complement of Sanitation Workers are there, they are not adequate to serve the increased needs so contractual workers have also been employed.

VII. REVIEW OF FINANCES OF REWA MUNICIPAL CORPORATION

The overall Finances of the Rewa Municipal Corporation for the years 2016-17 and 2017-18 are given in Table 13 below.

Table 13: Overall Finances of Rewa Municipal Corporation 2016-17 & 2017-18

Item	2016-17 (Rs Lakhs)	2017-18 (Rs Lakhs)	Per Capita for 2017-18* (Rs)
Revenue Receipts	12701.73	8075.76	3106
Revenue Expenditure	7503.31	7246.73	2787
Revenue Surplus	5198.42	829.23	
Cap Receipts	7353	33683.76	12955
Cap Expenditure	9169.24	37250.68	14327
Cap Deficit	1816.24	3566.92	

Source: Rewa Municipal Corporation

*Calculated by assuming a cumulative population growth rate of 10% from 2011-2017

There was a higher budget estimate for Revenue Receipts in 2016-17 which was not met by actuals so this was lowered to a more realistic estimate for 2017-18 resulting in a much lower revenue surplus of only Rs 829.23 lakhs. The Capital Receipt and Expenditure estimates for 2017-18 are much higher because of the investment being made under the Atal Mission for Rejuvenation and Urban Transformation. While the capital expenditure is satisfactory for the time being due to the AMRUT investment, the revenue mobilisation and expenditure is very poor and insufficient for providing proper services and generating enough surpluses to fund capital expenditure in future. A break up of the revenue receipts is given in Table 14 below.

Table 14: Revenue Receipts of Rewa Municipal Corporation 2016-17 & 2017-18

Item	2016-17 Estimates (Rs Lakhs)	2016-17 Actuals (Rs Lakhs)	2016-17 Shortfall of Actuals to Estimates (%)	2016-17 Shortfall of Estimates (%)
Taxes	1361.09	861	36.7	3063.09
State Government Grants	6735.95	345.8	94.9	899.98
Leases	692.55	311.55	55.0	492.53
Sales Cess	13.75	11.85	13.8	31.55
Other Grants	160	0.5	99.7	98.16
Interest	35	15	57.1	17.7

Item	2016-17 Estimates (Rs Lakhs)	2016-17 Actuals (Rs Lakhs)	2016-17 Shortfall of Actuals to Estimates (%)	2016-17 Shortfall of Estimates (%)
Octroi Compensation	2195.99	1719.17	21.7	1950
Electricity	533	201.64	62.2	820.5
Others	63.5			40

Source: Rewa Municipal Corporation

There is a huge shortfall in the actual amount of State Government Grants for 2016-17 so a more realistic amount has been budgeted for 2017-18 though even that is not likely to be met. Octroi compensation given by the State Government in lieu of the Municipal Corporation foregoing the levying of Octroi is the biggest source of revenue being double of taxes collected. Among taxes, property taxes at Rs 580 lakhs constituted the biggest revenue earner in 2016-17 but there was a shortfall of 24.3 percent in this. There was also a shortfall of 61 percent in water tax collection. What is of major concern is that property tax constitutes just 10.8 percent of the total budgeted revenue receipts for 2017-18 when it should be at least 25 percent as mandated by the guidelines for urban local boides that had been prescribed by the Jawaharlal Nehru Urban Renewal Mission. The actual per capita property tax collection in 2016-17 was a dismal Rs 168 when it should be at least Rs 500 as per the guidelines of the JNNURM. The revenue expenditure details are given in Table 15 below.

Table 15: Revenue Expenditure of Rewa Municipal Corporation 2016-17 & 2017-18

Item	2016-17 Estimates (Rs Lakhs)	2016-17 Actuals (Rs Lakhs)	2016-17 Shortfall of Actuals to Estimates (%)	2016-17 Shortfall of Estimates (Rs Lakhs)
Establishment	2949.35	2305.5	21.8	2858.21
Administration	426.7	156.86	63.2	312.7
Operation & Maintenance	3741.05	783.72	79.1	3645.1
Interest	97	85.76	11.6	196.92
Others.	289	34.5	88.1	21.8

Source: Rewa Municipal Corporation

Most notable here is the huge shortfall of 79.1 percent in the O&M expenditures followed by 63.2 percent shortfall in the administration expenditures indicating that there is heavy understaffing of the leadership of the organisation

accompanied by poor operation and maintenance. The dependence on grants from the Central and State Governments as opposed to resource mobilisation on its own through taxes and especially property taxes is of concern from the point of view of financial sustainability. The budgeting has been done in a very unprofessional manner so that the administration cannot easily draw any conclusions for better financial performance. The above data clearly show that the finances of the corporation are unsustainable and inadequate. Since the poor are unable to pay for services from private sources to improve their sanitation, this under spending by the municipal corporation adversely affects their well being so it is inequitable as well.

VIII. CONCLUSIONS

We can conclude as follows from the foregoing review of the overall sanitation situation in Rewa Municipal Corporation Area -

1. There is inadequate provision of sanitation services especially with regard to septage and faecal sludge management. There is gross violation of both the Water (Prevention and Control of Pollution) Act 1974 and The Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013 as mostly the septic tanks are being cleaned manually and the septage being disposed of into nalas and surface water bodies and due to open drains the wastewater is also seeping into the ground.
2. The slums are badly served or not served at all. The pit latrines that have been built are all single pit ones that will not last very long. Open defecation is still going on because the poor who do not have toilets cannot pay the user charges of the public latrines.
3. The tests carried out on water samples clearly indicate that both the surface water and ground water are highly contaminated so unhealthy. The situation may improve with the implementation of the sewerage project but it is unlikely that the new system will be properly maintained or even operationalised. Thus, the septage and faecal sludge management systems currently in place are environmentally unsustainable.
4. The finances of the Rewa Municipal Corporation are in a precarious state and are highly unsustainable being reliant on grants from the Central and State Governments for both capital and revenue expenditure. This has led to the provision of inadequate sanitation services and also as a result, an inequitable situation for the poor who are unable to procure sanitation services themselves from private operators by paying for them.
5. The method of maintaining accounts of the municipal corporation is unprofessional so that it is not possible to get information immediately as to whether revenues and expenditures are sustainable and equitable. Consequently budgeting is done mechanically without taking into account the actual performance in revenue mobilisation and the ways in which it can be improved.

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Annexure III
Septage Management Factsheet
Sheopur

1. **Location:** Sheopur is a small district town of the Gird region in the North Western part of Madhya Pradesh located at 25^{0}40'N latitude and 76^{0}44'E longitude. It is situated 210 kms away from the city of Gwalior which is the headquarters of the Division and is connected to it by road and narrow gauge rail. It is situated 400 kms away from the capital city of Bhopal and is connected to it by road.
2. **Terrain, Geology and Climate:** The town is situated on a hilly outcrop sloping northwards surrounded on the right bank of the Seep river which drains into the Chambal River further north and is part of the Ganga Basin. An irrigation canal from the Chambal dam forms the northern boundary of the town. The soil is partly alluvial and partly formed by erosion of shale, limestone and sandstone. The underlying rock structure is Vindhyan shale, limestone and sandstone with jointed and fractured sandstone being the ground water bearing layer with limited porosity. The premonsoon water level is about 4 m below ground level while the post monsoon water level is about 0.6 m below ground level.

   The climate is characterized by a hot summer and general dryness but for the south west monsoon season. The normal annual rainfall is 944 mm with 92% in the period from June to September. Thus, water for ground water recharge is available only during the south west monsoon period.
3. **Demography:** The population characteristics of Sheopur town are given in Table 1 below.

Table 1: Demographic Characteristics of Sheopur Municipality Area 2011

Area	Number of House-holds	Total Popu-lation	Male (%)	Female (%)	SC (%)	ST (%)	Lite-rate (%)	Male Lite-rate (%)	Female Lite-rate (%)	Wor-kers (%)	Male Wor-kers (%)	Female Wor-kers (%)
Sheopur	13724	71951	52.3	47.7	14.6	3.4	73.1	81.9	63.3	30.5	48.7	10.5

Source: Census 2011

The decadal growth rate of population is 23.3% which is moderate and only slightly above the average population growth rate for the district of 22.9%.

The proportion of Scheduled Castes in the population is almost equal to the national average, while that of Scheduled Tribes is comparatively low and the literacy rate is high. There is a very high difference in the work participation rate among males and females with the former being four and a half times the latter. The overall work participation rate is lower at 30.5 percent as compared to the National rate of 35.3 percent. There are 21 wards and those with greater presence of the SCs and STs are given in Table 2 below. The ward map of Sheopur is given in Figure 1.

Table 2: Wardwise Demographic Characteristics of Sheopur Municipality Area 2011

Ward Number	Name	Area (Ha)	No. of Hhds	Pop.	Density (Person/ Ha)	SC (%)	ST (%)
2	Sant Kabir	18	341	2027	113	42.7	0.0
10	Ambedkar	31	968	5061	163	20.9	1.4
11	Munshi Md. Husain	54	2995	15269	283	24.8	1.2
12	Vinoba Bhave	46	966	4903	107	9.6	18.2
15	Malviya	6	636	3170	528	41.5	7.8
18	Kidwai	2	277	1514	757	18.8	4.4

Source: Sheopur Municipality

Figure 1: Ward Map of Sheopur

4. **Drainage:** There are lined open drains in the town which are in bad shape mostly and cover the whole of the municipal area. These drains empty into nalas which finally empty into the Seep River. Both the storm water and the wastewater are drained by these drains and nalas. Consequently, during monsoons when there is heavy rain, the congested areas get inundated by a mixture of rain and wastewater.
5. **Sanitation Situation:** There is no sewerage system in the town except in some of the new private colonies where too the outflow is released without treatment into open drains. Most of the sewerage is treated in Septic Tanks and these have soil base resulting in the seeping of the sewerage water into the ground. A very few septic tanks have soak pits. In some houses sewerage is being released directly into the open drains. Some amount of open defecation is also there.

   The Census 2011 data on sanitation services available in the town are given in Figure 2, 3 and 4. The number of households with latrine facility has gone up subsequently due to the implementation of the Swachh Bharat Mission with the construction of 1,000 toilets and another 600 yet to be constructed but due to lack of space in the congested slums there are still a significant number of households without toilets who are either going to public toilets or are resorting to open defecation.

Figure 2. Type of Sanitation Available in Sheopur Municipality Area 2011

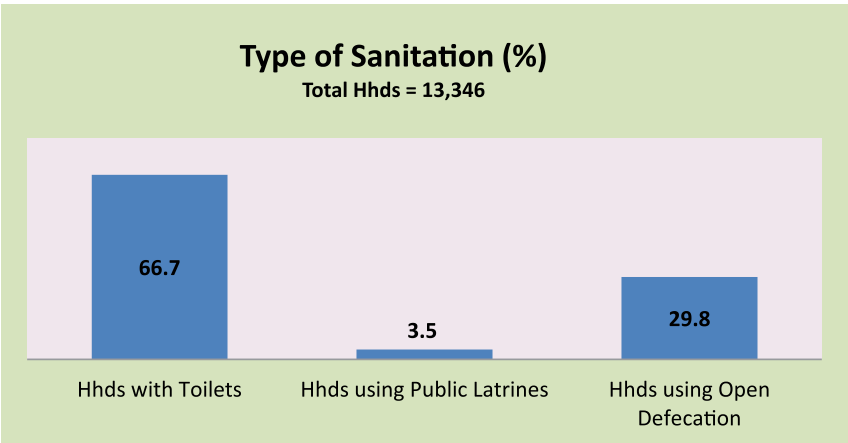


Figure3: Disposal of Toilet Waste in Sheopur Municipality Area 2011

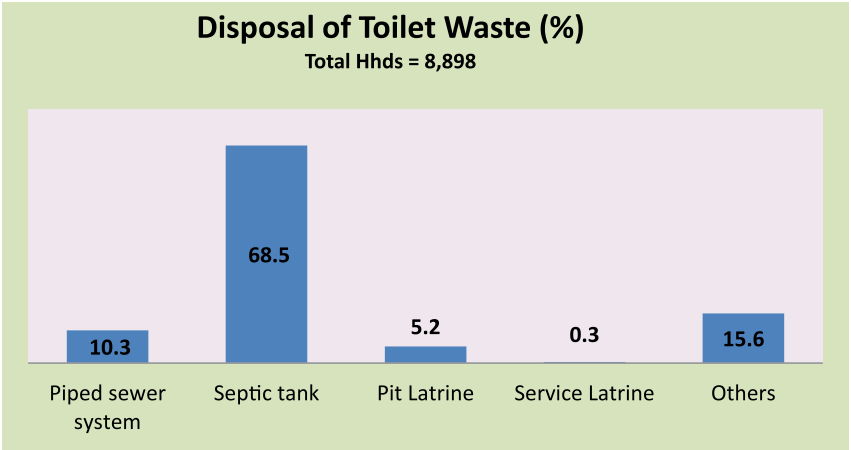
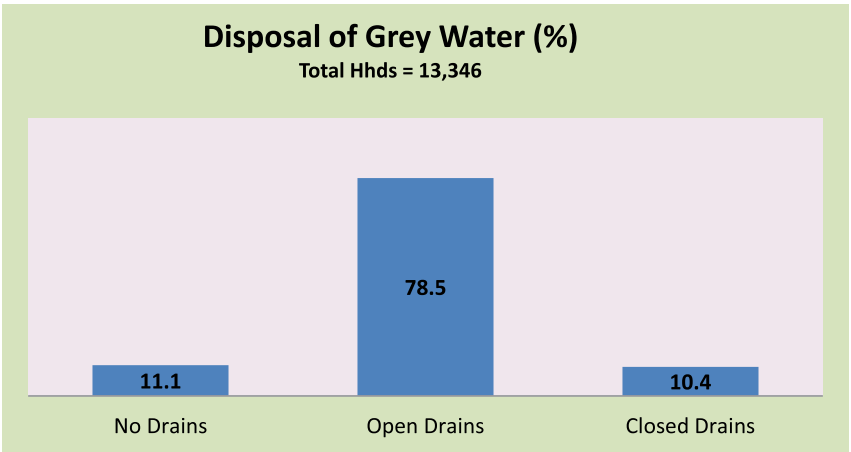


Figure 4: Disposal of Grey Water in Sheopur Municipality Area 2011



6. **Septage Management**: The ground survey of septage management was done by conducting group discussions with the residents and inspecting the septage management procedures in a selected sample of ten wards. These wards were selected in consultation with staff of the NGO, Mahatma Gandhi Seva Ashram, which is involved in implementing education and child rights programmes in the slums of the town. Wards were chosen in the main congested areas of the town and from those areas where there is a high concentration of Scheduled Castes and Scheduled Tribes. Discussions were held with people living in slums and also in middle and high end housing.

The slums had mostly single pit latrines which had been built recently with grants from the Municipality under the Swachh Bharat Mission. Many residents complained that despite their names having been enrolled for toilets, they had not got the same. The middle and high end houses release their wastewater both grey and black into the open drains and these are in fairly bad shape. Even the residential colony of the Irrigation Department in Subhash ward has wastewater festering in open drains without treatment. Consequently, the gutters and open drains are filled with sewerage and pigs are roaming in them feasting on the faeces. The public toilets too are not managed properly and release their outflow from the septic tanks into open drains. People rely on groups of Dalit cleaners who clean the septic tanks by hand and dump the septage in the open drains.

7. **Water Quality:** The polluted water not only contaminates the surface water but also the ground water. Tests were carried out on various surface and ground water sources and the results are given in Table 3 below. The various parameters that have been tested are –
BOD – Biochemical Oxygen Demand, TDS – Total Dissolved Solids, TSS – Total Suspended Solids, DO – Dissolved Oxygen, TC – Total Coliform, FC – Faecal Coliform, FS – Faecal Streptococci, AN – Ammoniacal Nitrogen, TN – Total Nitrogen

Table 3: Test Results of Water

Test	BOD mg/l	TDS mg/l	TSS mg/l	DO mg/l	TC	FC	FS	AN mg/l	TN mg/l
					Most Probably No per 100 ml				
Open Well in Fort	2	140	12	5.5	TNTC*	TNTC	TNTC	1.5	4.5
Borewell on Pali Road	1	240	8	8	Absent	Absent	Absent	1.5	7.5
Seep River Upstream	1	60	9	7.9	TNTC	TNTC	TNTC	1.5	7.5
Seep River Downstream	1	320	8	6.9	TNTC	TNTC	TNTC	1.5	12
Nala Water	16	360	60	1	TNTC	TNTC	TNTC	1.5	3
Permissible Value (IS:2296)	3	500	20	>5	50	50	50	Absent	Absent

*Too Numerous To Count

The results of the river, nala and groundwater tests show that there is considerable contamination due to the lack of proper treatment of the wastewater in Sheopur.

8. **Review of Municipal Finances:** The overall Finances for the year 2016-17 are given below.

Table 4: Overall Finances of Sheopur Municipality 2017-18

Item	2017-18 (Rs Lakhs)	Per Capita for 2017-18* (Rs)
Revenue Receipts	2112.40	2669
Revenue Expenditure	2112.12	2668
Revenue Surplus	0.28	
Capital Receipts	3800.0	4801
Capital Expenditure	3800.0	4801
Capital Deficit	0	

Source: Sheopur Municipality

*Calculated by assuming a cumulative population growth rate of 10% from 2011-2017

The Capital Receipt and Expenditure estimates are much higher than the revenue estimates because these are all being provided by the State and Central Governments under various schemes. The capital expenditure despite being higher is inadequate given the very bad sanitation situation in the town. The revenue mobilisation and expenditure is very poor and insufficient for providing proper services and there is no prospect of generating enough surpluses to fund capital expenditure in future. A break up of the revenue receipts is given in Table 5 below.

Table 5: Revenue Receipts of Sheopur Municipality 2017-18

Item	2017-18 Estimates (Rs Lakhs)
Taxes	97.25
Water Cess	306.0
Octroi Compensation	833.0
Leases	735.0
Others	140.87

Source: Sheopur Municipality

Octroi compensation given by the State Government in lieu of the municipality foregoing the levying of Octroi, export and passenger taxes is the biggest source of revenue being more than eight times that of taxes collected. Among taxes, property registration tax at Rs 50 lakhs constituted the biggest source of revenue. What is of major concern is that property

tax at Rs 30 lakhs, constitutes just 1 percent of the total budgeted revenue receipts for 2017-18 when it should be at least 25 percent as mandated by the guidelines for urban local boides that had been prescribed by the Jawaharlal Nehru Urban Renewal Mission. The per capita property tax collection estimate is a dismal Rs 38 when it should be at least Rs 500 as per the guidelines of the JNNURM. The revenue expenditure details are given in Table 6 below.

Table 6: Revenue Expenditure of Sheopur Municipality 2017-18

Item	2017-18 Estimates (Rs Lakhs)
Establishment	471.0
Operation & Maintenance	1601.12
Others.	40.0

Source: Sheopur Municipality

The budgeting has been done in a very unprofessional manner as the previous year's estimates and actual expenditures are not mentioned. Consequently, it is not possible to draw any conclusion regarding the actual performance of the Municipality with regard to revenue mobilisation and expenditures. However, the dismal per capita revenue mobilisation and expenditures clearly show that the finances of the municipality are unsustainable and inadequate and it is excessively dependent on grants from the Central and State Governments.

9. **Conclusions**: The sanitation situation with respect to faecal sludge and septage management in the town of Sheopur is currently in a sorry state with inadequate provision of services. The tests carried out on water samples clearly indicate that both the surface water and ground water are contaminated. There is currently no plan of the Municipality to improve this situation.

Septage Management in **Sheopur**

I. INTRODUCTION

The general information about the town of Sheopur, Madhya Pradesh is as follows.

1. **Location:** Sheopur is a small district town of the Gird region in the North Western part of Madhya Pradesh located at $25^0$40'N latitude and $76^0$44'E longitude. It is situated 210 kms away from the city of Gwalior which is the headquarters of the Division and is connected to it by road and narrow gauge rail. It is situated 400 kms away from the capital city of Bhopal and is connected to it by road.
2. **Terrain, Geology and Climate:** The town is situated on a hilly outcrop sloping northwards surrounded on the right bank of the Seep River which drains into the Chambal River further north and is part of the Ganga Basin. An irrigation canal from the Chambal dam forms the northern boundary of the town. The soil is partly alluvial and partly formed by erosion of shale, limestone and sandstone. The underlying rock structure is Vindhyan shale, limestone and sandstone with jointed and fractured sandstone being the ground water bearing layer with limited porosity. The premonsoon water level is about 4 m below ground level while the post monsoon water level is about 0.6 m below ground level.

   The climate is characterized by a hot summer and general dryness but for the south west monsoon season. The normal annual rainfall is 944 mm with 92% in the period from June to September. Thus, water for ground water recharge is available only during the south west monsoon period.
3. **Demography:** The population characteristics of Sheopur town for all the 21 wards are given in Table 1 below.

Table 1: Demographic Characteristics of Sheopur Municipality Area 2011

Area	Number of Households	Total Population	Male (%)	Female (%)	SC (%)	ST (%)	Literate (%)	Male Literate (%)	Female Literate (%)	Workers (%)	Male Workers (%)	Female Workers (%)
Sheopur Municipality	13724	71951	52.3	47.7	14.6	3.4	73.1	81.9	63.3	30.5	48.7	10.5

Source: Census 2011

The decadal growth rate of population is 23.3% which is moderate and only slightly above the average population growth rate for the district of 22.9%. The proportion of Scheduled Castes in the population is almost equal to the

national average, while that of Scheduled Tribes is comparatively low and the literacy rate is also high. There is a very high difference in the work participation rate among males and females with the former being four and a half times that of the latter. The overall work participation rate is lower at 30.5 percent as compared to the National rate of 35.3 percent. A more detailed demographic picture of the town comes from the ward wise density of population and distribution of the SCs and STs given in Table 2 below. The corresponding ward map of Sheopur is also shown in Figure 1. Correlating the two it becomes clear that the area south of the Shivpuri Road from its crossing with the Sawai Madhopur Road down to the Fort area on the banks of the Seep River is the most congested. Five wards in this congested zone, Sant Kabir, Ambedkar, Munshi Md. Husain, Malviya and Kidwai wards shaded in pink in the table have the highest concentration of Scheduled Caste population living in highly congested conditions and one ward shaded in mauve, Vinoba Bhave, has a high concentration of Scheduled Tribes.

Table 2: Wardwise Demographic Characteristics of Sheopur Municipality Area 2011

Ward Number	Name	Area (Ha)	No. of Hhds	Pop.	Density (Person/ Ha)	SC (%)	ST (%)
1	Maulana Azad	29	681	3793	131	2.7	1.4
2	Sant Kabir	18	341	2027	113	42.7	0.0
3	Lokmanya Tilak	6	298	1565	261	1.4	0.3
4	Mahavir Swami	3	210	1186	395	0.5	0.0
5	Jawahar	3	252	1360	453	1.9	0.1
6	Rajendra	8	384	1987	248	0.8	0.8
7	Shastri	50	1099	5978	120	4.5	1.7
8	Subhash	40	655	3435	86	13.7	3.3
9	Patel	50	934	4887	98	11.9	2.2
10	Ambedkar	31	968	5061	163	20.9	1.4
11	Munshi Md. Husain	54	2995	15269	283	24.8	1.2
12	Vinoba Bhave	46	966	4903	107	9.6	18.2
13	Mahatma Gandhi	12	546	2868	239	5.9	1.8
14	Ganesh	4	261	1295	324	0.1	0.5

Ward Number	Name	Area (Ha)	No. of Hhds	Pop.	Density (Person/ Ha)	SC (%)	ST (%)
15	Malviya	6	636	3170	528	41.5	7.8
16	Shahid Gappumal	3	341	1982	661	2.9	4.7
17	Tagore	5	238	1105	221	0.1	1.8
18	Kidwai	2	277	1514	757	18.8	4.4
19	Sanjay	4	345	1881	470	11.1	0.1
20	Shivaji	17	365	1981	117	5.0	0.0
21	Maharana Pratap	8	316	1573	197	0.3	0.0

Source: Census 2011, Sheopur Municipality, 2011

Figure 1: Ward Map of Sheopur

4. **Drainage:** There are lined open drains in the town which are in bad shape and cover the whole of the municipal area. These drains empty into nalas which finally empty into the Seep River. Both the storm water and the wastewater are drained by these drains and nalas. Consequently, during monsoons when there is heavy rain, the congested areas get inundated by a mixture of rain and wastewater.

II. SANITATION SITUATION

There is no sewerage system in the town except in some of the new private colonies where the outflow is released without treatment into open drains. Most of the sewerage is treated in Septic Tanks and these have soil base resulting in the seeping of the sewerage water into the ground. Very few septic tanks have soak pits. In some houses sewerage is being released directly into the open drains. Some amount of open defecation is also there. The Census 2011 data on sanitation services available in the town are given in Figure 2, 3 and 4. The number of households with latrine facility has gone up subsequently due to the implementation of the Swachh Bharat Mission which has resulted in 1,000 household toilets being built and another 600 in the pipeline. However, due to the lack of space in the congested slums there are still a significant number of households without toilets who are either going to public toilets or are resorting to open defecation.

Figure 2. Type of Sanitation Available in Sheopur Municipality Area 2011

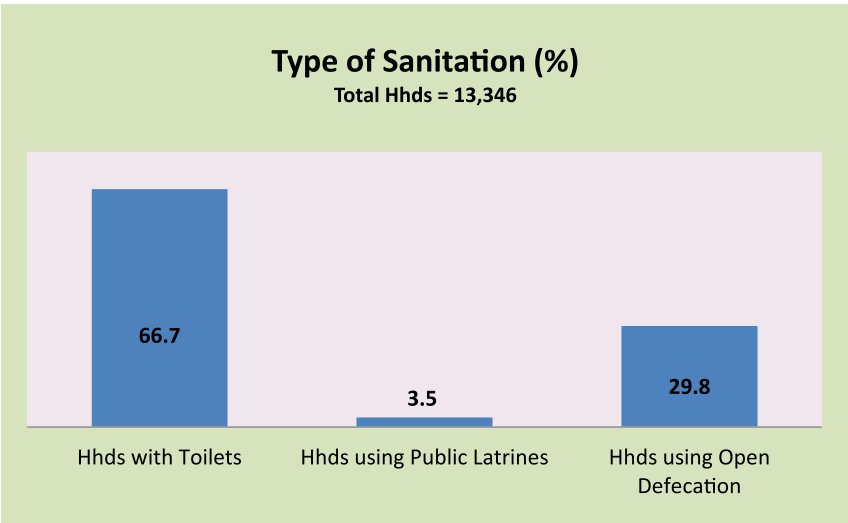


Figure3: Disposal of Toilet Waste in Sheopur Municipality Area 2011

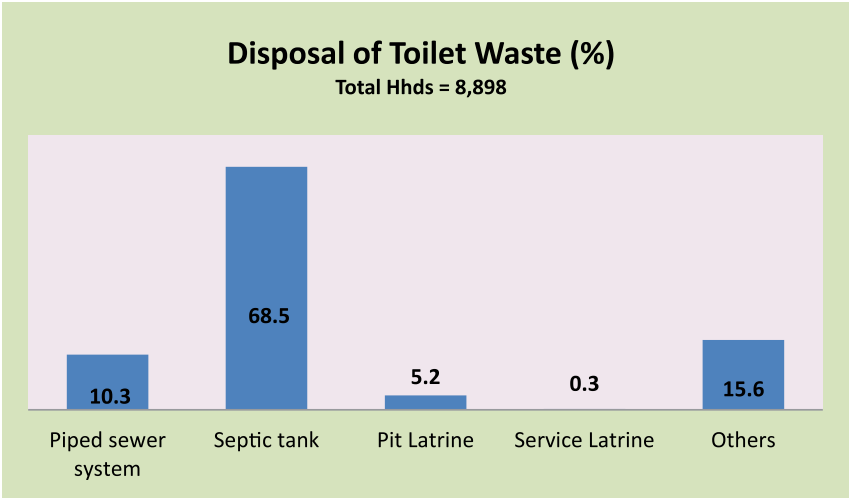
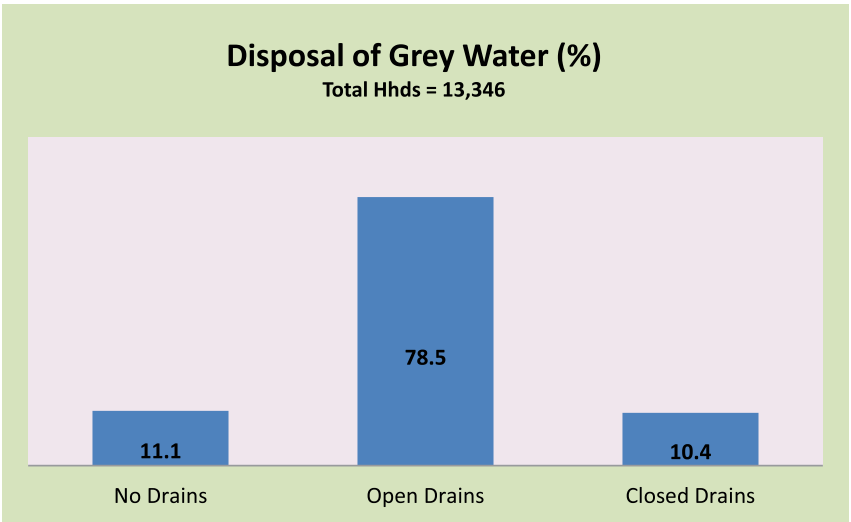


Figure 4: Disposal of Grey Water in Sheopur Municipality Area 2011



Not only is there a low coverage by sewerage at 10.3 percent which is being disposed untreated into nalas but the proportion of open drains, which are mostly choked due to lack of proper and regular cleaning, is also very high at 78.5 percent.

III. EXISTING SANITATION PLANNING

The Sheopur Development Master Plan 2021 (DTCPMP, 2007) identifies 13 wards out of the total 21 as having slums inhabited by 56 percent of the total population which are in need of infrastructure development. Even though the Master Plan acknowledges that there is a lack of proper sanitation and sewerage arrangements with most of the households using septic tanks and directing the outflow into drains, no plan is detailed for laying sewer lines and setting up an STP to treat the sewerage. The City Development Plan (CDP) prepared under the JNNURM (IDFC, 2011) estimates the total wastewater to be about 10.58 million litres per day (MLD) by 2020 and 16.52 by 2035. The CDP proposes the laying of underground sewers to take advantage of the slope of the town towards the north. Two gravity mains are proposed in the middle and in the east of the town and an interceptor sewer along the Seep River to the west of the town. An STP is proposed north of the town to treat the sewerage. There is no provision for septage management in this proposal as the overflow from the septic tanks are proposed to be connected to the sewers.

IV. SEPTAGE MANAGEMENT

The ground survey of septage management was done by conducting group discussions with the residents and inspecting the septage management procedures in a selected sample of ten wards. These wards were selected in consultation with the staff of the NGO, Mahatma Gandhi Seva Ashram, which is involved in implementing education and child rights programmes in the slums of the town. Wards were chosen in the main congested areas of the town and from those areas where there is a high concentration of Scheduled Castes and Scheduled Tribes. Discussions were held with people living in slums and also in middle and high end housing. Wards were chosen keeping in mind the following criteria -

1. They are located in the main congested areas of the town
2. There is a high concentration of Scheduled Castes or Scheduled Tribes living in the slums.

Discussions were held with people living in slums and also in regularised built up colonies. The wards chosen were as follows –

Table 4: Sample Wards Chosen for Survey

Ward No.	Ward Name	Locality Name
2	Sant Kabir	Harijan Basti
5	Jawahar	Joshi Mohalla
10	Ambedkar	Nursery Ke Saamne
11	Munshi Md. Husain	Ambedkar Colony
12	Vinoba Bhave	Taal wala Sahariyan
13	Mahatma Gandhi	Masjid Basti
14	Ganesh	Kamaal Khedi
15	Malviya	Jayashree Palace ke Peeche
16	Shahid Gappumal	Mandiwaale Sahariyan
18	Kidwai	Regar Mohalla

The slums mostly had single pit latrines which had been built recently with grants from the Municipality under the Swachh Bharat Mission as shown in Figure 2. Many residents complained that despite their names being enrolled for toilets, they still did not get one.

Figure 2. Single Pit Latrine in Malviya Ward

The middle and high end houses release their wastewater both grey and black into the open drains and these are in fairly bad shape. Even the residential

colony of the Irrigation Department in Subhash ward has wastewater festering in open drains without treatment as shown in Figure 3 below.

Figure 3. Open Drain in Irrigation Colony in Subhash Ward

Consequently, the gutters and open drains are filled with sewerage and pigs feed on the faeces present, as shown in Figure 4 below.

Figure 4. Pigs in open drain in Jawahar Ward

The public toilets too are not managed properly and they release their outflow from the septic tanks into open drains as shown below in Figure 5.

Figure 5. Outflow from Septic Tank of Public Toilet in Bus Stand releasing into the open drain

People rely on groups of Dalit cleaners who clean the septic tanks by hand and dump the septage in the open drains. Thus, the polluted water from these open drains and the septage not only contaminates the surface water but also the ground water. Tests were carried out on various surface water and ground water sources and the results are as follows –

a. Open well in the Fort which is currently being used for gardening purposes as shown in Figure 6 below. The results of the tests are given in Table 5. The various parameters that have been tested are –

   BOD – Biochemical Oxygen Demand, TDS – Total Dissolved Solids, TSS – Total Suspended Solids, DO – Dissolved Oxygen, TC – Total Coliform, FC – Faecal Coliform, FS – Faecal Streptococci, AN – Ammoniacal Nitrogen, TN – Total Nitrogen

Table 5: Test Results of Open Well Water in the Fort

Test	BOD mg/l	TDS mg/l	TSS mg/l	DO mg/l	TC	FC	FS	AN mg/l	TN mg/l
					Most Probably No per 100 ml				
Observed Value	2	140	12	5.5	TNTC*	TNTC	TNTC	1.5	4.5
Permissible Value for Class A Water Sources (IS:2296) except for TSS	3	500	20	>5	50	50	50	Absent	Absent

* Too Numerous To Count

Clearly, the ground water in the unconfined phreatic aquifer is contaminated and not fit for drinking as it does not meet the permissible standards with regard to coliform, ammonia and nitrogen.

Figure 6: Open Well in the Fort

b. Borewell in the Mahatma Gandhi Sewa Ashram premises which is situated in Patel ward.

The water test results are given in Table 6 below.

Table 6: Test Results of Bore Well Water on Pali Road

Test	BOD	TDS	TSS	DO	TC	FC	FS	AN	TN
	mg/l	mg/l	mg/l	mg/l	Most Probably No per 100 ml			mg/l	mg/l
Observed Value	1	240	8	8	Absent	Absent	Absent	1.5	7.5
Permissible Value for Class A Water Sources (IS:2296) except for TSS	3	500	20	>5	50	50	50	Absent	Absent

The confined aquifer water quality is better than that of the unconfined aquifer as bacterial contamination is not present; however, ammonia and nitrogen are present so the water is contaminated to a certain extent.

c. Water in the Seep River upstream of the barrage as shown in Figure 7 below is still and a few nalas from the Fort area drain into it.

Figure 7 : The Seep River reservoir upstream of Banjara Barrage

The water quality parameters for the reservoir water are given in Table 7 below

Table 7: Test Results of Seep River Water in Banjara Barrage Reservoir

Test	BOD mg/l	TDS mg/l	TSS mg/l	DO mg/l	TC	FC	FS	AN mg/l	TN mg/l
					Most Probably No per 100 ml				
Observed Value	1	60	9	7.9	TNTC*	TNTC	TNTC	1.5	7.5
Permissible Value for Class A Water Sources (IS:2296) except for TSS	3	500	20	>5	50	50	50	Absent	Absent

* Too Numerous To Count

The upstream River water is fairly clean, possibly due to greater monsoon flow. Only ammonia and total nitrogen are present as pollutants.

d. Downstream of the barrage most of the nalas of the town empty into the Seep river so pollution levels are higher with eutrophication taking place as shown in Figure 8 below.

Figure 8 : Eutrophication Downstream of Barrage in Seep River

The test results for the downstream water are given in Table 8.

Table 8: Test Results of Seep River Water Downstream of Barrage

Test	BOD mg/l	TDS mg/l	TSS mg/l	DO mg/l	TC	FC	FS	AN mg/l	TN mg/l
					Most Probably No per 100 ml				
Observed Value	1	320	8	6.9	TNTC*	TNTC	TNTC	1.5	12
Permissible Value for Class A Water Sources (IS:2296) except for TSS	3	500	20	>5	50	50	50	Absent	Absent

* Too Numerous To Count

Clearly the downstream water is heavily contaminated due to the pollution by the water from the nalas.

e. There is one major nala that joins the Seep River just below the Banjara barrage with very polluted water as shown below in Figure 9.

Figure 9. Nala emptying into Seep River below Banjara Barrage

The results of the testing of water for this nala are given in Table 9 below.

Table 9: Test Results of Nala Water below Banjara Barrage

Test	BOD mg/l	TDS mg/l	TSS mg/l	DO mg/l	TC	FC	FS	AN mg/l	TN mg/l
					Most Probably No per 100 ml				
Observed Value	16	360	60	1	TNTC*	TNTC	TNTC	1.5	3
Permissible Value for Class A Water Sources (IS:2296) except for TSS	3	500	20	>5	50	50	50	Absent	Absent

* Too Numerous To Count

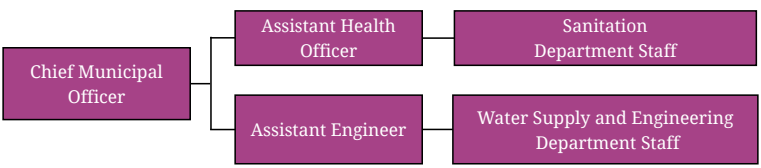
The biochemical oxygen demand and total suspended solids are much higher than the permissible limit while dissolved oxygen is much lower. Coliform and streptococci are present along with ammonia and nitrogen thus indicating that the nala water is highly contaminated.

There are no ponds or tanks in Sheopur town, so only river, nala and groundwater were tested which showed that there is considerable contamination due to the lack of proper treatment of the sewerage and other wastewater.

V. STAFFING PATTERN OF SANITATION DEPARTMENT

The Sheopur Municipality is headed by a Chief Municipal Officer. An assistant health officer is in charge of the sanitation department while an assistant engineer is in charge of the water supply and engineering department as shown in Figure 10 below.

Figure 10: Organogram of Sheopur Municipality Related to Sanitation



The staff strength of the Health and Sanitation Department of the Sheopur Municipality is grossly inadequate. The sanctioned strength and the actual employment are given in Table 10 below. Clearly there is severe understaffing in the sanitation department which is affecting the provision of sanitation services, especially to the slum areas.

Table 10: Staffing of Health and Sanitation Department of Sheopur Municipality

Post	Sanctioned Staff	Actual Posting
Assistant Health Officer	1	0
Sanitation Inspector	1	0
Sanitation Supervisor	3	1
Assistant Sanitation Supervisor	3	2
Sanitation Workers (Permanent)	91	87
Sanitation Workers (Contractual)		242

Source: Sheopur Municipality

VI. REVIEW OF MUNICIPAL FINANCES

The overall Finances of the Sheopur Municipality for the year 2016-17 are given in Table 10 below.

Table10: Overall Finances of Sheopur Municipality 2017-18

Item	2017-18 (Rs Lakhs)	Per Capita for 2017-18* (Rs)
Revenue Receipts	2112.40	2669
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Source: Sheopur Municipality

*Calculated by assuming a cumulative population growth rate of 10% from 2011-2017

The Capital Receipt and Expenditure estimates are much higher than the revenue estimates because these are all being provided by the State and Central Governments under various schemes. The capital expenditure despite being higher is inadequate given the very bad sanitation situation in the town. The revenue mobilisation and expenditure is very poor and insufficient for providing proper services and there is no prospect of generating enough surpluses to fund capital expenditure in future.

A break up of the revenue receipts is given in Table 11 below.

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The revenue expenditure details are given in Table 12 below.

Table 12: Revenue Expenditure of Sheopur Municipality 2017-18

Item	2017-18 Estimates (Rs Lakhs)
Establishment	471.0
Operation & Maintenance	1601.12
Others	40.0

Source: Sheopur Municipality

The budgeting has been done in a very unclear manner as the previous year's estimates and actual expenditures are not mentioned. Consequently, it is not possible to draw any conclusion regarding the actual performance of the Municipality with regard to revenue mobilisation and expenditures. However, the dismal per capita revenue mobilisation and expenditures clearly show that the finances of the Municipality are unsustainable and inadequate and it is excessively dependent on grants from the Central and State Governments.

VII. CONCLUSIONS

The sanitation situation with respect to faecal sludge and septage management (FSSM) in the town of Sheopur is currently in a poor state with inadequate provision for different services. The tests carried out on water samples clearly indicate that both the surface water and ground water are contaminated and unhealthy. There is currently no plan to improve this situation and the Municipality is grossly understaffed. The municipal finances are in a precarious condition and the Municipality is heavily dependent on State and Central Government grants for both capital and revenue expenditures as its own revenue mobilization through taxes is insufficient.

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