

JABALPUR

SEWERAGE SECTOR



PROMotion of Inclusive, Sustainable growth and diversity to strengthen Local Governments

Project PROMISE





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Message

Greetings!

Urban areas in India are growing at very fast pace majorly due to shift from rural areas and expanding infrastructural needs of the existing population of the city. The city governments play a significant role in addressing the above needs but at the same time it becomes difficult for the city governments to tackle the problems holistically due to their minimal capacities, and limited budgets. In order to assist the cities, the project team through this exercise has developed a holistic approach for the city governments to prioritize their projects/ initiatives within available resources based upon citizen feedback.

We are glad to provide our support in association with Administrative Staff College of India (ASCI) in the sewerage sector in Jabalpur which is also being developed as Smart Cities. This has been a unique initiative by engaging with the project city, its stakeholders including the technical staff, political representatives, end users-comprising of women, youth population, and people with special needs irrespective of age, gender and caste.

I would like to express our gratitude to European Union for providing us an opportunity to assist the city governments with regard to different sectors in each project city. I would also wish to thank the members of city core group committee and national advisory committee for their continuous support provided towards completion of this report.

Warm Regards,
Mr. Emani Kumar
Deputy Secretary General, ICLEI – Local Governments for Sustainability &
Executive Director, ICLEI South Asia

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Administrative Staff College of India (ASCI) was established in 1956 and is now a premiere Institute for research, training, capacity building and information, dissemination in Urban development and management.

Jabalpur Municipal Corporation Jabalpur, Madhya Pradesh

Greater Warangal Municipal Corporation Warangal, Telangana

Karnal Municipal Corporation Karnal, Haryana

Ajmer Municipal Corporation Ajmer, Rajasthan

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Table of

CONTENTS

1.	Introduction to the Project		
2.	City Profile	14	
	2.1 Basic profile	14	
	2.2 Demographic profile	14	
	2.3 Population growth trend	16	
	2.4 Population projection	16	
	2.5 Service profile	17	
	2.6 Alignment with central government (Ministry of Housing and Urban Affairs Schemes)	18	
	2.7 Estimation and future exploration	18	
3.	Existing Situation Assessment	20	
	3.1 Phase I	20	
	3.2 Phase II	22	
	3.3 Dstails of phasing and actors involved	25	
4.	Outreach Initiative	26	
	4.1.1 Outreach & Communication – Survey on User's Perception	27	
	4.1.2 Methodology	27	
	4.1.3 Sample size and selection	28	



PROMotion of Inclusive, Sustainable growth and

diversity to strengthen Local Governments

Sewerage Practices

Learnings from **Jabalpur**

4.2 Issues Identified	29
4.3 Summary	29
4.3.1 Observed and anticipated issues	29
4.3.2 Lack of awareness about self cleanliness	30
4.3.3 Blockage of Sewer line	31
4.3.4 Lack of Implementation of Rain Water Harvesting Policy	31
4.3.5 City wide issues	31
5. Recommandations	32
5.1 Recommandations based on issues identified in the study area	32
5.1.1 Planning Stage:	32
5.1.2 Construction Stage:	36
5.1.3 Conservation of water source	36
5.1.4 Integrated data development and management	36
5.1.5 Financial Assessment & Planning for sources of funding	37

1 Introduction

*Promotion of Inclusive, Sustainable growth and diversity to strengthen Local governments" (PROMISE) is being implemented by ICLEI- Local Governments for Sustainability, South Asia in association with Administrative Staff College of India (ASCI), with support from European Union. The project is being implemented in four Indian cities, representing different geographical locations- Ajmer in Rajasthan, Karnal in Haryana, Jabalpur in Madhya Pradesh and Warangal in Telangana. The project was initiated in the selected cities in early 2016 and will continued to run till mid of 2019 with an objective to strengthen the local governments in carrying out the service level improvements. The project has been designed with an aim to help the selected cities to develop their capacity to plan, conduct, manage and evaluate their projects in an inclusive manner with a focus on all communities, vulnerable groups irrespective of their gender or religion.

The overall objective of this project is to improve Local Authority's capacity to improve quality of life in an inclusive manner. The project aims to support the local authorities to create, enable and institutionalize equitable and inclusive governance mechanisms, and facilitate the development of smart and sustainable growth in cities. The proposed project shall strengthen capacities of local authorities for integrated, participatory, inclusive and sustainable development and efficient resources mobilisation and utilization to enhance service delivery, increase community participation and promote diversity in the urban system. The specific objective of the project is to develop a PROMISE tool for outcome based planning and evaluation of the development actions of local authorities. The PROMISE tool intends to help the cities in the following methods:

- Build managerial and technical capacity of local governments to develop projects jointly by engaging with and involving city staff, community, private sector, project team experts, local stakeholders and jointly implement projects in the city.
- Mobilize available opportunities and utilize resources in a diverse and strategic manner and help local governments to better leverage the opportunities available under national programs such as

Swachh Bharat Mission, HRIDAY, Smart Cities and AMRUT, through well-defined criterion for project evaluation and implementation based on outcomes.

- Enable local governments to adopt participatory planning in project prioritization and execution.
- Ensure equitable and inclusive service delivery mechanisms through participatory governance that reach all sections of society, including the most vulnerable.
- Improve accountability of local authorities to diverse stakeholders and local communities.
- Acknowledge and promote diversity in local working environment of cities by encouraging citizen engagement in developmental project planning and execution.

Besides the PROMISE tool, various other activities are being undertaken in each project city. This report presents the details of the activities undertaken in Jabalpur pertaining to sewerage sector under the ongoing project. As per the scope of the project, a pilot area was selected in Jabalpur, in consultation with Jabalpur Municipal Corporation with an aim to carry out a detailed study and interventions at a small scale and if found appropriate, the same may be replicated by the Municipal Corporation in other parts of the city. Ward number 31 was selected as a pilot area in Jabalpur. As mentioned above, the ongoing project also aims to promote engagement with the city. In this regard, a core group committee at city level has been formed in each project city in order to interact and have views from various experts. The core group committee of Jabalpur includes the following experts:

- Hon'ble Mayor, Jabalpur Municipal Corporation
- Commissioner, Jabalpur Municipal Corporation
- Executive Engineer, Jabalpur Municipal Corporation
- Municipal Councillor, Ward number 31, Jabalpur

For developing a wider sense of the city and the Sewerage Sector, the report also touches upon the following topics.

Introduction to the project

This section provides the background of the study and outlines the study objectives, tasks and approach and methodology followed to complete the project.

· City profile

This section assesses the demographic profile of the city along with its Sewage scenario of the city.

. Current Implementation plan of the city

This section talks about the existing scenario of sewerage in the city and proposed initiative proposed by Municipal Corporation. It discusses about the initiatives taken in the city under the PROMISE project to understand the priorities of the citizen's with regard to sanitation and to sensitize importance of centralise sewage connection.

Recommendations

Based on the project findings, this section discusses the areas of interventions suggested to be undertaken in the study area.

2 City Profile

The city is the district headquarters of Jabalpur district (third largest district in the state), and accounts for almost 44 percent of the total district population (21.67 lakh). It is also the divisional headquarters of Jabalpur division, which includes the districts of Jabalpur, Katni, Mandla, Narsimhapur, Chhindwara, Seoni and Balaghat. It is the

regional center and has good linkages by way of road and railway, has grown to become a trading and industrial center in the region. The city had a vibrant industrial economy during 1950 to 1980, when production in the defense establishments located here was at its peak.

2.1 Basic Profile

District: Jabalour

State: Madhya Pradesh Connectivity: Rail and Road Area of the city: 367 sq. km. No of administrative wards: 71

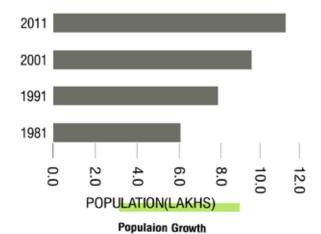
Name of the local government: Jabalpur Municipal Corporation

2.2 Demographic Profile

Population: 1,081,677 (Census 2011)

Density: 2947 pp sq.km.

Population Growth Rate (2011): 14%



Parameters	Status as per Census (2011)	Status as per 2014
Municipal Area	129 km	274 sq km
No. of wards	70	79
Total Population	10,54,336	12,07,166
No. of households	2.1 lakhs	2.4 lakhs

Table 1: Broad Demographic Profile of the city

Jabalpur Municipal Corporation (JMC) was established on 1st June 1950, under Nagar Palika Act (Act no.3-1948). Ever since the establishment of JMC, municipal limits have undergone many changes. The number of wards has increased from 30 to existing 79 wards. JMC jurisdictional limit also includes 55 villages in the periphery.

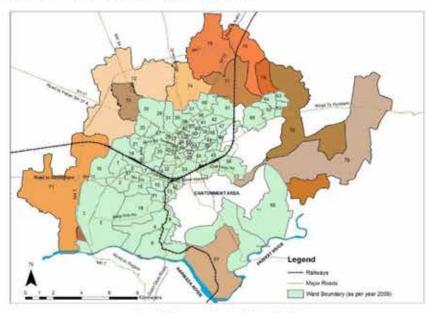
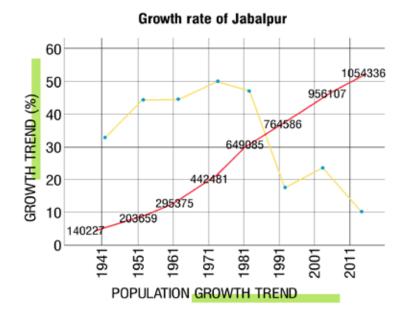


Figure 1: Changes in Municipal Limits of Jabaipur

2.3 Population Growth Trend

As per census 2011, the population of Jabalpur city was 10,54,335 compared to 2,03,659 in 1951. The population of the city showed an exponential growth during 1951-1981 with the decadal growth rate of 45%. However this growth was gradually reduced to 10.09% during 2001-2011. The graph below represents the decadal growth rate since last 70 years.



Year	Population	Decadal growth rate (%)
1951	951 2,03,659 -	
1961	961 2,95,375 45.03	
1971	1 4,42,481 49.8	
1981	6,49,085	46.69
1991	7,64,586 7.79	
2001	9,56,107	25.05
2011	10,54,336	10.09

Table 2: Decadal Growth Rate

Source: Census of India

2.4 Population projection

The sewerage system needs to be designed for 30 years. JMC has thus projected the 2039 population as 30.33 lakhs. The population was forecasted based on available data and forecasting the population growth. Projected populations are summarised in the table below.

SL.NO	Year	Projected Population (in lakhs)
1	2024	15.37
2	2039	20.33

Table 3: population projection

Source: UWSEIMP Report, Jabalpur

2.5 Service Profile

The table below presents the status of sewerage management as per year 2017-2018

SL.NO	Phase	Sewerage Network proposed for	Sewer Network laid (length in km)		Remarks	
SL.NU	i nasc	Jabalpur City	Till March 2017	Till Jan 2018	Hemarks	
	Under PHASE -1		IVIdIGITZUT7	Jan 2010	Within 1 year of	
1	(Branch & Main Sewer)	209.21km	60.31	74.89	work, progress is insignificant in Phase 1	
2	Under PHASE – 2 (Branch &Main Sewer)	160.95 km	33.32	112	There is significant progress in work in Phase 2	
3	Under AMRUT (Zone 1 to 5)	664.60	0	0	Not started	
	Total	1034.76	96.63	186	Overall there is a	
	% of Network Cor	mpleted	9.0%	17.97%	significant progress in work.	

Table 4: Coverage of Sewage Network

Source: Municipal Corporation, Jabalpur

SL.NO	Sewage Treatment Plant Proposed for Jabalpur Ciy	Sewage Treatment Plant Completed for Jabalpur City	% of Treatment Plant as per Capacity	
1	50 MLD at Kathonda	50 MLD at Kathonda		
2	32 MLD at Kathonda	-		
3	34 MLD at Lalpur	-		
4	29 MLD at Tewar	-	33.11	
5	5 MLD at Ganga sagar Talab	-		
6	1 MLD at Gokalpur Talab	-		
Total	151 MLD	50 MLD		

Table 5: Sewage Treatment Capacity

SL.NO	Treatment Plant	Quality of Treated Water Proposed	Achieved Quality	% of treatment as per target
1	50 MLD at Kathonda	BOD less than 30mg/l	BOD less than 30mg/l	100

Table 6:Quality of Sewage Treated

SL.NO	House connected in nos.	Sewage Collection from one house (135*5*80%) in Itr	Total Sewage collected per day (540* 5000) Itr	% of Collection efficiency of sewerage network
1	5000+ and counting	540 ltr	2.7 MLD	2

Table 7: Collection Efficiency

2.6 Alignment with Central government (Ministry of Housing and Urban Affairs schemes)

The city is part of major central scheme focused on urban infrastructure improvement. Listed below are few major central flagship scheme being implemented in Jabalpur focusing on urban infrastructure:

SMART CITY MISSION

- Under the Smart City Programme, the city aspires to transform into a vibrant regional economic and cultural hub through inclusive urban regeneration, to act as a magnet for investment and new opportunities for the youth
- The Area Based Interventions rely on a financially robust and sustainable, Retrofit cum Redevelopment in Wright and Napier

Town (743 Acres). It smartly interlinks existing strategic urban spaces to regenerate its Central Business District.

 - Under the Pan City Initiative, Jabalpur aims to setup RFID-based, real-time, smart waste management system.

AMRUT

Funds have been allocated under AMRUT for development of infrastructure in water, sewerage, transport and green spaces. Based on State Annual Action Plan submitted by Madhya Pradesh State Government under AMRUT, total funds requirement is Rs 1,74.04 crores.

2.7 Estimation and Future extrapolation

Based on population projection, sewage generation for entire Jabalpur city has been estimated. According to UWSEIP report Jabalpur, sewage generation estimated for years 2024 and 2039 is 85 MLD, 130 MLD, 160 MLD respectively. The sewer network of the city is designed for entire planned area of the city; however, slum areas are not considered under the coverage of sewerage network.

Year 2024					
Population	15.37	Lakhs			
Slum per cent assumed	29.00	%			
Balance population	71.00	%			
Slum population	4.46	Lakhs			
Population without slums	10.91	Lakhs			
SEWAGE GENERATION					
No sewerage network in slums, hence the generation of sewer is not considered					
Daily Water Demand	145.00	Lpcd			
Rate of Sewage Generation w.r.t. water Demand	80.00	%			
Rate of Sewage Generation	108.00	Lpcd			
Total Sewage generation	117.86	MLD			
Total sewage by considering 80% connectivity	94.29	MLD			
Other demand considering 50% of total of other demand	31.75	MLD			
Total sewage generation	126.03	MLD			
Add for Infiltration (1.8 Mld per 100 Km length)	3.4	MLD			
Total sewage generation	129.43	MLD			
Say	130.00	MLD			

Year 2039					
Population	20.34	Lakhs			
Slum per cent assumed	29.00	%			
Balance population	71.00	%			
Slum population	5.90	Lakhs			
Population without slums	14.44	Lakhs			
SEWAGE GENERATION					
No sewerage network in slums, hence the generation of sewer is not considered					
Daily Water Demand	145.00	Lpcd			
Rate of Sewage Generation w.r.t. water Demand	80.00	%			
Rate of Sewage Generation	108.00	Lpcd			
Total Sewage generation	155.97	MLD			
Total sewage by considering 80% connectivity	124.77	MLD			
Other demand considering 50% of total of other demand	31.75	MLD			
Total sewage generation	156.52	MLD			
Add for Infiltration (1.8 Mld per 100 Km length)	3.4	MLD			
Total sewage generation	159.92	MLD			
Say	160.00	MLD			

Table 8: Sewage Generation Estimation

Source: UWSEIP, Jabalpur

3 Existing Situation Assessment

As already described earlier, Jabalpur city has grown fast. In the year 2014 the municipal limit has extended from 70 to 79 wards , which includes 55 villages in peri-urban areas. To cover city with centralise sewerage system, the city has initiated sewerage project under ADB, JNNURM and AMRUT in Phase I, II, III which still covering the central area of the city.

Currently the work under two phases of sewerage management

in the city is being carried out, covering the core area of the city comprising of 70 wards. Phase I is being implemented for Zone I, while Phase II is being implemented for the work of Zones II, III, IV, V. Phase III has been proposed under AMRUT considering the base year 2018 to cover the newly added areas under municipal limit and to connect the missing links in Phase I and Phase II. The total sanctioned cost of Phase III under AMRUT is Rs.324.09 crores.

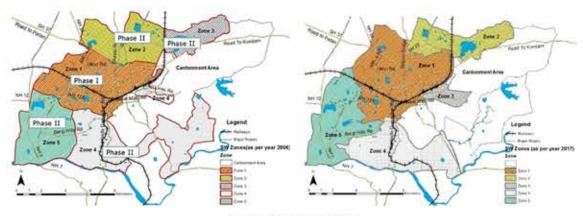


Figure 2: Sewage Zones in Jabelpur

3.1. Phase I

Total Proposed length - 209.21 km Sanctioned cost - Rs.7,801.00 lakhs Design year - 2039 Area included - Zone 1

For a systematic sewage collection and treatment for the core are of the city, two contract packages have been awarded to M/s Ramky. Infrastructure Ltd. Contract package number JBP/WW/02 (Providing, Laying, Jointing, Testing & Commissioning of trunk sewers & Outfall sewers for the core area of Jabalpur) in July 2007, with duration of two years, and package no. JBP/WW/03 (Providing, Laying, Jointing, Testing & Commissioning of Branch sewer network for the core area of Jabalpur) was awarded in October 2007, with

duration of two years. The contractor did not execute the works even during the extended contract periods. The contractor was supposed to be complete the work in July2009 for package JBP/WW/02 and October 2009 for package JBP/WW/03, but the contractor was unable to complete the works within the stipulated contract period as well as extended period.

In view of the above, both contract packages were terminated in April 2012. The above works were thus required to be completed by utilizing the sanctioned loan In order to accomplish the above the remaining works, package number JBP/WW/02 was grouped under two lots, Lot-1 and 2, with the aim to connect the missing links in overall package number JBP/WW/02.

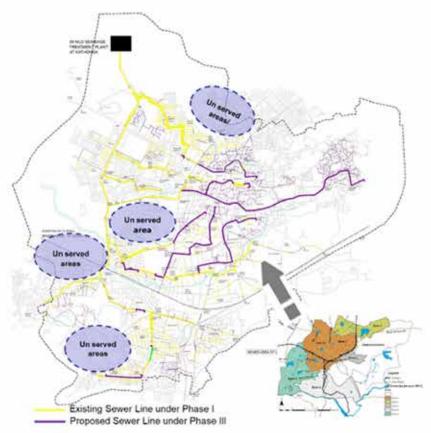


Figure 3: Status of work in Phase I & Proposed work in Phase III

Particulars	\$	Details	
Name of the project		SEWERAGE AND SEWAGE TREATMENT PROJECT PHASE-	
Sanctioned cost		Rs 7801.00 Lacs	
(1) Date of sanction (2) Approved Date of completion		(1) 10th May 2006 (2) Sept 2012	
		Package(1) Laying of trunk and outfall sewers	
Number of pag	ckages	Package(2) Laying of branch sewers	
		Pckage (3) 50MLD STP at Kathonda	
		Package(1) 30-12-06/30-01-07/2466.75lacs	
Tendering deta	ils: NIT Date/Closing Date/App closure date	Package(2) 05-04-07/21-05-07/4853.35lacs	
		Pckage (3) 15-01-07/14-02-07/798.30lacs	
Design year		2039	
Design popula	tion	750,000 souls	
Area of city co	vered	4321.00 Hectare	
Length of	sewer network under each packag	je	
Davis de d	RCC Pipe trunk sewer	33.41 km	
Package 1 JBP/WW02	RCC Pipe out fall sewer	5.20 km	
JUL / WWYOZ	Property connection chamber	1720 Nos.	
0 1 100	RCC Pipe branch sewer	160.60 km	
Package (2) JBP/WW03	UPVC Pipe branch sewer	10.00 km	
JUL / WWW.J	Property connection chamber	7280 Nos.	
	Total	209.21 km	
Package (3) JBP/WW04	Sewerage treatment plant at kothunda	50.00 MLD capacity	

Table 9: Phase I- Details of scope of work, Sanction date & Project cost

Status of work under Phase-I

s	L.NO	Description of packages	Parameters		is per PERT art	Proposed	Completion status	Progress in	Remarks/Present time extension
		(units)	· urumotoro	Start Date	End Date		in units	1%	given up to
	1	JBP/WW/02	Package under progress	13-07-2007	30-03-2011	38.61 Km	12.64 Km, 208	32.73%	Tender Terminated
	2	JBP/WW/02 (Lot-1)	Package under progress	01-04-2013	31-04-2014	1.4 Km	1.3 Km	93%	-
	3	JBP/WW/02 (Lot-2)	Package under progress	13-03-2015	31-03-2018	24.57 Km	8 Km	32.56%	Work in progress
	4	JBP/WW/03	Package under progress	15-10-2007	14-10-2010	170.60 km, 1029	38.37 kms, 1029	22.49%	Tender Terminated
	Total Length: 60.31 km								
	5	JBP/WW/04	Completed package	30-10-2010	15-10-2017	STP at Khathunda	Construction of STP is Completed	100%	-

Table 10: Phase I -Details of work executed till March 2017

3.2 Phase II

Total proposed length - 160.95 km Sanctioned cost - 7,081.00 lakhs Design year - 2042

Area included - Zones 2,3,4,5

Phase II has been proposed only for one package, for a total length of 160.95 km of sewer line. In Phase II three STPs are proposed

but there is no provision of property connection. Phase II has been awarded to Simplex Infrastructures Limited in August 2007. However, the work has not been completed within the stipulated time period and is supposed to be completed by the end of 2019.

Particulars	Details
Name of the project	SEWERAGE AND SEWAGE TREATMENT PROJECT PHASE-II
Sanctioned cost	Rs 7081.00 Lacs
(1) Date of sanction (2) Approved Date of completion	(1) 10th May 2006 (2) August 2017
Number of packages	One
Tendering details: NIT Date/Closing Date/App closure date	02-04-2007/24-05-2007/14167 Lacs
Design year	2042
Design population	10,75000 souls
Area of city covered	8257 Hectare
Length of sewer network	
SWG pipes	118.324 Km
RCC pipes(350 mm-1100 mm dia)	42.626 Km
Total	160.95 Km
Sewerage treatment plant	
(I) For zone No. 02 at Kathunda	32.00MLD
(II) For zone No. 03 & 04 at Lalpur	34.00 MLD
(III) For zone No. 05 at Tewer	29.00MLD

Table 11: Details of Scope of work, date of sanction and Project cost

Present status of work under Phase II

SL.NO	Description of packages	Status		as per PERT art	Proposed	Completion	Progress in	Remarks/Present time extension
JE NO	(units)	Otatus	Start Date	End Date	BOJATA S	status	1%	given up to
3	4/06/JJ3.2	Package under progress	07-09-2007	August 2017 Extented for August 2018	160.95 Km of sewer line	33.32 Km, 3602 Manholes completed	20.70%	Civil work completed for 3 pumping stations Kanchanpur Rakhannaga & Bragi hills) & 1 pumpin station at Dhanwanty Nagar in progress

Table 12: Status of work executed till March 2017

Status of work in Phase II and Proposed work under Phase III

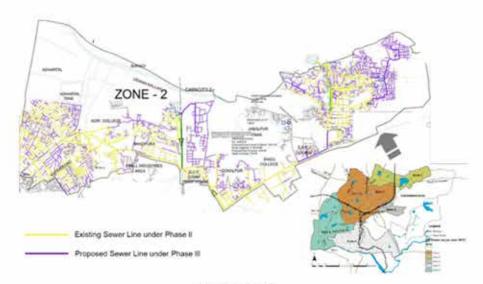


Figure 4: Zone2 Map

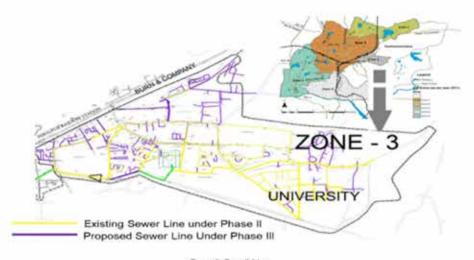


Figure 5: Zone 3 Map

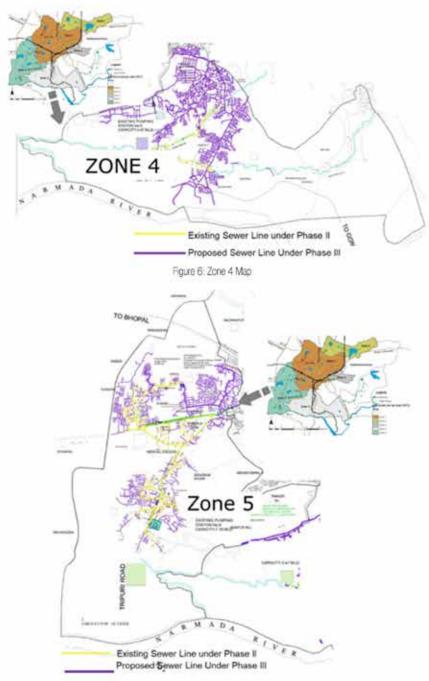


Figure 7: Zone 5 Map

The sewerage initiatives going in Jabalpur can be summarised as:

- . Phase I: Comprises work for Zone I- Work Ongoing
- . Phase II: Comprises work for Zone 2,3, 4, 5: Work Ongoing
- . Phase III: Proposed for left over areas which was not included in Phase I and II in previous proposals. Proposed

3.3 Details of Phasing and actors involved

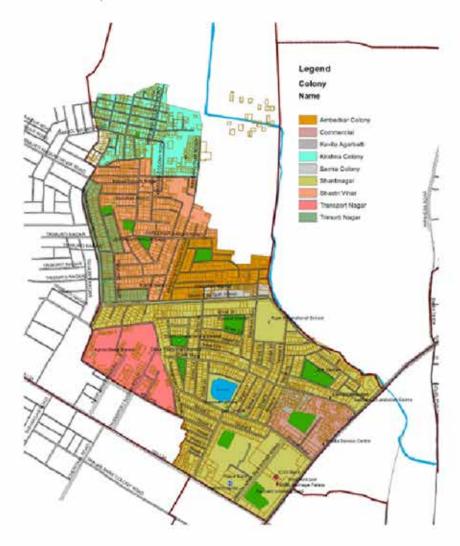
Phase	Month/ year of Commissioning the Project	Sources of Funding/Scheme	Consultant	Contract/ Agency	Details of Packages/ Components	Awarded Cost of tendering (in lakhs)	
Phase I	May 2006	ADB loan	L N Malviya Infra Projects Pvt. Ltd.	M/s Ramky Infrastructure Limited (Contractor terminated) Anand Associated (Contract in function- execution and supervision)	Providing, laying, jointing, testing and commissioning of trunk sewers and outfall sewers for the area under Zone 1	Rs. 8,118.00	
Status of work: Ongoing Note: • After termination of M/s Ramky, the balance work was being implemented under JNNURM. • After dissolution JNNURM scheme, JMC now implementing the work on its own fund.							
Phase II	Aug 2007	JNNURM	Simplex Meinhardt (JV)	Supervision by WAPCOS	Laying of sewer line in 4 Zones (2,3,4,5) & Construction of 3 Nos. STP etc.	Rs.14,167.00	
Sta	atus of work: Ongo	ing					
	Dec, 2017	AMRUT	EGIS India	In joint venture of Eagle — PC snehal	Sewerage system of left over areas and property connection in Zone No. 01-05 Sewerage treatment	Rs. 32,400.00	

Table 13: Details of Phasing and actors involved in Sewerage Project of the city

4 Outreach Initiatives

Moving ahead with the project activities in the city, the project team after making an overall assessment of the sewerage system in the city, narrowed down its scope of work to Shanti Nagar Area in ward number 3 - the study area selected for pilot interventions. Shanti Nagar area was selected since the infrastructure work has been completed and JMC is in the process to connect house-

holds with sewerage network. The project in thisward started from Shanti Nagar Colony and only this colony has coverage with sewer network till date. The rest of the areas of the ward still need to be covered with sewer network. Presently, more than 900 house connections have been provided in the ward but black water connection has still not started.



The table below presents the status of sewerage connection in pilot ward of Shanti nagar area

	Name of	colonies and status		
SL.NO	Colony Name	Execution status of sewer work		
1	Shanti nagar	Most of the area have been covered with house Connection(but only to grey water) Few left uncovered(lying of sewer line-work ongoing)		
2 Ambedkar Colony		Uncovered(No sewer line)		
3	Shastri Vihar	Uncovered(Line of sewer line-Work ongoing)		
4	Trimurti Nagar	Uncovered(Line of sewer line-Work ongoing)		
5	Krishna Colony	Uncovered(No sewer line)		
6	Samta Colony(Basti Area)	Uncovered(No sewer line)		
7	Kavita Agarbatti(Basti Area)	Uncovered(No sewer line)		
8	Transport Nagar (Commercial area)	Uncovered(No sewer line)		

Table 14: Progress in Pilot ward

4.1.1 Outreach & Communication – Survey on User's Perception

The project of sewer network in Jabalpur city is under implementation stage with an idea to provide fully-fledged sewerage system. Under this project, the infrastructure has already been constructed in most of the area however household are yet to be covered with connections. Shanti nagar area has been selected for initiating the process of connecting households with the centralized infrastruc-

ture. As explained earlier, project team undertook detailed assessment of the households in the pilot ward to understand the public attitude and behaviour towards the centralized sewer system facility. For field survey, a set of questionnaires was prepared for household's (to cover the categories of covered areas, uncovered areas, basti areas) and for the commercial areas.

4.1.2 Methodology

Based on the preliminary study of sewerage service in the city and physical observation of sewerage service and its status, a draft questionnaire on service delivery as well as user attributes was designed. The draft questionnaire was pilot tested in one service locality (ward number 31). Individual household interviews were conducted to get feedback.

4.1.3 Sample size and selection

For field survey, stakeholders were divided into four categories; covered, uncovered, basti & commercial areas. As per the revenue department of Jabalpur Municipal Corporation, total number of properties in ward number 31 is 3,052. A total sample size of 8% was surveyed.

According to data collected from Municipal Corporation 900 residential properties are presently connected to sewer line. Total number of properties in basti areas and commercial properties were estimated to be 250 and 812, respectively. Rest of the properties are categorized under uncovered residential area.

Stakeholders	No. of households	Total No. of properties	% of sample taken	Sample size
1	Covered Area	900	10%	90
2	Uncovered Area	1090	8%	90
3	Basti Area	250	15%	40
4	Commercial Area	812	2%	20

Total number of properties: 3052 Total number of households surveyed: 240

Total sample taken: 8%

Table 15: Categorization of stakeholders with percentage of sample taken from each categorization.

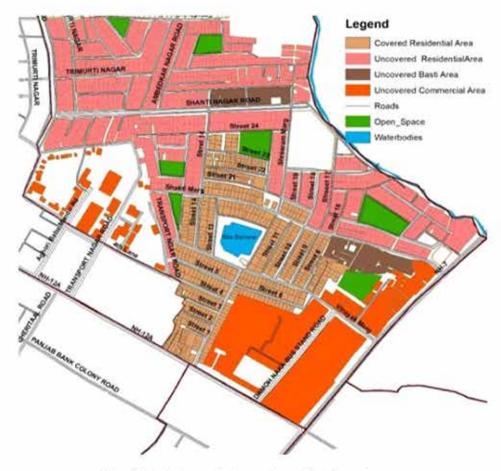


Figure 8: Map showing covered and uncovered areas of Shanti Nagar colony

4.2 Issues identified

Covered Areas

- The data profile reveals that only 1% out of total sample properties were connected to black water drainage and 99% of total sample properties were had only grey water drainage connection
- 81% of households are connected to open drainage and 19% households have soak pits with septic tanks
- 46% of sampled households are dissatisfied with sewer line facility at their locality
- Over 63 percent households feel visible difference in cleanliness of area due to sewerage system
- More than 49% of households reported reduced disease occurrence after establishment of sewerage connections

Uncovered Areas

- 61% households stated that drains are cleaned on monthly hasis
- Majority of households rely on private service provider for cleaning of drains

- Over 99% of households expressed their willingness to connect with sewerage system
- Over 61% of households experienced blockage of drains on monthly basis On an average Rs 500 per household is spent on maintenance of septic tank

Basti Areas

- 95 percent of the surveyed households revealed that waste water is allowed to flow to road side drains
- . 62% of households participate in monthly cleaning of drains
- 60% households stated that clean their drains by themselves
- Over 60% of households revealed that they are distressed due to foul smell in their locality, while 40% showed their concern for mosquito breeding due to waste open in open drains
- There is 100% coverage of toilet (private or shared). Survey data reveals that 52% of households have private toilets and 48% have access to shared toilets (two or three households within the same house unit).

4.3 Summary

The results of the survey are summarised in the table below.

4.3.1 Observed and anticipated issues

SL.NO	Indicators	Covered Residential Area	Uncovered Residential Area	Basti Area	Commercial Area
1	Coverage of storm water drainage	About 46% of residents are willing to connect the toilet directly to sewer line. Connection of black water to sewer led to waste water free drainage.	Septic tank overflow is connected to drains only.	100% of coverage of storm water drainage, but 92% drains are open and carry waste water.	100% of storm water which also carry waste water from commercial area.
2	Rain water harvesting facility	0% Coverage	0% Coverage	0% Coverage	0% Coverage
3	Extent of reuse & recycle of waste water	0% Coverage	0% Coverage	0% Coverage	0% Coverage
4	Coverage of toilets	100% Coverage	100% Coverage with septic system only	100% Coverage of toilet either private or shared	20% of establishment have private toillet rest use public toilets.
5	Coverage of sewerage network	Sewerage network carrying grey water only. Black water is still need to get connect with sewer line.	No coverage of sewerage network, waste water from households is being disposing into the drains only. Blockage of drains is common.	0% of sewerage coverage	0% Coverage of sewerage network, waste water disposed off into road side drains.
6	User Charges	49% not willing to pay for user charges	99% Percent are willing to get connection for sewerage facility. But 43% are not at all interested to pay for user charges.	52% of residents are willing to pay user charges for better facility.	None of the establishment shown interest for user charges.
7	Impact on Human Health & environment.	Residents are now satisfied due to reduction in foul smell and mosquitos.	Inabsence of sewwerage facility residents are distressed of foul smell & mosquitos breeding.	82% of residents found to distressed by health issue.	There is no visible impact on heath in commercial area.

4.3.2 Lack of awareness about self-cleanliness

It was understood that on ground the situation is not as ideal as was planned to be. Conservancies of street numbers. 1,2,3,4,5,6,7,8,9, 10,11,12,12,21,22 and 23 have been covered before the month of August 2017. However, soon after implementation of the project these households started throwing the waste in those conservancies again.







Figure 9: Condition before and after implementation of Sewer Project.

4.3.3 Blockage of Sewer line

The issue of blockage of sewer line arose at the very initial stage of functioning of sewer line, It was reported that it occurred due to abuse of sewer systems by users, flushing unsuitable products down toilets or sinks. Products such as wipes, clothes, sanitary products and nappies disposed through the household waste disposal system are responsible for blocking of the sewer line.



Figure 10: Poor Maintenance of Property Chamber leads to blockage at home



Figure 11: Waste water backed up at house

Reverse flow during rain

Houses built at a lower level than road level, suffered back flow of waste water after their house got connected with sewer line. This mainly occurred due to the installation of combined storm and sanitary sewer. During extreme rain in the months of July and August, these houses experienced water logging in the year 2017.



Figure 12: Newspaper outling highlighting back flow issues in the selected ward.

4.3.4 Lack of Implementation of Rain Water Harvesting Policy

In study area, waste water and storm water are being discharged in the sanitation sewer as there is no planning of storm water drainage.

By order dated 1st April 2005, rain water harvesting in Jabalpur has been made mandatory in buildings with an area 250 sqm or more. A rebate of 6 percent on property tax in the year of completion of rain water harvesting facility has been offered to the owner, as an incentive. Despite the provision of the rebate, this policy has not met with success.

One of the reasons for the same can be attributed to the cost of the same. The cost of rainwater harvesting structures depends on the type of technology adopted. The amount of Rs 3000 includes cost of pipes, filter media and construction of a pit. Apart from this an additional cost of Rs 1500 will be incurred in laying of pipes for draining the roof water. The incentive (6 percent rebate on property tax) for an average plot size of 250 sq. m, amounts to Rs 5000 per annum. The rebate of 6% of the amount will be of Rs 300 only. Therefore, the present subsidy is about one fifth of the incremental cost of the rainwater harvesting structure and is not enough to

4.3.5 City wide issues

Observed and anticipated issues at city level are summarised below: CONSTRUCTION, OPERATIONAL & MAINTENANCE PHASE

Sewerage and Waste Water Treatment System:

The sewerage and waste water treatment system of Jabalpur city has been constructed in different development stages. They are not consistent, synchronous with deteriorating facilities causing incapacity. Staging the investments for construction of waste water treatment plants further increases the ineffectiveness in condition of limited capitals.

 Connection & service access: The ratio of households connected to the centralised sewerage system is low. In city only 30% households are connected to sewerage system, out of which 90% of households still use septic tank. Black water connection at household level is not a mandatory requirement presently, leading to ineffective use of treatment system.

- Sewerage Tariffs: Currently no tariff is being collected, though the ratio of sewerage tariff is planned at a maximum of 40% of the clean water price.
- Operation Cost is not recovered: Local authorities have trouble in implementation of the current regulations on tariff collection. The level of cost recovery against the O&M expenses is nil.

Management and Funding issues

Management Issues: Providing sewerage facility in the city requires large scale investments, to the tune of approximately Rs. 470 crores over a period of 10 years. This is mainly due to the fact that consultants/contractor/engineers have constantly been changing.

5 Recommendations

In this section, provides recommendations aimed at improvement in the sewerage sector through development of an inclusive sewerage management system in the city.

5.1 Recommendations based on issues identified in the study area

The recommendations can be detailed into different stages as listed below:

- Planning stage
- Operation and Maintenance

5.1.1 Planning Stage

Integrated Urban Water Management Approach

Even though the city is planning to implement wastewater management system, the approach is isolated and does not consider the entire life cycle of water. JMC should consider integrated urban water management system approach. The approach includes water resources management through all stages including distribution of water and managing wastewater. This approach allows to make entire water cycle more efficient and thereby reduce the requirement of infrastructure (distribution as well as sewerage system). The components of integrated urban water management include:

Inclusive participatory planning

Participation of key stakeholders from public, private and social sectors, representing different socio-economic classes and have a stake in waste water in Jabalpur municipal limits is essential. There can be many stakeholders involved but an agreement needs to be reached with the representatives of local government who remain the main convener. The participation of stakeholders is needed in order to: break 'silos' between different sectors and activities and reach a common understanding and vision for addressing the challenges and activities to be undertaken for the same.

Consider wastewater as a resource that can be used productively.

Currently JMC does not have any plans regarding the use of waste water. Grey water can be reused for irrigation, urban agriculture and industrial processes, treated or untreated depending on the purpose of its use; nutrients in wastewater (grey and black) can be used for energy production and fertilizer production.

Optimum infrastructure design

Ward number 31 faces issues related to back flow of sewage into individual households during heavy rain. Optimum infrastructure design at planning stage should consider the same, while the city plans to scale up the project and connect households from other wards to trunk line. The design of system should be based on a multi-criteria decision support system to analyses a wide range of indicators, including:

- · Condition of households
- · Size of population in ward
- · Access skilled manpower
- Natural terrain or slope

The figure below details the current situation of crossing of drains while giving connection to sewer services

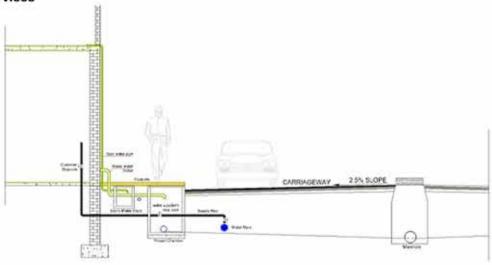


Figure 13: Drawing showing the current situation where sever pipe works crossing drains in vicinity

The vulnerability of drains to blockage can be minimised through technical advice during construction of storm water drains and property chambers. However, this would be difficult to implement in areas where drains have been built or reconstructed already. Under ideal circumstances, all related departments of JMC should work in coordination to avoid crossing of one underground services with other.

Suggested layout for household connection to Sewerage network separation for design of sewer, storm & water line.

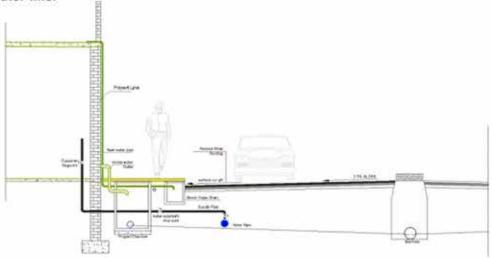


Figure 14: Road Section depicting placing of services in Ideal situation

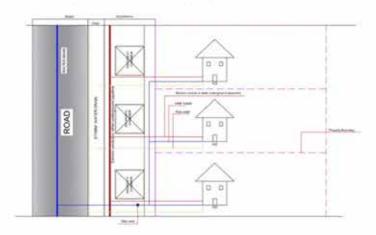


Figure 15: Plan of the various underground services

1) Horizontal Separation between Underground Water Mains and Sanitary or Storm Sewers

New underground water mains should be laid to with a horizontal distance of at least three feet between the outside of the water main and the outside of any existing or proposed storm sewer and at least three feet and preferably ten feet from the existing and proposed sanitary sewer.

2) Vertical Separation between Underground Water Mains and Sanitary or Storm Sewers

New or relocated, underground water mains crossing any existing or proposed sanitary sewer or storm sewer should be laid so the outside of the water main is at least 6 inches, and preferably 12 inches, above or at least 12 inches below the outside of the other pipeline. It is preferable to lay the water mains above other pipelines.

In cases where it is not possible to maintain a 10 ft horizontal separation, deviation may be allowed on a case-by-case basis, if supported by data from the design engineer. Such deviation may allow installation of the sewer pipelines closer to a water line, provided:

- The sewer pipeline and water line are laid in separate trenches, or
- 2. The sewer pipeline and water line may be installed in the same

trench with the water line placed on a bench of undisturbed earth.

In either case, the crown of the sewer pipeline shall be at least 12 inches below the invert of the water line.

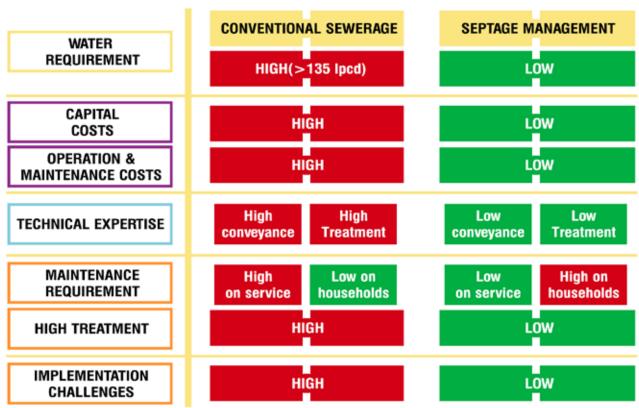
In situations where it is impossible to obtain proper horizontal and vertical separation as stipulated above, the following protection should be provided:

- Encasement of the sewer pipeline in concrete (minimum 6-inch thickness).
- In instances of conflict with sanitary wastewater structures mentioned above, relocate the water line to achieve either a 10-foot horizontal or 18-inch vertical separation.

Inclusive water governance

Since the centralize sewage system only covers the planned development areas, informal settlements such as slums are excluded from it. Planning should include a combination of centralized and decentralized management systems. As the city lacks policy for septage management, decentralized management should include policy for effective septage management.

The benefits of septage management over the conventional sewerage systems are as follows:



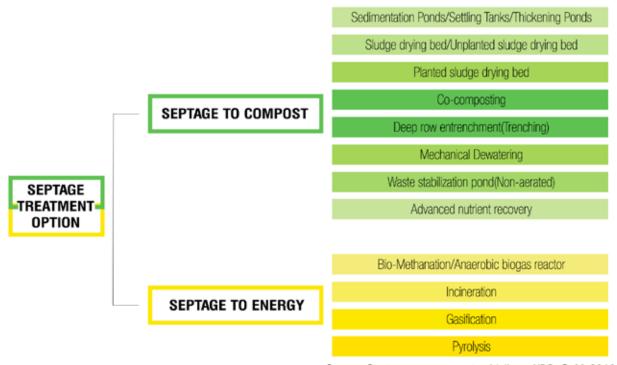
Septage management guidelines

Source: Septage management guidelines, UDD, GoM. 2016

The steps for planning of DEWATS system are listed below:

- · Assessment of existing situation across sanitation service chain
- · Assessment of existing toilets and septic tanks and creation of database
- · Planning of septage treatment facility
- · Involvement of private sector participation for septage management activities
- · Awareness generation and capacity building activities
- · Management of Information system (MIS), monitoring and feedback systems

The flow chart below from Maharashtra septage management guidelines provides various options for septage management through DEWATS system



Source: Septage management guidelines, UDD, GoM, 2016.

Based on detailed assessment one of the above options can be selected.

5.1.2 Construction Stage

Enhance capacity of related stakeholders through awareness and campaign Programmes (Awareness raising for communities Via information campaigns, communication, education, in cooperation with social organizations).

Jabalpur Municipal Corporation should take up initiatives for raising awareness programmes through communications and media, targeting all age groups of people. It is recommended that workshops and knowledge sharing programmes on sewerage system of the city be conducted. In addition, citizens and the community should be allowed to participate while planning and executing the work, in order to increase acceptability of the project.



Figure 16: Public meeting and presentation can enhance public knowledge about severage system

5.1.3 Conservation of water sources

There is a pond (approximately 0.7 hectare) in ward number 31. This pond is however maintained very poorly. Through rain water harvesting project, rejuvenation of the pond may possible. The pond will then be able to support various ecosystem services for the benefit of the local communities.

5.1.4 Integrated data development and management

As the sewerage network project for Jabalpur has been proposed under phased manner, through different schemes and initiatives, an integrated data management system will be helpful to implement project more efficiently. The database with regard to several aspects like sewer connection details, collection network, asset details, history of installation etc. will be useful for decision making.

The system will enable remote monitoring of vast centralized sewerage systems by computer data processing with fault detection and alarm call-out procedures. The system would prove to be very helpful in initiating maintenance responses to deal with emergency situations. Such monitoring technologies enable labor cost savings associated with operation and maintenance inspections. This GIS based dataset includes mapping of all components of sewer system, proposed and existing network of sewer line, main trunk line, manholes, pumping stations, location of STPs, roads, zone boundaries of all the phases (Phases I, II and III, and proposed work in 55 villages) together to create a comprehensive view of completed and proposed work for sewerage service.

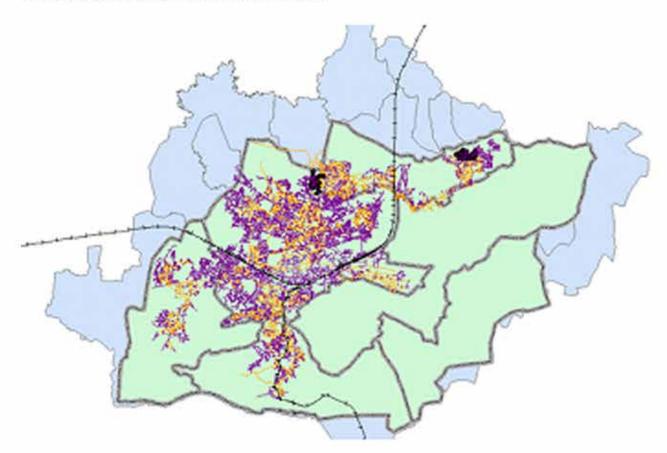


Figure 17: Snapshot of Dashboard of sewerage network of Jababur city

5.1.5 Financial Assessment and Planning for funding

Jabalpur Municipal Corporation is in process of implementing the sewerage reforms for the entire city of Jabalpur and adjoining 72 villages which fall in the municipal limits of Jabalpur. Financial modelling is needed for ascertaining the financial scenario and key values which will be helpful in making decision for implementation of the project. The main components involved in the financial analysis are sources of funds, Capital expenditure (Capex), Operation & Maintenance cost, recovery of Capex & Opex etc. which is presented in detail below:

Project cost & Direct & Indirect & Indirect Short fall of FUNDS in JMC

Jabalpur sewerage reform project is being implemented in three phases. First phase & second phase comprises of JNNURM funding and third phase comprises of AMRUT funding.

The phase wise breakup of project cost for implementation of sewerage reforms and funding issues for Jabalpur city are:

Direct short fall of fund

Rs. In Crore Project Cost — Capex on Sewerage					
JNNURM (Phase I)	85.91	78.00	7.91		
JNNURM (Phase II)	141.67	70.8	70.87		
AMRUT (Phase III)	438.57	324.089	114.481		

Total Direct Short fall in required fund: 193.26

Project grant & short falls in grants

			Rs in (Crore				
		Fun	ding Schen	nes & Share	s			
JNNURM	Govt. of India (Share-50%)		Govt. of M.P. (Share- 20%)		ULB (Share 30%)		Total	
	To be Taken	Fund received	To be Taken	Fund received	To be Taken	Fund received	Sanctio- -ned	Fund received
JNNURM (Phase I) Sanctioned cost Rs.78 Cr.	39.05	25.35	15.62	14.03	23.4	17.55	78.00	56.93
Shortfalls in fund in Phase I	13.7		1.59		5.85		21.14	
JNNURM (Phase II) Sanctioned fund Rs. 70.8 Cr.	35.40	31.86	14.16	12.74	21.24	21.24	70.8	65.85
Shortfalls in fund in Phase II	3.54		1.42		0		4.96	
AMRUT	Govt. Of India (Share- 33.33%)		Govt. of M.P. (Share- 50%)		ULB (Share 16.67%)		Total	
	To be Taken	Fund received	To be Taken	Fund received	To be Taken	Fund received	IUIAI	
AMRUT(Phase III) Sanctioned fund 324.089	108.01	-	162.04	-	54.02		54.02	

NOTE

- As of date, total fund received by ULB from centre & state under AMRUT is 67 Cr. (Fund comprises for Water Supply & Sewer both).
- out of which 22 Cr. has been expended on sewerage work.
- · Since the AMRUT is on progress, if only assume for share of ULB, ULB have to think for this fund in before.

Requirement of	fund in ULB for	sewerage reform

PROJECT PHASES	DIRECT	INDIRECT	TOTAL
JNNURM (Phase I)	7.91	21.14	29.05
JNNURM (Phase II)	70.87	4.96	75.83
AMRUT (Phase III)	114.481	54.02	168.50
			273.38 crores

Based on the above analysis the Municipal Corporation of Jabalpur needs Rs. 273.38 crores to complete the proposed work of sewer under phases I, II and III. The broad picture of the financial gap that JMC needs to fill to complete at least the proposed work under different phases of sewerage reforms in the city is summarised. However, JMC needs to think about the other phases too that will come up in the near future for the rest of the work of sewerage in the city.

JMC is recommended to arrange sources of funds through different financial models. The ULB may adopt the following approaches:

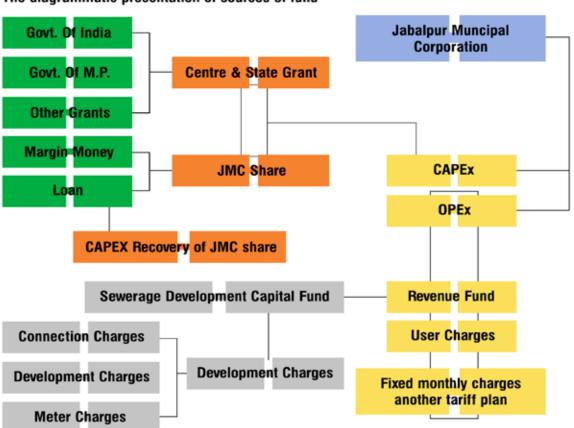
A. User financing project funding is proposed for JMC share and categorized as follows

- One-time sewerage charges while granting the new service connection
- Connection charges i.e. meter cost
- Sewerage charges (forming 40% of the water tariff)

B. Other sources

I. Loan which is also recovered from Sewerage Infrastructure Development Charges.

The diagrammatic presentation of sources of fund





Local Governments For Sustainability, South Asia