



Sanitation Capacity
Building Platform

Urban Wastewater Management in Telangana

A City Level Sanitation Study
(Siddipet, Mahbubnagar, Karimnagar)



National Institute of Urban Affairs



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Foreword

Sanitation Capacity Building Platform (SCBP) established in 2016 is a platform anchored by NIUA and 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 to Ministry of Housing and Urban Affairs (MoHUA), Government of India, by focusing on urban sanitation and supports states and cities to move beyond Open Defecation Free (ODF) status by addressing safe disposal and treatment of human faeces.

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 Management (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 waste water management. The ULB's institutional landscape and the major issues and 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 is based 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. Review of other secondary data such as DPRs, performance reports, annual budget documents etc. were also used in the study. Transact walks in City area, Site visits to public toilets, IHHLs, DRCCs, Vermi Compost Units, Landfill areas, STPs, Water bodies, Sewerage Networks, etc. were undertaken to examine the various challenges and also to interact with the various stakeholders involved in the process. Further the water samples from all the three towns were tested for the chemical and microbial contamination at the points of water distribution and in the impact zones of probable contamination.



Section I

Urban Septage & Sewerage Management in Telangana

1. Background

Urban environmental management is one of the most challenging issues as rapid urbanization trend continues globally. In India urbanization is taking place at a faster rate and the population residing in urban areas has increased to 28.53% as per 2001 census, and crossing 30% as per 2011 census and standing at 31.16% currently (Business Standard 2012). Building urban infrastructure to meet these growing populations has been a major challenge and one among them is under-management of domestic wastewater leading to the pollution of fresh water sources. In the developing cities, it is estimated that more than 90 percent of sewerage is discharged directly into rivers, lakes, and coastal waters, without treatment of any kind. In India, cities produce nearly 40,000 million liters of sewerage every day and barely 20 percent of it is treated (Mihir Shah. 2016). As per the survey of Central Pollution Control Board (CPCB), In India, the estimated sewerage generation from Class I cities and Class II towns (representing 72% of urban population) is 38,524 million liters/day (MLD), of which there exists treatment capacity of only 11,787 MLD (about 30%) (CPCB 2010). Because of the hiatus in sewerage treatment capacity, about 38791 MLD of untreated sewerage (62% of the total sewerage) is discharged directly into nearby water bodies. (ENVIS 2015).

Attainment of financial, environmental, social and equitable services in wastewater management is one of the critical outcomes envisaged in the Sustainable Development Goals. The current focus of many flagship missions of the government or components within them, like AMRUT, Smart Cities and Swachh Bharath Mission etc. are aligned with this goal and decisive beginnings towards its achievement have already been made by different cities countrywide. In order to strengthen and accelerate the progress in this direction, as well as to incentivize these initiatives by looking at the larger and more sustainable impacts or aspects of sewerage, faecal and septage management issues at city levels, the National Institute of Urban affairs (NIUA) New Delhi has designed a study of the Urban Sanitation, Septage and Wastewater Management across 4 states of Madhya Pradesh, Karnataka, Odisha and Telangana. The study is designed with the twin deliverables of yielding vital information to the participating ULBs and the States within which the ULBs are located and also contribute to the Capacity Building services provided by the NIUA under the Sanitation Capacity Building Platform (SCBP). The assessment is expected to answer the following key questions.

Key research Questions of the study

1. What is the current status of sanitation, septage and wastewater management in 3-4 towns of the Telangana state in terms of quantitative and qualitative assessment of sewerage and septage management in each town? What are the technologies/systems in use? Or what are the current

- FSS management practices? Capacities of the existing sewerage system vs. capacity currently required)
2. How sustainable and equitable are the existing and proposed sanitation, septage and wastewater disposal services in urban areas of the given towns of the state you wish to study. Place this in context to the Municipal Finances and Institutional structure of the Urban Local Bodies and the economic situation of the population in general and the poor in particular.
 3. What is the septage containment, conveyance, and disposal and treatment systems in each town? What is the business model for the private sector operators (study for a few operators)? Where this is done by the Municipality, what is their operational model?
 4. What is the contribution if any of unsafe disposal and treatment, contributing to the contamination of ground water and surface water?
 5. What are the 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 the towns?

Methodology

MARI has collaborated with RCUES, an urban training institute to undertake this study. The research team has been put in place with experts in urban sanitation with defined roles & responsibilities for each component of the study. As a first step the research team met the key officials in CDMA and briefed about the project objectives and the town selections was made and official instructions were communicated to the Municipal Commissioners to support with necessary information and field visits as required by the study. Preliminary field visits to the three towns were made by the research team to brief the commissioners on the assessment and also to briefly visit the town for checking the current status septage management. Checklists and key questions were prepared after the preliminary visits and the information was collected from detailed interactions with staff teams (Water Supply, Sanitation, Town Planning, Finance, MEPMA, PHED, DMHO). FGDs with SLFs, TLFs, Slum Dwellers, Pit Emptiers, DRCC Entrepreneurs, Contractors executing UGD works etc. Transact walks in City area, Site visits to public toilets, IHHLs, DRCCs, Vermi Compost Units, Landfill areas, STPs, Water bodies, Sewerage Networks, etc. were undertaken to examine the various challenges and also to interact with the various stakeholders involved in the process. Further the water samples from all the three towns were tested for the chemical and microbial contamination at the points of water distribution and in the impact zones of probable contamination. The preliminary findings were represented to the town officials and are validated for their accuracy. The data gaps if any were filled in during these follow up visits. Key results of the study were shared with NIUA during a partners meet in New Delhi and the same are also shared at the CDMA office. Inception report and detailed fact sheets for the three towns and

submitted to NIUA for their approval before proceeding for the final town wise report and consolidated state report.

About Telangana State

The new state of Telangana was formed on 2nd June 2014 with the enactment of Andhra Pradesh Reorganization Act 2014 with Hyderabad as its capital. The state comprises of 31 districts as per the Telangana district reorganization undertaken in 2016. The Census 2011 reports urban population of Telangana state as 13.72 million representing about 38.89 percent of total population. Most of the net increase in the urban population is contributed by five erstwhile districts of Hyderabad (100 percent), Rangareddy (70.32 percent), Warangal (28.34 percent), Adilabad (27.68 percent) and Karimnagar (26.08 percent). The urban population of the state is 1,37,24,566 spread across 73 Urban Local Bodies consisting of 6 Corporations, 42 Municipalities of all grades and 25 Nagar Panchayats and 1 Secunderabad Cantonment including the 13 urban agglomerations and 79 census towns as per 2011 census. The net increase of urban population between 2001 and 2011 is 38,71,779 persons. Hyderabad is the 100 percent urbanized district in the state with Greater Hyderabad Municipal Corporation representing more than 50 percent of the state urban population.

In order to meet the growing demands of the population in this rapid urbanization process, CDMA has been designing various programs under the flagship schemes such as Amrut, smart cities and Swatch Bharat Mission etc. addressing the solid and liquid waste management apart from safe and adequate water supply. The state wide urban towns and the category wise ULBs are shown in the map below.

Table 1: ULBs in the state of Telangana

ULB	No's	Urban Population
Municipal Corporations	6	8637445
Selection Grade	Nil	Nil
Special Grade	2	328715
First Grade	8	831373
Second Grade	15	974732
Third Grade	12	570941
Nagar Panchayats	30	819708

Source: CDMA 2017

Map 1: Map showing category wise ULBs in the state of Telangana



Source: CDMA 2017

2. Urban Sanitation Policies and Governance

In Telangana State, the Urban Development is being spearheaded by the Municipal Administration and Urban Development (MA&UD) Department headed by the Principal Secretary, MA & UD Dept. which is the umbrella organization at the Secretariat level and deals with the Planning and Development in urban and rural areas. The MA&UD Dept. has overall administrative control of 3 wings and 1 Corporation (Parastatal bodies) comprising the Commissioner & Director of Municipal Administration (CDMA), the Engineer-in- Chief (Public Health & Municipal Engineering Dept.) and the Director of Town & Country Planning; Telangana Urban Finance and Infrastructure Development Corporation. It also coordinates housing development with Telangana Housing Board and Telangana State Housing Corporation etc.

The CDMA looks after the overall Municipal Administration, revenue, audit and accounts, poverty alleviation, other municipal services like solid waste management, capacity building and coordination with the other wings of MA&UD.

The Engineer-in-Chief (PH&MED) takes care of Water Supply and Sewerage schemes and other Engineering activities like planning, investigation, project formulation, design, procurement, implementation, quality control, and exercises technical control over all the engineering works in all the ULBs. The PH&ME Dept. was evolved from the erstwhile Public Works Department (PWD). After completion, these schemes are being handed over to the ULBs for regular operation and maintenance.

The Director of Town & Country Planning handles the tasks of planning and development in urban and rural areas by preparing Master Plans, and regulation of development through development control and enforcement activities.

Policies, Plans, Programmes and Guidelines related to sewerage and septage management

Post MDGs, India is also a signatory to the 17 Sustainable Development Goals of the UN agreed in 2015 under which Goal 6 is “Ensure Availability and Sustainable Management of Water and Sanitation for All” while Goal 7 entails “Ensuring Environmental Sustainability” which aims at halving the No. of persons without sustainable access to improved drinking Water and improved sanitation. Although India could achieve the target for water supply, there is significant shortfall in sanitation.

The Govt. of India formulated the National Urban Sanitation Policy in 2008 and it recommended for safe collection, transportation and disposal of septage and installation of appropriate O&M systems for the upkeep of sanitation equipment. Further the Govt. of India has also brought out “Septage Management Guidelines” in 2013. The National Building Code 2005 and the Manual on Sewerage and Sewerage Treatment by the CPHEEO constitute the major sources of standards and guidelines for septage management in India. The CPHEEO Manual has suggested that state and municipal governments should draw up an action plan for extracting, treating, and disposing the sludge generated in on-site facilities in accordance with the “Septage Management Guidelines” 2013, and prepare measures and budgets necessary for implementation of the plan. The MoUD, Govt. of India also formulated the Faecal Sludge and Septage Management (FSSM) Policy in 2017 with the objective of achieving safe and sustainable sanitation for all by putting in efforts towards safe collection, treatment and disposal of all human waste that is collected from onsite sanitation systems such as septic tanks, public and community toilets.

Accordingly, the Govt. of Telangana have also prepared the Telangana State Sanitation Strategy (TSSS) 2017 under the aegis of the State Level Sanitation Committee (SLSC) following a consultative process whose vision is “All cities

and towns in Telangana become totally clean, sanitized, healthy and livable ensuring and sustaining good public health and environmental outcomes for all its citizens, with a special focus on hygiene and affordable sanitation for the urban poor and women.” Accordingly, the TSSS provides an overview of the urban State Sanitation Scenario and integral solutions for addressing the sanitation issues and showcasing linkages with cross cutting sectors like water supply, solid waste management and storm water drainage. It also sets out a planned approach for improving urban sanitation in the State in a sustainable and phased manner.

The technical aspects like providing appropriate sewerage and septage management services, and the strategic aspects like planning, finance, technology, capacity enhancement, inclusiveness, climate and disaster resilience, strengthening of institutions and governance are also incorporated in the strategy. As a first district to implement, Warangal Municipal Corporation has adopted the “Operative Guidelines on Septage Management” with the technical support from Administrative Staff College of India, Hyderabad.

3. Ongoing WASH Flagship Programs

The major flagship programs that are being implemented in the state of Telangana for improving water and sanitation facilities are AMRUT, Swatch Bharat Mission, Smart cities programs, Mission Bhagiratha and Mission Kakatiya apart from the external aided programs of GIZ and World Bank.

Mission Bhagiratha (URBAN): Drinking water supply to every household

Telangana Drinking Water Supply Project named “Mission Bhagiratha” has been taken up with a commitment to provide safe, adequate and sustainable drinking water for the rural and urban areas by 2017, to bring down the disease burden due to contaminated water and to improve health standards as well as economic status of the families with an outlay of Rs. 42,853 Cr. It envisages supply of treated drinking water to every household at their door step on saturation mode at 100 LPCD in rural areas, 135 LPCD in Municipalities/ Nagarpalikas and 150 LPCD in Municipal Corporations. 10% of total water will be earmarked to meet Industrial needs. The program is estimated to cover a geographical area of 1.11 lakh sq. km spread over 537 Mandals, 63 ULBs benefitting 2.73 cr. people in Telangana and is designed such that 98% of transmission & distribution systems function by gravity. There will be 19 new intake structures, 50 WTPs (3,344 MLD), 596 ELBRs, 554 Sumps/GLBRs and 18,276 village service reservoirs, 1.44 lakh km including construction of new pipelines of 1.006 lakh km.

Telangana Drinking Water Supply Corporation” is set up for implementation and future O&M functions. Quality control & Vigilance wing is strengthened, pre and post delivery inspections are being made jointly with third party consultant i.e., WAPCOS. Supply of treated water to all habitations in rural areas has been entrusted to RWS&S Dept., and supply of treated water to all habitations in urban areas has been entrusted to PH&ME Dept. and supply of treated water to all habitations in Hyderabad and ULBs within ORR has been entrusted to HMWS&SB.

Water Supply projects are taken up by PHED in 61 ULBs, by RWS&S in 4 ULBs (mostly Nagar Panchayaths) and balance by HMWS&SB in 7 ULBs. The Project contemplates drawing about 42.67 TMC of water (2018) from major reservoirs, Krishna and Godavari Rivers and from other reservoirs. Identifying the sources in such a way that the dead storage in reservoirs will be sufficient and will be utilized during drought situations. The Govt. has reserved 10% of water in all the reservoirs for drinking water, specifying it as the first charge. Necessary water drawl permissions are also accorded. The Govt. accorded Administrative Sanction for taking up water supply improvement projects in 44 ULBs (25 under Phase I and 19 under Phase II) under Mission Bhagiratha to provide water to every household under the program ‘Intintiki Nalla’ and inviting tenders under LS contract-Modified Annuity mode for Rs. 2311. 48 Cr. (25 ULBs in Phase I for Rs. 809.20 Cr. + 19 ULBs in Phase II at 1,502.28 Cr.) All the projects under Phase I are under execution, and tenders are invited for the projects under 3 packages under Phase II, to be completed in 15 months.

Mission Kakatiya (Mana Ooru Mana Cheruvu)

Mission Kakatiya is a program for restoring all the minor irrigation tanks and lakes in Telangana State, the Goal of which is to restore 46,531 tanks and lakes across the state in 5 years and was inaugurated on 12 March 2015. The scheme aims at reviving defunct and neglected tanks and recharge groundwater wherever the scheme is taken up. The silt from the tank bed is being removed, transported and used in the farms to improve the soil fertility. The program is benefitting the farmers to increase gross irrigated area under tank ayacut. Productivity has gone up wherever tank silt is used for paddy, cotton and sorghum and the household agricultural income has also increased by 78.50% in the tank ayacut area. The increase is mainly due to the increased water storage and retention capacity in the tanks after the tank renovation program. As it helped in reviving the tanks, the program also helped in increasing the groundwater level by more than 1m (in fact 2.55 m) compared to the normal raise in 2013 as per a study conducted by I&CAD Dept. Thus it has also enhanced the dependability and sustainability of the ground water sourced Protected Water Supply schemes.

Swatch Bharat Mission

Swatch Bharat Mission, another flagship program of the Govt. of India, is also being implemented from 2014 in Telangana state with the objective of making the towns Open Defecation Free (ODF) by 2019. Out of the total 31.35 lakh urban households, 9.56% of households do not have access to a sanitary toilet in their residential premises in urban Telangana. Out of this, about 8.38% (2,27,094 households) defecate in the open against 12.6% at the national level. The remaining 0.88% use public sanitation facilities. Open defecation is among the highest in the districts of Adilabad (25.87%), Mahabubnagar (19.37%) and Nalgonda (18.22) i.e., higher than the state's average of 8.68%. The 28,221 households without toilet use shared toilet facilities while 1,81,675 go out to defecate in the open, adding to the faecal load in the environment. So far, 36 towns have been declared as ODF by the QCI of MoUD and other 37 towns are awaiting verification by the QCI. So far, 1.44 lakh individual toilets have been constructed/converted in the ULBs out of the target of 1.64 lakh individual toilets except GHMC.

Smart Cities Mission

Smart Cities Mission is another path breaking program of the Govt. of India. Karimnagar and Warangal Cities are covered under the SCM in Telangana state. Karimnagar City has been declared as ODF by the QCI. Towards graduating to ODF status, the City has proposed Septage management for Rs.75 Cr. under the SCM, since the City is being provided a sewerage system under the UIDSSMT scheme under JNNURM program at a cost of Rs.77 Cr. covering most of the core city and which is nearing completion. The Warangal Municipal Corporation has also been declared ODF by the SBM directorate, but it has to graduate towards ODF + for which the City has proposed sewerage collection and recycling and lake regeneration under the Smart Cities Mission for Rs.134.90 Cr.

AMRUT Cities

AMRUT programme is a flagship program of MoUD, Govt. of India, the purpose being universal provision of water supply and sewerage connections to people's households. The Govt. vide GO Ms No. 43 MA&UD Dept; Dt. 20-02-2017 accorded Administrative Sanction for taking up water supply improvement projects in 10 ULBs under AMRUT to provide water to every household under the flagship program 'Intintiki Nalla' at the project cost of Rs. 1521.31 Cr. The municipalities include Karimnagar, Mahbubnagar (NIUA sanitation study towns). The Telangana Govt. has proposed sewerage system in Siddipet Municipality under the flagship AMRUT program of Govt. of India at a cost of Rs.205.83 Cr consisting of 2 Sewerage Treatment Plants of a total of 18.10 MLD capacity for which the projects are under implementation.

External Aided/ funded Program

The GIZ is supporting the Govt. of Telangana towards achieving ODF and ODF+ status in policy and strategy formulation, programme management etc. There is another World Bank program which is supporting the TPMD program.

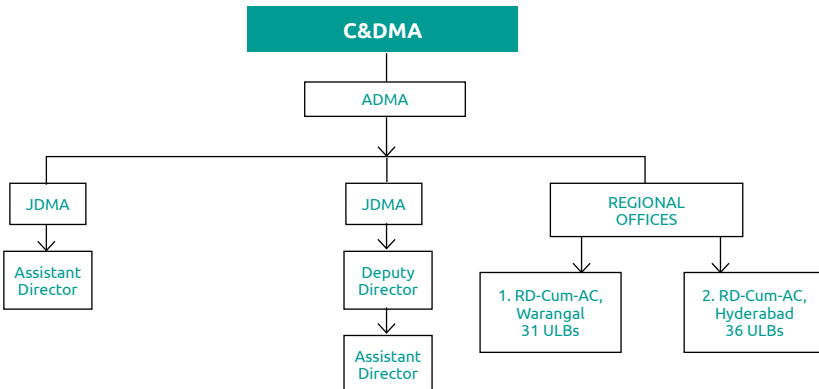
4. Institutional Structure of the Municipal Administration

The state and district level administration is very important for efficient functioning of the systems. The CDMA at state level works in tandem with the district and also with the other contemporary functionaries within state level to ensure service delivery. At the state level the CDMA administrative and Governance is shown below.

Commissioner and Director Municipal Administration

At the State Government level the Municipal Administration function is part of the portfolio of the Minister for Municipal Administration & Urban Development, with the Principal Secretary as the Administrative Head at the State Secretariat. They are responsible for policy formulation and consideration of any amendments to any Bill placed before the cabinet. At the administrative level the Commissioner and Director, Municipal Administration and their team are responsible for the implementation and scale-up of various policies formulated at the State level and translates the same into concrete activities. The C & DMA is supported at the State level by Additional Directors, Joint Directors, Regional Directors, Deputy Directors, Statistical Officers Assistant Directors and Various Sections, headed by Section Officers. It is interesting to note that these Sections are also named Sections 'A' through Section 'H' with a distinct subject assigned to each Section.

Figure 1: General Structure Municipal Administration Department - C&DMA



In order to ensure the coordination of some of the critical functions under Municipal Administration that require high level of technical specialization, CDMA works closely with other departments within the administrative ambit of the Municipal Administration Department and they include

- A. Public Health & Municipal Engineering Department
- B. Town & Country Planning Department,
- C. Urban Finance & Infrastructure Development Corporation
- D. Urban Community Development Department.

A brief description of each unit is given below.

A. Public Health & Municipal Engineering Department (PH&MED)

The Department is in charge of investigation, designs, and execution of water supply and sewerage schemes in all the Municipalities in the state and Municipal Corporations, besides the technical control over all the engineering works. After completion, the schemes are handed over to the concerned Municipal Corporations and Municipalities for operation and maintenance.

Main functions (PH&MED)

- Approval of designs of Municipal works;
- Technical sanction to estimates;
- Technical opinion to the Municipalities in finalization of tenders;
- Check measurement of works executed by the Municipal Engineers grade II & III;
- Periodical inspection of water supply and sewerage schemes maintained by Municipality
- Approval of Bye-laws for water supply in Urban Local Bodies

PH&MED is headed by Engineer in Chief supported by Superintending Engineer (Public Health), Executive Engineer (PH), Dy. EEs and EEs. At the establishment level a non-technical personal assistant (NTPA) looks after the administrative functions, supported by a superintendent separately for services and accounts.

Currently PH&MED is responsible for implementation

- AMRUT Mission implemented in 12 Telangana towns including all the 3 cities selected for the study i.e. Karimnagar, Siddipet and Mahbubnagar.
- Telangana Municipal Development Project (a project implemented by the State Government with support from the World Bank) for the supply of water to the high priority water supply in selected ULBs, capacity building of urban functionaries to develop and manage urban services and water supply projects with World Bank Assistance.
- Mission Bhagiratha (Urban) which envisages coverage of all households on

a saturation mode with supply of treated drinking water to every household at their door step at the rate of 100 LPCD in rural areas, 135 LPCD in Municipalities/ Nagarpalikas and 150 LPCD in Municipal Corporations. 10% of total water will be earmarked to meet the Industrial needs.

B. Directorate of Town & Country Planning

The Directorate of Town & Country Planning is responsible for looking after the subject of planning and development in urban areas. The department inspects if the towns are planned and regulated under the provisions of APTP Act, 1920 under the provisions of local body acts, viz., Municipal Corporation Act, Andhra Pradesh Municipalities Act and A.P Urban Areas (Development) Act and A.P. Cinematography Act. The department assists the Government in all Town and Country Planning matters as well as in coordinating with various departments involved in area development like Telangana Housing Board, Telangana State Housing and Urban Development Corporations, Telangana Industrial and Infrastructure Corporation, Industries Department etc.

Main Functions include:

The Technical statutory functions i.e. Preparation of General Town Planning Schemes (Master Plans), preparation of indicative land use plans (Mandal Master Plans), technical approval of layouts, technical approval of buildings plans, (group housing), commercial complexes, preparation and approval of type designs for community and public buildings, technical clearance of installations (industries) and approval of road development plans and NOC for cinema theatres / multiplexes.

The Technical non-statutory functions include allocation of IDSMT funds (The scheme is already closed in the year 2005 and the work of approved components is under progress), approval of designs for public and community buildings and suggesting variations to the sanctioned Master Plans.

Advisory Functions include officiating as advisor to urban development authorities, Telangana Housing Board, Telangana Industrial Infrastructure Corporation, Telangana Pollution Control Board, Telangana Swagruha Housing Corporation and Government on planning matters and advising on selection of sites and services of Municipal Councils.

C. Telangana Urban Finance & Infrastructure Development Corporation (TUFIDC)

TUFIDC is an organization initiated by Telangana Government for implementing several infrastructure and housing schemes for urban poor. Floated as a company, initially, TUFIDC, in the year 2005 was incorporated as a Trust and re-structured to act as an asset manager for implementation of its various

reforms projects. TUFIDC Ltd provides technical and financial assistance in the form of loans and advances to ULBs etc. and also acts as trustees for funds raised. The TUFIDC is the channelizing agency for funds released by State and Centre under different schemes (JNNURM, AMRUT, Swatch Bharat etc). TUFIDC is also the designated nodal agency for Tax Incremental Financing, Housing in Partnership and coordinating agency for activities under JNNURM.

D. Mission for the Elimination of Poverty in Municipal Areas (MEPMA)

MEPMA has been formed in the year 2007 in the then united Andhra Pradesh vide GO MS 414 establishing the Mission of the formulation of strategies to implement poverty reduction programs in urban areas. Following the carving out of the State of Telangana, and the division of departments and staff, MEPMA Telangana State was formed vide GO MS No 129 dated 31/5 2014. The overall aim of MEPMA is enabling the 30 lakh urban poor to have improved quality of life by accessing services from all organizations through their own self-reliant and self-managed institutions. Under MEPMA, the women are organized into Self Help Groups and these are federated at slum level, city level, and district level and also at state level to demand their rights demonstrating their collective strengths. All the flagship programs of the DAY-NULM, NUHM, SBM and other poverty alleviation initiatives of the urban poor are implemented through these groups and federations to further strengthen their resource base through self-generated thrift and access to support from financial institutions including banks.

The four departments are expected to function hand in hand with highest cooperation to follow the sequence of planning, technical assessment, funding approval, implementation and handing over the assets to the Municipalities. The Municipalities have to then take care of the entire functional services which the following structure has been put in place.

Municipal Corporations – Structure and Functions

Urban local bodies are the Municipal governance institutions at the city level. “A Municipal Corporation is a body politic, created by the incorporation of the people of a prescribed locality and invested with subordinate powers of legislation, for the purpose of assisting in the civil government of the state and regulating and administering its local and internal affairs”. The municipal authorities (a term used to connote municipal corporations and the different grades of municipalities and Nagar Panchayats) are envisioned to be economic gems, generating their own resources by way of revenue from the citizens by way of taxes, etc. Looked at from that perspective, they are independent units, and governments in themselves.

Figure 2: Organisational Structure in Municipal Corporation



Functions of Municipalities

As per the provisions of the Municipal Acts, the municipalities are entrusted broadly with the following functions.

1. Public health, sanitation, conservancy and solid waste management.
2. Provision of water supply, drainage and sewerage.
3. Construction and maintenance of roads, drains, culverts and bridges.
4. Provision of street lighting.
5. Urban poverty alleviation programs.
6. Slum improvement and up gradation.
7. Provision of public parks and play grounds.
8. Construction and maintenance of public markets, slaughter houses.
9. Urban planning including town planning.
10. Regulation of land use and construction of buildings.
11. Maintenance of secondary and elementary schools.
12. Urban development programs.
13. Vital Statistics including Registration of Births and Deaths.
14. Maintenance of burial grounds.

Function and Objectives of the Municipal Council

The primary role of the municipal council is that of political oversight of the Municipality’s functions, programmes and the management of the administration. All of the powers of local government are vested in the municipal council. It has the power to make by-laws (legislative authority) and the powers to put those laws into effect (executive authority). The municipal council has executive and legislative authority over the matters set out in Part B of Schedule 4 and Schedule 5 of the Constitution. The Municipality may also administer any other matter assigned to it by national or provincial

legislation. The Municipal councils meet regularly and discuss the action plans and implement various schemes in consultations with its members. Municipal councils have the following functions.

1. to provide democratic and accountable government for local communities;
2. to ensure the provision of services to communities in a sustainable manner;
3. to promote social and economic development
4. to promote a safe and healthy environment;
5. to encourage the involvement of communities and community organisations in the matters of local government.

Analysis of the Institutional structure CDMA and ULBs

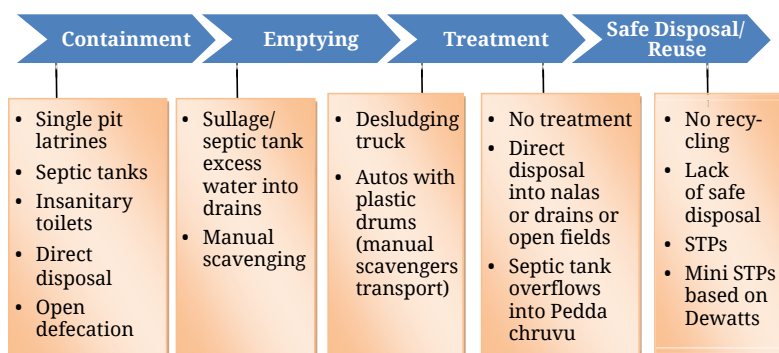
From the above it can be seen that the support organizations and departments operating alongside and under the ambit of municipal administration department and the ULBs are strategic moves to ensure that the focus on the various functions that relate to the implementation of schemes and Missions is not lost or diluted. Second, the division of activities also ensures that the various steps involved in the implementation of various sub-components is done in a specialized manner, to be able to lend the best and most professional inputs into the activity. A very important issue for consideration is also that the various technical specializations involved in the accomplishment of a single task makes it important for the presence of a strong institutional mechanism to enable drawing the required specialists and eliciting their support in the accomplishment of the task. While the role of various factors including inter-departmental coordination could have played a role in the problems currently faced in the KMC, it does point to certain lack of coordination between the concerned departments which needs to be addressed. Similarly the regularity of coordination meetings from the CDMA level down to the Municipality needs to be checked and streamlined. Reviews in these meetings are most important for course correction and streamline the progress of various activities. An important point to be noted is also that these coordination meetings should take place at all levels where required including the cutting edge levels so as to ensure translation of the information to all these levels and also percolates to the level of the community for enhanced citizen participation in implementation.

5. Status of Septage and Sewerage Management

Only 46% of properties (57% of population) in urban areas are connected with sewerage network most of which is in GHMC while sewerage coverage in slums is only 30%. Out of the total generated wastewater of 1,884 MLD, only 750 MLD (40%) is treated. Recycling and reuse of wastewater is very minimal with only one 20 MLD STP with extended aeration technology at Necklace road the effluent of which is let out into Hussain sagar lake. The quality of wastewater treatment

is fairly good (mostly in GHMC). The extent of cost recovery in wastewater management is 68% (GHMC) while the collection efficiency is 38%. Till the onset of Swatch Bharat Mission, sanitation is presumed to be synonymous with solid waste management in Telangana. But of late, sanitation is understood to comprise onsite sanitation through IHHLs based on Twin Pit Pour Flush technology, conventional sewerage system with underground sewerage network, and faecal sludge and septage management involving conveyance of the septage/faecal sludge through private/municipal desludging vehicles and causing its treatment through Faecal Sludge & Septage Treatment Plant (FSTP) or co-treatment in a conventional Sewerage Treatment Plant (STP). The entire Septage and Sewerage management value chain is depicted in the diagram below.

Figure 3: Sanitation Value Chain



Out of the total 73 ULBs in the state, in addition to GHMC, only 4 ULBs namely Karimnagar, Vikarabad, Ramagundam and Mancherial have sewerage system. The sewerage system in Karimnagar is in partial operation while those in Ramagundam and mancherial are in dysfunction. The sewerage network in the Hyderabad core city was first developed in 1931 by Sri Mokshagundam Visvesvaraya in an area of 54 sq.km covering a population of 5 lakh. The coverage of sewerage network in old MCH area (GHMC core area) is about 70% with a sewer network of about 4100 km and about 20% in the suburbs. The treatment capacity of the STPs with secondary treatment at 4 locations and of those with tertiary treatment at 14 locations is about 40% i.e., 750 MLD out of 1400 (1884) MLD wastewater generated in the HMDA (Hyderabad Metropolitan Development Area). About 592 MLD of treatment capacity has been created under NRCD (National River Conservation Directorate) Phase I with STPs in four locations. This scant treatment capacity is leading to pollution of water bodies and of ground water. In view of this, additional 610 MLD treatment capacity is being created under NRCD Phase II project in GHMC area by HMWSSB. In Karimnagar, an 18 MLD capacity STP with MBBR technology is commissioned and in partial operation. Sewerage schemes are being implemented in further

4 towns namely Nizamabad, Miryalaguda, Nalgonda and Siddipet. Under the UIG (Urban Infrastructure and Governance) component of JnNURM, a total of 52 projects were sanctioned at a cost of Rs. 2118 Cr and under the UIDSSMT scheme, out of the total cost of Rs.2459.96 Cr., sewerage sector was allocated Rs.350.46 crores to Telangana region in the erstwhile AP state.

While there is conventional sewerage system (sewer network served) in core areas, most of the slums and peripheral areas are served by either individual toilets (Twin Pit Pour Flush Toilets, either existing or recently constructed under SBM), or the toilets connected to septic tanks. Out of the 73 ULBs, 69 ULBs are served with on-site sanitation systems. Though majority of them may have been constructed as per design, some are constructed with only one pit, some with bottom concrete lining, some in clayey soils with no percolation of the sewerage to surrounding ground, some with the two pits adjoining and interconnected thus defeating the very purpose of twin pits. All these factors are making them only partially functional leading to improper digestion of the sewerage and environmental degradation.

As regards to septage management, there is no formal mechanism in any of the ULBs in the state, leading to insanitary handling and disposal of septage and faecal sludge without any treatment into the water bodies, drains or in open areas in and around the towns. So far, only Warangal Municipal Corporation has formulated “Operative Guidelines on Septage Management” and has initiated its implementation and a Faecal Sludge Treatment Plant (FSTP) of 20 KLD at a cost of Rs.1.2 Crore is being installed. At present, septic tank cleaning facility, albeit informal, is available only in few ULBs like GHMC, Warangal, Karimnagar, Jagtial, Nizamabad, Nalgonda, Khammam and Mahbubnagar, formal facility being available only in GHMC areas served by HMWSSB. However, none of the ULBs have an organized septage treatment system and there are hardly any organized networks of the sanitation workers handling the sludge machines or pit emptiers.

Approaches to Sewerage, Septage and Faecal Sludge Management (containment, conveyance and disposal) in the urban areas

Sewerage: Generally the preference in official circles in urban areas is for conventional sewerage system, particularly in Hyderabad and in bigger towns like Warangal, Karimnagar and Nizamabad corporations as water carriage system is supposed to solve localized environmental degradation. It is thought that the faecal matter is transported through the sewerage network and treated in a far off Sewerage Treatment Plant (STP) and disposed to water bodies or to land thus ridding the core areas from unhygienic environment and environmental degradation.

As a prelude to conventional sewerage system, presence of sanitary toilets is of primary necessity. First, the ULBs have planned to become ODF by converting all the existing insanitary toilets into sanitary (septic) toilets and by constructing new sanitary toilets where the households don't have toilets. This activity is nearing completion with 36 ULBs already declared ODF and the rest of the ULBs awaiting verification by QCI. This is expected to make the towns sanitary both at the personal level and at the community level.

The next step is to make them ODF plus by ensuring proper conveyance, treatment to effluent discharge standards and safe disposal to ensure a terrestrial and aquatic environment free of filth and pathogens. Once universal access to sanitary toilets is available and the city is made ODF, then the goal of ODF plus is planned to be achieved by either conventional sewerage system, or through faecal sludge and septage management (FSSM).

Further sanitation infrastructure needs to be complemented by storm water drainage network to collect and convey the septic tank effluent and the grey water to the sewerage treatment plant (STP). The storm runoff can be disposed by diverting it to water bodies thus preventing excess loading on the STP.

The Govt. of Telangana embarked on an ambitious programme of providing sewerage and drainage systems to cover all the ULBs across the state in the run up to achieve total sanitation status:

- a. **Package-1:** 13 ULBs for underground drainage (UGD) and 15 ULBs for storm water drainage (SWD) covering eight districts.
- b. **Package-2:** 18 ULBs for UGD and SWD covering six districts.
- c. **Package-3:** 19 ULBs for UGD and SWD covering nine districts.
- d. **Package-IV:** 18 ULBs for UGD and SWD covering six districts

Towards the above, the State Govt. has called for Expressions of Interest for study and preparation of DPRs. The tasks are proposed to be funded from the loan from the World Bank under the Telangana Municipal Development Project.

In all the smaller ULBs, and in the slum areas, in poor settlements and in peri-urban areas of larger ULBs also, Individual Household Latrines (IHHLs) with twin pit pour flush technology have been/are being constructed as ideally they provide an end to end solution by closing the nitrogen cycle in plain, gravelly areas. In hilly areas, in clayey soils septic tanks are being constructed, and in congested settlements with no space for IHHLs, community toilets are being constructed as a last resort. In view of the limited resources available in the ULBs, the Govt. of India has also recommended adoption of septage and faecal sludge management in preference to conventional sewerage

system, particularly in smaller ULBs and in peripheral, slum and low-density settlements. The CPHEEO Manual also recommends low cost, low maintenance systems like the Simplified Sewerage system, Small Bore Sewerage system to minimize the capital cost and the O&M cost.

With the water becoming a precious and scarce commodity, the HMWSSB has recently initiated steps for recycling and reusing the treated wastewater by selling the same for construction, industries, irrigation, gardening, urban forestry, car washing etc. at Rs. 125/5 KL with the transportation expenses to be borne by the consumer.

Sewerage and septage management technologies and their performance / efficiency (UGD/STP)

Sewerage: The most common technology for sanitation is the conventional centralized sewerage system. The technologies adopted vary from Waste Stabilization Pond (WSP), Upflow Anaerobic Sludge Blanket (UASB), Moving Bed Bio Reactor (MBBR), Sequential Batch Reactor (SBR), Soil Bio Technology (SBT), Phytotrid processes. The WSP technology has been adopted where there is adequate land. Where land availability is limited, other technologies such as MBBR, SBR and SBT etc. are being adopted. In Karimnagar, MBBR technology has been adopted for the 18 MLD STP which has recently been commissioned, but the cost of treatment is very high due to the scanty influent quantities due to low coverage of sewer connections.

Although technologies like UASB+ Extended Aeration are being adopted, the extent of reduction of e-coli bacteria after treatment doesn't exceed 63%. The primary reasons for the low efficiency is poor maintenance of pumps and motors in STPs and pumping stations, inadequate capacity for maintenance, inadequate understanding of the biological processes, power cuts, lack of adequate finances etc. Other reasons include lack of delegation of powers, lack of focus in official circles on the imperative for effective O&M, lack of adequate house service connections to feed the STPs, objection from nearby residents for running the STP due to foul odour and deafening noise from the air blowers, dumping of septage etc. In Karimnagar, the extent of connections is only about 5% resulting in sub-optimal utilization of the STP capacity (about 3%) affecting their performance and resulting in high cost of treatment. If the STPs based on UASB technology are planned ahead properly to utilize the methane for generation of fuel (biogas) or power or without flaring it, it would be cost effective.

In general, it is observed that the BOD removal efficiency of SBR process is better than UASB process which again is better than MBBR process; the TSS removal efficiency is better in UASB than in MBBR which is again better than

SBR and the nutrient removal is better in MBR than in SBR which again better than UASB. In the Life Cycle Costing analysis, the LCC of UASB reactor is less than MBBR process which is again less than SBR process. However, the SBR process is highly software and PLC driven requiring expert technicians to operate and maintain the same and the O&M is also costlier compared to the other processes like UASB, MBBR and WSP. Where land is not a constraint, WSP technology is the least in terms of LCC. A DEWATS (Decentralized Wastewater Treatment System) of 10 KLD capacity has been installed in Mahabubnagar Municipality at a cost of Rs. 10 lakhs with Constructed Wetlands process, whose performance is under evaluation.

The existing sewer systems are in a very dilapidated conditions and manual maintenance of sewerage network has become difficult particularly in narrow lanes, exposing the foundations of adjacent buildings, with the meager municipal staff and lack of sewer cleaning equipment. Rodent menace is also one of the major causes of poor condition of sewerage network, making its maintenance difficult. Water supply mains laid along sewers and sometimes across them is also resulting in contamination of drinking water.

Cost and investment analysis of the UGDs and STPs

The cost of providing sewerage system in urban areas was taken to be Rs. 4,704 per capita by the High Power Expert Committee (HPEC) headed by Ms Isher Judge Ahluwalia as per 2009-10 rates. If we consider the IHHL (Individual House Hold Toilet) with Twin Pit Pour Flush (TPPF) technology as a closed cycle stand alone technology, then the cost of providing sanitation is about Rs.5000 per capita (assuming household size as 4). The IHHL can also be connected to conventional sewerage system or to DEWATS system in case it is not working satisfactorily or in flood prone, hilly or in impermeable soil strata.

High Capital cost (CAPEX) is the challenging factor for providing sewerage system in urban areas across the country. The cost of sewerage network constitutes about 80% of the total cost of sewerage system and the cost of STP about 20%. However, the cost of simplified sewerage network, similar to that adopted in Latin America (Ex. Brazil), is about 60-70% of the cost of conventional sewerage network due to the flatter gradients and lesser depth of sewers, adopted in unplanned low income settlements and new housing colonies with regular layouts. However some precautions like providing infrastructure for clean outs of clogged sewers etc. are required for effective maintenance of the simplified sewerage.

In the case of Siddipet, the estimated CAPEX of sewerage system for the entire town is Rs. 261.68 Cr. which comes to Rs. 13.46 Cr. /MLD or Rs. 14,538/capita or Rs. 58,152/household considering the prospective population of 1,80,000 for

which the major components of the scheme have been designed. This however includes the cost of land, permissions, taxes, price variations and other lump sum provisions.

More than the CAPEX, the Operation & Maintenance Cost (OPEX) is key to financial and operational sustainability of any sanitation system. For the Sanitation system being implemented in Siddipet, the total OPEX comes to Rs. 2.35 Cr./annum or Rs. 15.67 lakhs/MLD/annum or Rs. 4.29/KL or Rs. 97.79/connection/month (Rs. 26.63/cap/month) assuming the potential no. of connections for the present population of 1,38,690 as 20,000. This is for a city sewerage system with a combination of SBR, MBBR and CAMUS-SBT based STP technologies.

It is observed that the present guideline of designing the STPs for the prospective population after 15 years from the base year (year of commissioning) is leading to over design of the required STP capacity, leading to significant under-utilization (capacity utilization only up to 50-75% of its designed capacity) of STP capacity. For example in Siddipet, while the STPs are designed for a total capacity of 20.1 MLD ($=7.25+10.85+(3 \times 0.40)+0.80$) for a prospective population of 180000 in the year 2033, the present total influent assuming immediate universal coverage of sewer connections would be only 14.97 MLD, which is about 75% of the installed capacity. This is leading to high per Household or per capita OPEX.

However, it is pertinent to note that these OPEX values are indicative and are based on normative flows and designed influent sewerage quantities which vary widely based on actual coverage of connections, time, season, biological loading etc. To realistically arrive at the OPEX, it is imperative to conduct field studies on existing STPs based on different technologies for proper understanding and for specifying appropriate bidder selection and performance criteria.

If we consider the STP technologies, the CAPEX of STPs based on conventional technologies comes to about Rs. 1.40-1.75 per MLD based on technology selected, the cost increasing for SBR and MBR technologies. The O&M cost for conventional technologies (MBBR/SBR/MBR) is varying from Rs. 2.8 - 3.2/ KL. As against this, the CAPEX for SBT (Soil Bio-Technology) varies from 1.0-1.25 Cr. /MLD and OPEX varies from Rs. 0.5-1.50 /KL, which is low compared to conventional technologies as a consequence of comparatively much lower power charges. The land requirement for SBT is also on par at about 600 sq.m/ MLD capacity compared to that of conventional technologies like SBR/MBBR/ MBR.

If DEWATS (Decentralized Wastewater Treatment Systems) approach is

adopted which results in low maintenance costs, the Life Cycle Cost is likely to come down substantially in view of the low power consumption and easy maintenance with local predominantly unskilled labor. They are more suitable and efficient for capacities up to 1,000 cum/day (1 MLD), and can be adopted in peri-urban, slum areas and dispersed, low density settlements, where the areas required for treatment options like constructed wetlands may be available. The average CAPEX of DEWATS plant is about Rs. 50,000/KLD consisting of primary, secondary and tertiary treatment processes. The cost/KLD increases as the capacity decreases i.e., the capex for a 1 KLD plant is about Rs. 1,00,000/KLD while it is Rs. 2,50,000/KLD for a 1,000 KLD (1 MLD) plant. It is advisable to plan modular increase in capacities for plants more than 100 KLD to derive optimum efficiency of treatment and cost effectiveness. The average land requirement is about 1 Ac. (4,000 sq.m.)/MLD. The average OPEX/annum ranges from 1% to 6% of the CAPEX /annum depending on the capacity of the plant, the opex increasing as the capacity decreases.

A recent SBT (Soil Bio-Technology) process of sewerage treatment is very cost effective particularly considering the Life Cycle Costs in view of the low maintenance cost achieved through minimal pumping costs and unskilled labor involved. The CAPEX is about Rs. 19 lakhs (in 2010) for a 15 KLD plant, occupying about 2 Ac. But the OPEX is only about Rs. 59,000 (3.1% of capex)/annum. The quality of effluent by and large complies with the latest CPCB effluent discharge standards. Out of the projected Life Cycle Cost of about Rs.25/KL, the CAPEX is Rs. 14/KL and the OPEX is Rs. 11/KL. The CAPEX of a recently commissioned SBT plant of 0.8 MLD capacity at Kurnool in Andhra Pradesh is Rs. 0.84 Cr. and the sanctioned CAPEX of 5 MLD STP at Adoni in Andhra Pradesh is Rs. 8.75 Cr. and the OPEX for 10 years is Rs. 7 Cr.

Current status of sanitation standards and monitoring of ULBs

The Effluent Discharge Standards earlier notified by the CPCB were made stringent in its 24th Nov. 2015 Gazette notification. But only the SBR and the MBR technologies were capable of delivering effluents meeting the above norms. All the other technologies need complementation with tertiary treatment processes to achieve these stringent standards. Both the technologies are capital intensive and of high OPEX. Further, they need trained and skilled manpower to operate and maintain the plants.

In the Indian context of scarcity of monetary and human resources and technical, operational, institutional and regulatory constraints, it is more appropriate to have relaxed standards, but with better regulatory and monitoring environment to ensure their compliance at the field level.

Presumably considering these realities, the MoEFCC, GoI have notified the

“Environment (Protection) Amendment Rules” on 13th October 2017 wherein the Effluent Discharge Standards for BOD, TSS and Faecal Coliforms have been relaxed and the pH has been retained as earlier. All the other parameters like COD, NH₄-N and N-Total have been omitted.

Table 2: Standards as prescribed - Concentration not to exceed

Parameter	Permissible limit
pH	6.5 – 9.0
BOD	20 mg/l (For Metro Cities & State Capitals...) 30 mg/l (for areas other than mentioned above)
TSS	<50 mg/l (For Metro Cities & State Capitals...) <100 mg/l (for areas other than mentioned above)
Faecal Coliforms	<1000 MPN/100 ml (anywhere in the country)

Considering the complexity and diversity of Indian conditions, technologies, temperature zones, technical and human resources limitations, the above standards seem to be more appropriate compared to those Notified on 24th Nov.2015. In fact the requirements of COD, NH₄-N and N-total have been totally ignored which indicates the pragmatic approach by the MoEFCC of late.

In course of time, as experience is gained and technologies are imbibed and refined, and the urban functionaries become accustomed to complying with the above norms, the CPCB needs to make the effluent discharge standards more stringent presumably in the next 5 years to preserve the quality of water bodies and to restore their pristine purity and of the water and to cultivate a culture of compliance to the environmental standards. Recycling and reuse of the effluent should be made mandatory for non-domestic purposes such as industrial/ agricultural/horticultural use, domestic flushing and gardening etc. duly taking precautions to eliminate/minimize pathogens in the effluent.

Similarly, there is a need to formulate standards for the septic tank effluents, and for FSTPs and formulate necessary standards for co-treatment of faecal sludge and sewerage received at the STPs. Compliance to Effluent Discharge Standards can be made possible by inculcating environmental awareness and education in a big way from 5th Standard itself in the children and by building bridges among the regulatory agencies, academic community, practicing engineers, NGOs and the student and parent community. It's no doubt a long way to go, but go we must; in the interest of our children, grand children and so on.

Role of private entrepreneurs in sanitation and in Sewerage, Septage and FS Management

Of late, private sector participation is assuming importance in view of the paucity of financial resources and limited capacity of technical staff available. While the capital work of the sewerage system is being tendered out to private contractors either on lump sum or EPC tendering system. The O&M (Operation and Maintenance) of the facilities created is a matter demanding attention of the decision makers particularly in view of the scarce financial and technical resources with the ULBs which needs the involvement of the private sector participation /Public Private Partnership, who brings capital and/or technical resources for effective O&M of the facilities. O&M is particularly critical for STPs, FSTPs, sewerage pumping stations etc. This can be done by performance based management contract (PBMC) for the O&M of STP/FSTP/pumping stations for short periods of 2/3/5 years which can be extended yearly based on sound performance by the operator.

Another model is a DBFOT contract (Design Build Finance Operate & Transfer)/DBOT/Hybrid Annuity- PPP model (approved by GoI in Jan.2016 under which 40% of the CAPEX quoted would be paid on completion of construction of STP/FSTP while the remaining 60% of CAPEX will be paid over the life of the project as annuities along with O&M cost) with the private operator. In the Hybrid Annuity PPP model, the operator will be responsible for the design, financing, construction and O&M for 10/15 years or for the entire design life of the STP/FSTP. One of the most important features of this model is that both the Annuity and O&M payments are linked to the performance of the STP. This model is being implemented under NMCG (National Mission for Clean Ganga) project. Conversely the amount spent by the operator can be paid to him through the sewerage tariff from the house sewer connections and the annuity payments by the ULB, linked to performance criteria, through an escrow account created for the purpose.

For the success of these PPP models, a robust pre-qualification process of the private operators to establish their financial, technical and operational capacities, a robust contractual arrangement (may be a Performance Based Concession Agreement), enabling legislative and regulatory framework with effective dispute resolution mechanism are imperative. Building capacities of the ULB functionaries in the formulation of the project proposal, procurement of the PPP operator, developing a robust contractual framework and an effective monitoring framework for management of the contract are *sine qua non* for its success.

6. Solid Waste Management in ULBs

Consequent to formation of new state of Telangana and reorganizing the state into 31 new districts, formation of a large number of new ULBs and due to various other associated development activities and opportunities, the state is experiencing much faster rate of expansion of urban areas and urban population which has a direct bearing on the quantities of solid waste being generated. On the positive side, it is encouraging to note that almost all the ULBs in the state have started focusing on solid waste management and the result of the same could be clearly seen in the form of improved collection efficiency. Indiscriminate dumping of waste is checked to a great extent and open dumping sites by the road side have almost been removed. The general appearance of the streets is improving as the efforts are being made to keep them litter free. Distribution of free dust bins, at two per house hold (green for wet waste and blue for dry waste) is popular activity implemented in many municipalities of the state. The number of personnel engaged (regular, outsourced and community paid) in solid waste management has also made significant improvement. Use of low value plastic carry bags is prohibited by a special order and the same is being enforced with varying degree across the ULBs in the state. Awareness and motivation campaigns are being organized by all the ULBs to propagate source segregation of waste. The key corporate CSR initiatives being implemented in the state in support of ULBs' efforts to practice sustainable solid waste management include, capacity building and propagation by ITC, construction of dry waste resource collection centers by Godrej and technical support in waste management by RAMK. The state has developed its Sanitation Strategy which has a section on solid waste management which has broadly estimated the quantities of waste generation, challenges to be addressed and accordingly proposed measures to be implemented. As per this strategy the ULBs in Telangana state generate about 66,287 MT of solid waste/day, while the per capita waste generation is 0.3-0.4 kg/day. The quantity of waste produced is growing at 5% per annum and the collection efficiency is claimed as 80%. 91% of the households and establishments are covered with door-to-door solid waste collection, while the segregation of garbage is varying from 5.9% to 100% with only two ULBs in the state achieving the SLB of 100%. The extent of recycling or recovery of waste is varying between 4.1% to 77.6% which is below the SLB of 80%. Urban Local Bodies spend around Rs. 1,000 – 1500 per tonne per day as payments from the municipal general funds. Out of this, 60 – 70 percent is spent on collection, 20 – 30 percent on transportation and less than 10 percent on processing and disposal activities. Under the twelfth finance commission a grant of Rs. 374 crores was invested to improve the collection of waste, transportation machinery and in acquiring land for processing and disposal facilities. Under the thirteenth finance commissions grant of Rs. 1,919 crore has been allocated for solid waste management projects on public private partnership basis in ULBs. The MA&UD department had grouped 122

ULBs into 19 clusters for developing Waste to Energy projects on PPP mode, in which 5 projects have already been cleared by Technical committee and State Government while the operations are yet to be commenced. On the whole the concerned Minister for urban development Shri. K.T. Rama Rao and state department of Municipal administration have prioritized sustainable solid waste management but there is a long way to go in terms of channeling the plans and ideas into actual results on the ground.

Recycling: Sorting of reusable materials and recycling the same is mostly happening in an informal manner. During the process of door to door collection the waste collectors are carrying jumbo bags in which the salable material like high value plastic, paper, metals, glass, cardboard etc are separately collected. After dumping the remaining waste at transition center, the waste collectors sell this material to local scrap vendors who in turn get it sorted / cleaned and supply to recycling units. Secondly, in most ULBs Dry Resource Collection Centers are established within the transfer stations wherein the DRCC entrepreneur would manually get the dry mixed waste further sorted to pick up recyclable material and sell the same to different recycling units. In this process though items like Low value plastic are having possibility of recycling, they are not picked up as the cost of labour is higher than the potential sales returns from the same. Environmental impact of any product is highest when the virgin raw material is extracted from the nature and in manufacturing of the product. This can be reduced considerably if reuse and recycling can be promoted in match with the potential that exist. However the practice of mixing the waste at user level is a major barrier in realizing this potential. Though the ULBs in the state are making good propagation efforts, the behavior change that can be seen is very little. In addition to the waste collected through the city garbage collection system, the scrap vendors also buy high value waste like paper and metals and feed the same into recycling process. The entire trade related to recycling of waste is in the informal sector controlled by retail and whole sale scrap vendors. No effort has been made by the ULBs and State Government to support their livelihoods nor to introduce any compliance standards to avoid damage to public health and environment.

Waste to composting: In the past few years almost all the ULBs including the three cities covered under this study have invested in creating infrastructure for composting of waste. The mixed wet or bio- degradable waste is generally put through aerobic composting process. The main wet and bio degradable waste producers / generators in the cities are households, hotels and restaurants, vegetable, meat and flower markets, slaughter houses, grain markets and sewerage sludge. While all this waste is compostable the nutrient composition and time required for composting of the same would be widely varying. Segregated collection and composting of this different types of waste

would be helpful in optimizing the process efficiency, realizing the nutrients and also ensuring appropriate use of the compost. For example the exclusive composting of waste from vegetable markets can be safely used in agricultural production. However no ULB in the state has such advanced data nor collection system. Even the existing composting units are digesting only partial quantities of compostable waste and in some cities they have become totally defunct due to poor maintenance. There are no technical or trained personnel available to manage this operation efficiently. The segregation of organic and inorganic waste is also not happening in the best standards required. Mixing of inorganic waste causing the threat of heavy metals and chemical contamination of waste and presence of hard materials due to which there is poor response from farmers to use the compost in the farming. Vernacular media has been regularly publishing stories on the instances of sewerage water being used for production of vegetables in the urban and peri-urban areas. Similarly the roof gardening with compost from household waste is also given wide publicity. As a result there is increasing interest and adoption of this practice of compost based vegetable production in urban areas. Market based solutions like sale of cockpit, sanitizers, bioculum, ceramic pots, etc are available for easy adoption of wet waste composting at household level. However the extension and market services are not in match with growing demand for the same. There is a great potential to upscale this idea contributing to insitu safe disposal of wet waste, which also helps in keeping the dry recyclable waste free from risks of contamination. Though anaerobic composting is more efficient in terms of recovering the energy value of the waste no evidence of practice of the same has been found during the study.

Though production of refuse derived Fuel has good potential no such effort has been started in the state. However the Multi Layer Laminates used for packaging of chips, confectionery items etc, which are having high calorific value are collected and freely supplied to cement factories to burn in cement kilns. But the response from the waste collectors and rag pickers is very poor to this idea as the weight based compensation is not at all remunerative for them. A daylong labour put into collecting the MLLs may not even fetch Rs30. Considering the hazards of unsafe disposal of MLLs and to recover energy from all other calorific material state has come with appropriate strategy. The state is also seriously considering to adopt waste to energy approach to mainly reduce the volumes of waste and to do away with the hazards of landfills. A step forward has been made by developing plan to set up 48 MW WTE plant with an estimated cost of Rs 720 crores at the current landfill site in Jawahar Nagar. The proposed installed capacity of the plant is to combust about 2,400 metric tons of waste per day while daily waste generation of Hyderabad city is about 4,500 tons. In partnership with a private firm by name M/s Shalivahana MSW Green Energy Ltd. a RDF based energy plant was established in the landfill area of

Karimnagar city for combustion of waste from Karimnagar city and also nearby cities like Siddipet. But currently this plant is shut down and contract was not renewed due to non compliance of contractual obligations by the operating company. Open burning of waste in the streets and at landfills is a prohibited activity. However the practice of the same is found across many ULBs. Lack of knowledge among sanitation staff of ULBs and absence of protest from the public due to lack of knowledge of harmful effects are the main reasons for the continuing practice of open burning of the waste.

In the past five years many of the ULBs in Telangana have been assigned adequate land to go for scientific land filling of the waste. The ULBs are expected to adopt a combination of physical, biological and chemical approaches to eliminate the hazardous impact of waste on environment and render them innocuous. Compaction and covering the waste with soil and control measures to prevent air and water (ground and surface) pollution are supposed to be taken up at the landfill sites. However due to lack of financial and competent human resources, landfills are currently managed as mere open dumping sites for municipal solid waste. In several places the communities living around are protesting against the operations of landfills and demanding for shifting of the same to places away from their habitations. With growing realization of adverse impacts of landfills, it is going to be very challenging to find suitable sites for setting up new landfills.

The majority of the ULBs in the state lack proper treatment and scientific disposal facilities, with the GHMC being better placed. The lack of systematic planning across the value chain is resulting in the inability of ULBs to comply with the SWM Rules 2016. Compliance to MSW rules 2016 require scientific systems of collection, transportation, management, processing and disposal of solid waste. Competent personnel, adequate financial resources accompanied by robust monitoring and accountability mechanism is an essential requirement for efficient management of solid waste operations at the ULB level. Another major gap in the solid waste management by ULBs is lack of cost recovery plan. Expenditure on waste collection to final disposal operations is a major line item. But the ULBs are lacking vision and capacities to plan for differential collection charges for different categories of waste streams and waste producers, income from sale of compost and lease charges of dry waste collection centers etc.

7. Storm water drainage systems

As a general condition of the towns in Telangana, the coverage of storm water drains is generally low ranging from 25% to 50% only against the Service Level Bench marking of 100% coverage. Similarly most of the drains are open drains with no covers, while the SLBs require 100% covered drains. It is noticed in general

that continuity in drainage network is missing, primary drains are not taken to their outfall point, with missing links particularly in the downstream (d/s) end, lack of connectivity among primary and secondary drains and among secondary and tertiary drains, inadequate culvert sections etc. leading to inundation in certain areas, sometimes even in the CBD (Central Business District) areas.

The flooding problem is compounded by the solid waste viz., plastic, debris and silt deposited by the households finding their way into the drains and its non-clearance by the sanitation workers. Sometimes the removed silt and plastics etc. in drains is also finding its way into the drains due to the time gap in clearing the same.

In some stretches, the drainage capacity is constrained by the lack of adequate gradient in the drainage stretches, inadequate water way and freeboard at the control sections like culverts, depressed culvert slabs, passing of water mains and telephone cables through the culverts and drains. There is the problem of inadequate sections on the d/s end sometimes lesser than the u/s sections.

The problem is compounded by the sullage mixed with raw sewerage finding its way into the water bodies, contaminating them and leading to death of aquatic organisms and ground water pollution.

It is also noticed that the upstream (u/s) and d/s reaches of water bodies like tanks are heavily encroached, the leading channels as well as the surplus escapes/channels on the u/s and d/s of the tanks respectively are conspicuously missing, resulting in flooding on the u/s and d/s reaches due to lack of proper drainage (disposal) capacity. For example, in Mahbubnagar and Siddipet towns, the once cascading tanks have become extinct, leading to loss of flood absorption basins, lowering of ground water table and lack of recharge of bore wells. All this is leading to lack of availability of local sub-surface water sources, forcing the ULBs to transport surface water from far off sources like Koel sagar, LMD etc. at colossal cost and unsustainable cost of production of water.

Water sample analysis for Microbial and chemical parameters

To determine the status of water quality among all the three towns water samples from various locations were collected to assess the extent of contamination. It was found that the water in the downstream areas of the dumping yards are polluted with e-coli and also in some samples of the piped water supply indicating the contamination from the sewer water.

Karimnagar: The effluent parameters for raw water of inlet chamber of Gopal cheruvu indicate that the pH of the effluent is 8.2, the Total Suspended Solids are 66 mg/l and the BOD in the effluent is 1.0 mg/l is also less than 30 mg/l, all

of which are within the permissible limits. The pH and BOD are adequate to sustain aquatic life. The influent BOD value is unrealistic considering the fact that the septage from domestic septic tanks is also being discharged at the inlet of the STP. But faecal coliforms are reported to be present in a 100 ml sample in the influent and effluent also which indicates faecal contamination in both the samples. However, the results do not indicate the MPN count which is essential, although they indicate the Total Coliforms.

The drinking water samples taken right from the raw water at Lower Maneru Dam up to consumer tap point indicates that the water is found to be physically, chemically and bacteriologically satisfactory, except for one sample from Hand Bore at Buttirajaram colony where the total hardness of 629 mg/l is slightly above the limit of cause for rejection of 600 mg/l. The nitrate levels are on the borderline indicating the risk of blue baby disease for children if consumed.

Siddipet: In Siddipet town the water samples have been sent to the two laboratories (Institute for Health Systems and Institute for Preventive Medicine) for checking the consistency of the results.

Analysis based on the HIS Lab: For the Sewerage influent at Chintal cheruvu inlet, the BOD₃ was found to be 37 mg/l against the permissible norm of 350 mg/l, which is understandable in view of the dilution with sullage. The other parameters have not been analysed as they were not considered appropriate at this point of time. Similarly, the sewerage in the Chintal cheruvu lake eastside was also found to contain BOD₃ of 8 mg/l although within the permissible limit of 30 mg/l, it is not adequate to sustain aquatic life. The water from Khaderpura GLSR have been analyzed for BOD₃ also in addition to normal water quality analysis in view of the faecal contamination observed. The BOD is found to be which is found to be 2.4 mg/l against the permissible 30 mg/l which is adequate to sustain aquatic life. For the Sewerage influent at Narsapur lake inlet, the BOD₃ was found to be 35 mg/l against the permissible norm of 350 mg/l, which is understandable in view of the dilution with sullage. The other parameters have not been analysed as they were not considered appropriate at this point of time. Similarly, the sewerage in the Narsapur Lake was also found to contain BOD₃ of 37 mg/l against the permissible 30 mg/, which is not adequate to sustain aquatic life.

Analysis by IPM (second lab)

The analysis of wastewater samples by IPM indicates faecal contamination evidenced by the presence of Faecal coliforms and of E.coli in source water from LMD, Kammarapally filter beds, Hand Bore at Yellamma Temple, water in Chintal cheruvu and Narsapur cheruvu, sewerage at Bhogeswara Temple bridge and at Narsapur cheruvu. The sewerage, particularly at Bhogeswara

Temple Bridge contains Nitrites of 50 mg/l and BOD of 30 mg/l both of which indicates faecal contamination and makes the survival of aquatic organisms impossible. The situation is slightly better at Chintal cheruvu and at Narsapur Cheruvu. By and large, the results of both the IHS and the IPM in Siddipet are in resonance.

The analysis of drinking water samples also indicates that in general, the water is potable and satisfactory for drinking purposes, except for few samples viz., one sample in Khaderpura GLSR (no residual chlorine), PSP1 under Mankamathota ELSR (no residual chlorine), one Hand Bore in Chintal cheruvu colony, Household tap under Mankamathota ELSR, Borewell 2 about 500 m distant from municipal dump yard, which indicate faecal contamination and need for disinfection and source protection from contamination.

Mahabubnagar: The water in Pedda cheruvu is virtual sewerage which has a BOD of 19 and Nitrite of more than 1 (exact figure not indicated). In addition, the physical and chemical parameters are of grave concern, with the colour on Pt-Co scale of 40, TSS of 297 mg/l against the permissible 100. The water in Outlet of Pedda cheruvu and at Inlet to Pedda cheruvu leaves no solace with the Colour at 45 and Blackish, the BOD at 35 and 56, and TSS at 216 and 306 respectively which indicates highly degenerated sewerage with no scope for survival of aquatic organisms, leave about safety of human beings.

The water supply is also generally unsatisfactory, with only 6 out of 18 samples being bacteriological contamination. Out of 8 samples of water from Krishna river (Koel sagar), only the sample at Clear Water Reservoir has Residual Chlorine (2 mg/l) is satisfactory. Out of 18 samples, 3 samples have Nitrite more than 1 mg/l indicating faecal contamination. Out of 18 samples, 4 samples from bore wells have fluoride more than 1.5 mg/l posing the risk of dental and skeletal fluorosis.

This highlights the need for formulation and implementation of water safety plan from hazard and risk perspective from public health point of view and ensuring good water supply practices. The objectives are to minimize contamination of water sources, removal of pollutants by proper treatment processes, and prevention of contamination of water in the distribution network. Further this also signifies the imperative need for immediate initiation of Faecal Sludge and Septage Management (FSSM) in the town with FSTPs complemented by DEWATS (Decentralized Wastewater Treatment Systems) technologies to improve municipal and environmental sanitation and health outcomes to the public.

The community and the local NGOs working on WASH and environment needs to be intimately involved in testing of water samples at household level for

residual Chlorine and in monitoring the quality of sewerage effluent parameters to create awareness and ownership, and to bring necessary pressure on the ULBs for improving the quality of water supply and sanitation services which form the back bone of Liveable Urban Areas.

Also the broader vision that necessitates an integrated strategy is the need of the hour with a hydrological cycle perspective considering water supply, storm water drainage, sanitation and solid waste management as integrated and complementary sectors, to address the challenging issues like flooding, water pollution and availability, safe and sustainable sanitation and water supply to the citizens. Modern technologies like GIS based mapping of drainage network, networked automatic tipping bucket rain gauges, SCADA, disaster management infrastructure like centralized command and control centers to effectively forecast, monitor, control and manage the rainfall and floods like Digital Elevation Modeling (DEMs), climate resilient hydraulic modeling also need to be adopted to minimize the damage to life and property. Interdepartmental coordination particularly among municipal, revenue and irrigation departments and CWC (Central Water Commission) is also critical in times of floods to mitigate the suffering to the people.

8. Equity and Inclusion and role of communities in Sanitation

Due to limited opportunities of employment and failure of agriculture is forcing rural people to migrate to the urban areas. As a result, the slums are increasing in urban areas and people living in these areas are unable to access even the minimum necessary needs like healthy living environment, adequate food, clean drinking water and proper accommodation. The slums are often the victims of the under development and the basic facilities of drinking water, solid, liquid, and septage management are abysmal making the conditions of these poor vulnerable equal to diseases.

Some of the field visits to the towns revealed that the open defecation is still practiced and majority of the households have insanitary toilets or toilets with many technical deviations making it difficult for them to maintain and use them. Though the slums in the centre of the town are being modernized with new houses being constructed utilizing the two bed room scheme, but the peripheral areas and the non notified slums are the worse affected. Most of the households also depend on the public toilets and community toilets which are in a dilapidated conditions. The door to door collection of solid waste is not regular and since the slum dwellers are not willing to pay to the waste collectors there is often a rift between them. In some areas the sanitation workers collect once in two or three days. Wherever there are open nals,

it was observed that the households do throw litter into the nalas which ultimately clog. Stagnation due to plastics, old clothes, slippers and napkins are common, the silt is deposited in many nalas causing overflows, and storm water drains partially blocked with cemented building debris. The side drains are mostly kutchha nalas flowing with sullage and septage from the septic tanks and bottom sealed leach pits. The particles of excreta are also seen in the open drains. Maintenance of side drains and ensuring free flow of the same is perceived as exclusive responsibility of drain cleaners of the Municipality, however given less manpower they are cleaning only once in two days. It was also noted that the households do through litter, and other solid waste into the drains across the houses causing the blockages. There are many illegal constructions in these slums on the nalas affecting the free flow of drainage water. Overlap of drinking water and drainage water lines is a common feature in many slums with a potential for drinking water contamination, which was evident even in the water sample analysis. Municipalities also express their inability to provide services to the non notified or merged or peripheral areas due to budget constraints and lack of feasibility.

Community mobilization though very important to improve the sanitation conditions of the towns, there is not enough importance given to the processes especially the behavior communication change processes. Municipalities are not making enough efforts to make sure that there is citizen participation in their activities especially the solid and liquid waste management. Though the active wing of CDMA, MEPMA is focusing on empowerment of urban poor women but they are not effectively utilized in the mobilizations process. MEPMA promotes SHGs, Slum level and Town level federations which are very active. In the state of Telangana 12.6 lakh women are formed into 1.20 lakhs Self Help Groups with a - Savings / Corpus of Rs. 472.80 Cr. There are 3958 Slum Level Federations (SLFs) with Rs. 65.34 Cr and 97 Town Level Federations (TLFs) with Rs.2.07 Crs. MEPMA also promotes groups for the physically challenged and so far there are 56 Town Vikalanga Samakhya (TVS) formed. These CBOs undergo Capacity Building with periodical trainings in Administrative Staff College of India (ASCI), Centre for Good Governance (CGG), and Dr. Marri Chennareddy of Institute for Human Resource Development (MCR HRD), and Regional Centre for Urban and Environmental studies (RCUES).

However the strengths of these active women are not harnessed for the benefit of improving the sanitation situation in the towns. Some of the recommendations to be considered for making sure that these active women becomes part of the sanitation campaigning. 1. Area based committees to be formed for ensuring good public cooperation in sustainable use and maintenance of the sewerage network. 2. IEC strategy to be developed with behavioral practices required for sustainable use and maintenance of the sewerage network, eliminating

the malpractice of pushing solid waste and silt into the sewer lines and the same needs to be disseminated through these SHGs. 3. Engaging the city councilors, RWAs and TLF/SLF/SHG members in planning and implementation of the proposed works, appropriateness of the design and pipe size, execution schedule of the work etc. so that they are well informed and do not spread any unnecessary apprehensions about the work and their cooperation is assured during the execution and subsequently. 4. Schedule 12 of 74th Constitutional amendment Act makes the ULBs responsible for the protection and welfare of the poor and vulnerable communities. Translating this spirit into action is currently limited to capital works and targeted poverty alleviation initiatives under MEPMA with state funding. Rather, the ULBs should integrate the same into overall city development planning and ensure equitable and inclusive coverage of basic services. Accordingly, own financial resources should also be earmarked and the quality and reliability of the services for the poor should at least be on par with the general standards maintained for the richer sections in the same city, notwithstanding what is stated under clause (5) supra.

9. Financial Status

About 39 percent of Telangana's population lives in urban areas and with the proposed creation of 71 new ULBs, more population is expected to come under urban areas. Financial sustainability is invariably one of the key determinants of quality of services and overall development of these rapidly growing urban areas. Availability of finances in line with emerging demand for the same, efficiency of planning, collection and utilization, and robustness of accountability systems and practices embedded into Governance are the important factors contributing to financial sustainability of any ULB.

The resource base of the ULBs in the state of Telangana include mainly:

- a. own income raised through taxes, service charges, license fee, penalties, earning on own assets, sundry receipts;
- b. assigned revenues from the State Government (entertainment tax, stamp duty etc.) and
- c. grants from the state and Central Government.

In addition, ULBs are also provided loans by the State Government and the ULBs are allowed to borrow from markets through bonds for which the CDMA has been implementing independent Credit rating system which looks at their financial performance, economic growth prospect, capital utilization, infrastructure, and reduction in dependency on the State government grants, etc. Though about 23 ULBs in the state have qualified for borrowing from markets, only the Greater Hyderabad Municipal Corporation (GHMC) has availed this option in the recent past. It should also be noted that ULBs get considerable

support in the form of direct salary payments from the State Government to Municipal staff, employed on the basis of the state sanction and recruitment by the state service commission. The typical expenditure categories of a ULB are infrastructure development (capital expenditure), Operation and maintenance of the same for providing basic services, salaries of outsourced staff and sundry expenses related to office establishment. During the financial years 2015-16 and 2016-17 State Government has released a total grant of Rs. 259.18 and Rs. 66.62 Crores respectively, the details of the same are given below. During the interaction meetings with CDMA officials it was learnt that release of varied grants to ULBs in the state is to the tune of about Rs.1,000 crores.

Table 3: Grant Amount to the ULB for Various Purposes

2015-16			2016-17		
S. No	Purpose	Amount	S. No	Purpose	Amount
1	Development works in New Municipalities	1,286,000	1	Elections to Municipalities	
2	Water Supply and water taps	95,000,000	2	Assistance for Development works	
3	Our ward and our city	6,987,000	3	Internal Roads	
4	Parks and Play grounds	2,186,000	4	State Finance Commission Funds	531,326,432
5	Internal Roads	437,000	5	SBM-IEC	134,957,000
6	State Finance Commission	480,545,349	6	14 th Finance Commission	
7	SBM-IEC	1,122,574,550			
8	14 th Finance Commission	823,700,039			
9	Apportioned Amounts	59,115,533			
	Total	2,591,831,471		Total	666,283,432

The overall observations of this study on the financial situation of the ULBs in the state of Telangana are detailed as under:

1. The State Government of Telangana and the current political leadership is taking keen interest in improving the quality of life in urban areas for which commitments have been made to increase funding for developing the infrastructure and special initiatives like Smriti Vanams (Parks) and Haritha Haram (green garland) are being implemented across all the

urban areas, as a measure of increasing lung power and beautification, which also contributes to increase in the levels of underground water. A detailed road map and comprehensive planning is in progress to improve urban infrastructure, viz., laying down of roads, electrical and water supply lines, provision of internet facilities etc. Demarcation and expanding limits of urban areas is also likely to increase the number of ULBs and urban population.

2. The size of population and incomes of the ULBs are consistently raising but the ULBs are lagging behind in developing capacities for sustainable financial planning, budgeting, converting the potential opportunities into real income and achieving overall financial efficiency. Collection of Taxes etc., even though is encouraging, further improvement is going to be to the tremendous advantage of the ULBs.
3. Monitoring of service line benchmarks, performance linked funding system introduced under 14th Finance Commission and the directions and targets given by the state level authorities have resulted in consistently increasing collection efficiency, thereby further contributing to improved own income of the ULBs. However the growth of own revenue of the ULBs is much lesser compared to increasing rate of grants from the state and GOI. Most ULBs are not financially self-sustainable and tariff levels fixed by the ULBs for providing services often do not mirror the cost of supplying the same. Even if additional investments are recovered in a phased manner, inadequate cost recovery will lead to continued fiscal deficits. Also the grants from State and GOI are more on adhoc basis, leveraged to meet annual budget deficits and are not based on perspective planning of the ULBs.
4. There is an urgent need for ULBs to adopt realistic assessment of user / service charges to be collected for ensuring adequacy of own resources required to deliver good standards of services and these service charges should be collected and spent efficiently. This requires a vision and capacity at the ULB level. Most often the elected councils of ULBs are demanding for increased grant allocations from the State and GOI and neglecting the potential revenue opportunities that exist within their ULBs. The councils' elected leaders are also hesitant to push strategies of increasing user charges even when they are 'abysmally low' for the fear of becoming unpopular among voters and also, owing to socio-economic objectives / limitations of any government, which is a guiding partner for all ULBs.
5. On the contrary some of the ULBs have also expressed that their freedom to revise and enhance taxes is curtailed due to mandatory requirement of State Government's approval for the same. These ULBs also argue that instruments and power devolved to them for revenue generation are not compatible or do not synchronize nor justify the needs of expenditure; despite having good knowledge of the local situation they lack required autonomy to make decisions on tax revisions. This argument is countered with a view that

inefficiency of tax assessment and collection and wasteful expenditure should be thoroughly addressed before resorting to enhancing tax rates. Both the above two aspects merit consideration, as they are apparently true. A mutually effective policy should be considered for adoption. For example, the management should be open for any meritorious suggestions made by any person, including employees, who may be considered for promotion because of their suggestion and further, a carrot and stick approach needs to be adopted towards collection of revenues, by offering incentive schemes to the consumers and felicitation and recognition of hard working staff. The ULBs should advertise the name/s of such wards, where the collection is was robust, as a means of encouragement. Further, a greater part of the revenue generated in any particular ward of any ULB should be spent for the same ward, which practice would encourage increase in collection of the revenues. At least, this process or method could be tried on trial basis.

6. Considering that the capital grants to the ULBs are consistently increasing, systematic planning should be ensured to cover all the capital costs under the grants and avoid capital expenditure from own income (general funds) of the ULB so as to increase per capita expenditure on maintenance and provision of basic amenities to cover the entire population of the ULB.
7. Improving fiscal efficiency of ULBs requires capacity building of the Councilors and Ward Members of the ULBs, particularly in the areas of prudential norms for financial management, optimizing mobilization, increasing efficiency of use, strong controls to avoid pilferage and leakages and judicious utilization of financial resources towards achieving fiscal efficiency and progressive self sustainability. The thinking and approach of the current leadership at ULBs is dominated by seeking external grants and there is no focus on strategic use of external grants for building self sufficiency of the ULBs. This needs a paradigm shift which requires good quality capacity building services followed by handholding support to translate the new ideas into action. Innovative systems of funding and collection of revenues may well be considered on an experimental basis, while constantly improving upon on need based basis.
8. Telangana emerging as a new state and creation of 33 new districts, merging of several rural areas into adjacent municipalities has increased the urban population in the state. Concomitant with rapid urbanizations the number of commercial establishments and the volumes of their businesses are also fast growing. Thus the businesses are among the prime beneficiaries of the growing urbanization and on the other hand they are also increasing the direct and indirect pressure and demand for basic services of water supply, solid and liquid waste management etc. Considering the same, the service charges and tax assessment of businesses must be done in a more rational manner so as to increase own revenues for the municipalities.

9. Availability of financial data particularly on demand Vs collection of taxes and user charges, spending on services and capital works etc has significantly improved across ULBs in Telangana, the same is accessible in public domain and it is tracked for setting the new targets at ULB and State level. However the available data is not organized for putting in place a comprehensive financial performance system. For example, segregated data on colony wise or users category-wise collection charges, month-wise income and expenditure for each of the specific services cannot be tracked on a real time basis and needs considerable manual computation for analyzing the correlation between the fiscal and service delivery status.
10. Annual audits are regularly carried out in all the ULBs of the state and all the reports are available in the websites of ULBs and CDMA. But the current system of audit lacks the approach of providing constructive feedback and guidance to ULBs in improving their financial health. The primary reason being that these audits are merely financial audits and do not constitute cost audit, which should also be the objective for improvement of functioning of any public utility service, including ULBs. There is need for an institutionalized practice of detailed feedback from the annual audit on which the elected council and executive functionaries of the Municipality should collectively reflect and plan necessary interventions to address the issues and improve the financial situation of the ULBs.
11. There is an urgent need to shift from the current approach of annual adhoc budgeting which is limited to balancing expenditure and income. ULBs should be guided and capacitated to develop a 3-5 years term plans which would allow more systematic and planned approach to building the financial resource base for the ULBs. All the sources of own revenue, grants (AMRUT, SMART City, SBM, Heritage funds, SFC, 14th FC, etc.), grant based projects funded by external donors, market funds, potential funding through PPP options, CSR funding etc should be holistically projected and plan for efficient mobilization and utilization of the same needs to be developed basing on the plan for improvement of services in the given ULB. Implementation of such a financial plan must be monitored using robust performance efficiency and progress indicators. The outputs of the same must be concurrently placed in public domain for accountability and also to enthuse and instill confidence among local people to participate in ULBs efforts to improve fiscal efficiency.
12. With the advent of GST the ULBs are put to loss in getting their share of revenue in entertainment taxes which was earlier collected by the state Govt. and a share was assigned to the concerned ULBs. While on one hand, in certain cases, ULBs' revenues are affected owing to the levy or increase of GST, on the other hand, it is subjected to payment of GST on various items of consumption, affecting its revenue budget. There is need to assess

the net loss of revenue to ULBs and develop appropriate compensatory mechanisms. Currently Government of India is levying Swatch Bharat Cess at the rate of 0.5% on all taxable services which translates into a net tax amount of 50 paise on every one hundred rupees worth of taxable services. The proceeds from this Cess are being exclusively used for Swatch Bharat initiatives. Taking note of the concerns expressed at the state level on this, it is suggested that the Government of India from time to time should declare the amount accrued under this special Cess along with state-wise contribution and distribution of the same.

13. The Government of Telangana has invited Expressions of Interest (EoI) from expert technical agencies for preparation of DPRs for providing Under Ground Drainage (sewerage system) and Storm Water Drainage in 52 ULBs the consultancy for which is to be taken up under the World Bank loan earlier approved for the Telangana Municipal Development Project. However effective implementation of this project requires leadership and active engagement of the ULBs which are the prime partners of this project, proactive sharing of the information and multi stakeholder engagement to elicit ideas and support in implementation, community participation to identify and prioritize the felt needs of the local people and robust accountability mechanisms. Creating new assets /infrastructure for the purpose of improving services must give highest regard to long term environmental implications, ability of ULBs to meet the O&M costs and overall sustainability of the infrastructure.
14. Mission Bhagiratha is the flagship programme of State Government of Telangana under which 54.51 lakh population in 63 ULBs are going to get improved safe water services through 12.83 lakh household connections. This project is investing about Rs. 43,791 crores to develop intake structures, water treatment plants, power supply infrastructure, storage reservoirs and water supply pipeline network. For sustainable maintenance of the newly created infrastructure the, ULBs need to develop a strategy for creating community ownership and raise local resources for efficient O&M. The state is gearing up to supply 135 LPCD in all the municipalities. The implications of this increased quantity of supply and consequent flows of grey water to sanitation need to be assessed carefully and ULBs should make necessary plans including provision financial resources for wastewater management and ensuring good sanitation standards.

10. Challenges and Recommendations

The major challenges are at the stages of planning, selection of appropriate technology/process, identification of required land and permissions, fund mobilization, construction sequence, universalization of sewer connections, capacity utilization, and Operation & Maintenance arrangements, and recycling

and reuse arrangements right from the planning stage. Citizen engagement and communication strategies are also of utmost importance particularly in making the sanitation intervention yield the desired results.

The constraints to improved septage and sewerage management are lack of focus on sanitation at the top management level and at the political level, and lack of capacities at the middle management and operational level. Lack of effective O&M management at the middle management and lack of monitoring and oversight at the council level also major constraints in making the sanitation intervention yield the expected outcomes. Lack of adequate technical capacity constrains the ULBs in selection of appropriate technologies and in their O&M, while lack of adequate fund mobilization for infrastructure creation and for its sustainable O&M is a constraint at the top management and political leadership levels.

The major challenge to ensure effective sewerage system performance is availability of adequate water supply to the households in the sewerage service area. Even where there is water tap connection, although the per capita supply is around 108 lpcd for e.g. in Karimnagar, unreliable and intermittent supply is a big constraint leading to low performance of sewerage system. Further low per capita water supply like in case of Mahbubnagar (60 lpcd) does not fit feasible for a UGD system.

Recommendations/ Suggestions to improve the septage and sewerage management

Based on the study locations the recommendations are categorized for three types of sewerage and septage management systems i.e. for the conventional system, for ongoing UGD system and for the completed UGD system for their applications among various towns.

For ULBs where there is no conventional sewerage system – e.g.: Mahbubnagar

- Saturate all the households with sanitary toilets (IHHLs). Where there is no space for construction of IHHLs, plan community toilets with proper institutional arrangements for their effective O&M.
- Where there is Black Cotton soils and rocky soils, and high water table, septic tanks needs to be promoted with DEWATs treatment system, or conventional sewerage system with modular STPs can be promoted by connecting the toilets to them.
- When sewerage is contemplated, it may not be necessary to provide storm water drains in the internal roads as the roads can be designed to carry partial storm runoff.
- In the peripheral, poor and low density settlements low-maintenance

technologies like DEWATS options and FSTP (Faecal Sludge Treatment Plant) options for treatment along with FSSM (Faecal Sludge & Septage Management) can be recommended duly utilizing the existing septic tanks

- Necessary fall back options in STP/FSTP like modular units, bypass connections, standby pump sets, generators etc. may be planned in advance in case of emergency/accidental break down of the facility.
- Simplified sewerage / small bore sewerage option may be adopted for collection and conveyance duly utilizing the existing septic tanks as interceptor tanks. Households not having septic tanks may be provided with interceptor tanks afresh. A pilot can be promoted initially in a peri-urban area.
- Where FSSM is being planned, the existing Storm Water Drains need to be utilized and new storm water drains to be planned for conveying the household sullage duly making a fairly realistic assessment of the quantity and quality of sullage.
- Recycling and reuse of domestic wastewater may also be planned upfront by modifying the bye- laws to provide dual plumbing systems.

For ULBs where sewerage system is under implementation – e.g.: Siddipet

These recommendations are more applicable where there is UGD is under construction to avoid technical errors and to ensure efficiency of the system.

- The effluent of the STPs may be diverted to downstream flowing water bodies like surplus escapes or natural streams to close the hydrological cycle, instead of leading it to the stationary water body (like Chintal cheruvu in Siddipet). Such an approach will prevent accumulation of biological load in the static water body and prevent its eutrophication and gradual death of aquatic organisms. Necessary fall back options in STP/FSTP like modular units, bypass connections, standby pump sets, generators etc. may be planned to cater to emergencies /accidental break down of the facility.
- Care may be taken to construct the STPs first and simultaneously take up the trunk mains, sub- mains and laterals in that order so that, as soon as a sewerage zone or sub-zone is completed, it can be tagged on to the STP and commissioned. This approach might prevent complications such as work delays due to land issues/encroachments and prevent wastage of public money in case the downstream sewerage network is stalled.
- Existing septic tanks may be encouraged to be dismantled and the domestic sewerage including sullage may be connected directly to the street sewer.
- Necessary institutional arrangements may be kept in place to ensure sustainable O&M of the STPs created and to ensure universal coverage of all properties with sewerage connection to deliver the health benefits to the public and to make the system financially sustainable.
- PPP option through management contract/s for 2/3 years extendable on

yearly base may explored for the STP for which O&M arrangements are not in place.

- An appropriate tariff policy, tariff structure and a practical strategy towards realizing the same may be evolved in consultation with financial experts, councilors and the community.
- Recycling of the effluent and options for its reuse may be explored to make the system financially sustainable and for environmental sustainability.
- Metering of water supply connections will also control the demand, minimize wastage and prevent overloading of the STP.

For ULBs where sewerage system is nearly completed in the core area – e.g.: Karimnagar

- Universal coverage of all properties with sewerage connections, and to dismantle all the existing septic tanks and connect all the domestic wastewater to the street sewer wherever sewerage network has been executed. This will enable sufficient biological load on the STP and utilization of its capacity to the fullest possible extent, thus minimizing the cost of treatment of sewerage per KL. A campaign approach may be adopted to achieve this by utilizing the services of the MEPMA staff and the TLF, SLFs& SHGs duly giving them relevant training.
- It is also important to minimize discomfort to the nearby residents by minimizing the odour from the STP by addition of necessary chemicals and by providing green belt around the STP area.
- Noise from the air blowers etc. can be minimized by adopting latest technology of high efficiency blowers with appropriate size, placement , installation, use of acoustic panels, proper pressure setting, blower control systems etc
- Delays in construction may be minimized by ensuring that the estimate is prepared realistically. If there are budget constraints, then prioritize the areas of most needed.
- Meticulous planning for fund mobilization, appropriate technology, integration of all necessary components to ensure last mile connectivity and actual delivery of service outcomes to the public, materials and construction technology, O&M arrangements is imperative, failing which delays are imminent.
- Plan ahead for interception and diversion structures for storm water, and for diversion of sewerage effluent from STP to downstream flowing water body to ensure dilution, closing of the hydrological cycle and to prevent pollution of static water bodies like tanks (Ex: Gopal cheruvu in Karimnagar) due to continuous inflow of effluent with certain BOD etc. leading to accumulation of pollutants and the resulting eutrophication of the water body and depletion of Dissolved Oxygen leading to non-survival of aquatic organisms.
- Efficient and integrated designs to enable integrity and continuity of all

hierarchy of drains i.e., primary, secondary and tertiary needs to be ensured for controlling the flash floods and extreme climatic variations.

- PPP performance based management contract should be put in place adopting sound procurement practices. A robust testing and monitoring infrastructure must be put in place to ensure compliance with the MoEFCC effluent discharge standards.



Section II

Urban Sanitation Management in Siddipet

1. General Information

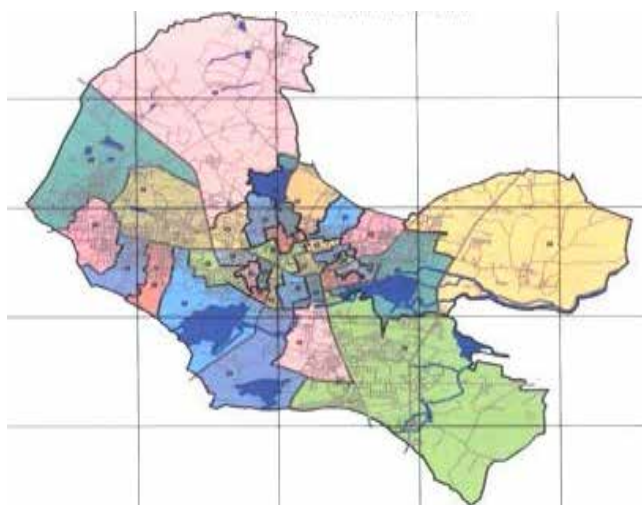
Consequent to demarcation of Telangana region as the 29th State of India, the State Government took up a major initiative of reorganizing the erstwhile 10 districts into 31 districts mainly for the purpose of better administration and development. This resulted in several smaller towns becoming district headquarters and concomitant urbanization. Siddipet is one of the newly formed 31 districts with a total population of 10.65 lakhs in which Siddipet (Municipality and district headquarters) has about 1.44 lakh population spread out in 36.03 sq.km. of the municipal limits.

Table 4: City At A Glance

Date of constitution	1952
Grade of ULB	Special Grade
Area	36.03 (SQ.KMS)
Population	1,38,690 as per SKS*
No of House holds	37,765 as per SKS
No of Municipal Wards	34
No of Notified / Non- Notified slums	12 29
Slum HHs/ population	13,019 / 48,299
SC/ST Households and Population	1080/ 8,995
Road / Drain Lengths	261 / 522 Kms.
MSW Generation	56.72 MTPD

*SKS :SamagraKutumba Survey

Map 2 : City At A Glance



The other Municipalities in the district are Dubbaka, Gajwel and Husnabad. The town is also quite centrally located in the state of Telangana at a distance of 110 Kms from the state capital of Hyderabad. Its average elevation is 675 meters and annual average rainfall is 745 mm. State Highways 1 and 16 connect Siddipet very well to all the other major cities in the state and to the National Highways. Siddipet is also known to be a good educational and business hub. All these factors are contributing to rapid expansion of the city and the land value in this small town is close to the range of prices in some prominent locations in Hyderabad city. The average population growth rate of 29.9% is estimated to further shoot up fast in the next 10 years. There are about 11263 families identified without their own house. About 20,000 people in the town belong to SC and ST categories. 21,335 women are organized into 2040 SHGs and federated under 62 Slum level Federations which are further organized into 2 town level apex Federations. The city has about 3050 institutions and commercial establishments including rice mills and large number of shops. There are 11 lakes and ponds around the city and important among them are Komati Cheruvu, Narsapur cheruvu and the Yerra cheruvu. Average depth of tube wells is 60 to 75 mts. while there are pockets with ground water at 5-10 m. depth due to ingress of Maneru reservoir back water.

Table 5: Water and Sanitation Profile

S. No	Particulars	Status
1	SwachhSarvekshan Rank for 2017	45th
2	Date of ODF declaration	2nd October 2015
3	No of Household Toilets	42,000
4	No of Public Toilets and seats	12/79 (53 M, 26 F, 1PWD)
5	No. of Community Toilets	Nil
6	% of Schools with toilet and urinals for Boys and Girls (Total Schools-141)	100%
7	Quantity of withdrawal for city water supply (Yashwada 12.50 + Bore Wells 0.50 + work in progress under Mission Bhageeratha 7.50 MLD)	20.50 MLD
8	Current Daily water supply	113 LPCD
9	Water Supply charges (flat rate per domestic connection per month)	Rs.150/-
10	No. of household connections and Public stand posts	14,580 /52
11	Solid waste generated per day	56.72 MTs
12	Daily Collection by the Municipality	100%
13	Collection charges for Households	Nil

S. No	Particulars	Status
14	Collection charges for commercial establishments	Rs 100 to 1000 (Slab system basing on the size)
15	Length of Pucca and kutchaside drains	225 / 286 KMs
16	Length of Pucca and Kutcha storm water drains	12 KM/9 KMs
17	Length of UGD Sewer Lines	249.16 KMs (work inprogress)
18	No of STPs	2 (Construction work in progress and 4 smaller CAMUS-SBT plants proposed for newly merged villages in M Catchment.)

Civic Amenities and Services provided by the Municipality

Construction and Maintenance of CC and BT Roads, side drains, developing UGD, supply of drinking water through daily supply for 30 minutes, maintenance of 6 market places, 21 burial grounds, 1 park, 1 play ground, 1 Auditorium, services to 68 worship places, street lighting, collection and disposal of solid waste, town planning and building regulation, property tax collection, issuing trade licenses, control and tax collection on entertainment and advertisement, hygiene and disease control measures in public places, protection and development of water bodies and greenery etc. are the main services and facilities supposedly provided by the Municipality. In addition, the Municipality also has social welfare and urban poverty alleviation programmes implemented through MEPMA.

Table 6: Siddipet Municipality Service Level Benchmarks at a Glance(SLB) Declaration to 14th Finance Commission

S.No.	Proposed Indicator	Benchmark	Present Status 2015-16	Target In Year 2016-17
1	WATER SUPPLY SERVICES			
1.1	Coverage of water supply connections	100.0%	65	70
1.2	Per capita supply of water	135 LPCD	113	125
1.3	Extent of metering of water connections	100.0%	NA	0
1.4	Extent of non-revenue water (NAW)	20.0%	24	23
1.5	Continuity of water supply	24 hours	30 minutes per day	45 minutes
1.6	Efficiency in redressal of customer complaints	80.0%	95	96
1.7	Quality of water supplied	100.0%	94	95
1.8	Cost recovery in water supply services	100.0%	26	30

S.No.	Proposed Indicator	Benchmark	Present Status 2015-16	Target In Year 2016-17
1.9	Efficiency in collection of water supply- related charges	90.0%	57	70
2	Wastewater MANAGEMENT (SEWERAGE AND SANITATION)			
2.1	Coverage of toilets	100.0%	99	100
2.2	Coverage of sewerage network services	100.0%	NA	0
2.3	Collection efficiency of sewerage network	100.0%	NA	0
2.4	Adequacy of sewerage treatment capacity	100.0%	NA	0
2.5	Quality of sewerage treatment	100.0%	NA	0
2.6	Extent of reuse and recycling of sewerage	20.0%	NA	0
2.7	Extent of cost recovery insewerage management	100.0%	NA	0
2.8	Efficiency in redressal of customer complaints	80.0%	98	100
2.9	Efficiency in collection of sewerage charges	90.0%	NA	0
3	SOLID WASTE MANAGEMENT			
3.1	Householdlevel coverage of solid waste management services	100.0%	92	100
3.2	Efficiency of collection of municipal solid waste	100.0%	82	100
3.3	Extent of segregation of municipal solidwaste	100.0%	85	90
3.4	Extent of municipal solid waste recovered	80.0%	79	80
3.5	Extent of scientific disposal of municipal solid waste	100.0%	NA	0
3.6	Extent of cost recoveryin SWM services	100.0%	-	-
3.7	Efficiency in redressalof customer complaints	80.0%	97	98
3.8	Efficiency in collection of SWM charges	90.0%	43	55

S.No.	Proposed Indicator	Benchmark	Present Status 2015-16	Target In Year 2016-17
4	STORM WATER DRAINAGE			
4.1	Coverage of storm water drainage network	100.0%	2	10
4.2	Incidence of water logging/flooding	0	0	0

Drinking Water Supply

The infiltration galleries in Maneru River with a capacity of 7.50 MLD and a water supply scheme with back water from Lower Maneru Dam as source with a capacity of 14.54 MLD and tube wells are the main sources and the first one has already become dysfunctional. With the existing infrastructure the Municipality is supplying 13 MLD of surface water, and 0.50 MLD of ground water from 160 power bore wells and 190 hand pumps. The per capita supply is 113 lpcd. The distribution network of 89 km connects 14,456 households out of the total households of 26,065 with House Service Connections (HSCs) and 52 public stand posts. Connection charge for residential purpose is Rs. 6,000 while the monthly flat tariff is Rs. 150. The same for Commercial and Industrial connections is fixed at Rs. 8,000 and Rs. 840 respectively. Metering of water connections is not yet introduced and among the 13,823 household connections, 1313 are unbilled connections. The estimated Non Revenue Water is 45.15%. As on 31-03-2017, the demand, collection and balance pertaining to water charges is Rs. 351.71/ 164.84 / 186.87 lakhs respectively. In the year 2014-15, the expenditure on water supply was about Rs. 10.65 crores while income (collection) was about Rs.1.52 crores (14.30% cost recovery). Low cost recovery at 14.30% and efficiency of collection at a meager 55.5% are matters of genuine concern w.r.t. sustainability of O&M (Operation & Maintenance) and service delivery.

The construction work is in progress to bring another 7.50MLD under Mission Bhageeratha flagship programme of Government of Telangana, and is likely to be completed in about 2 months. It will mainly cater to the 6 merged villages and to augment supply to the ill-served areas of old town envisaging replacement of the existing under- sized and old distribution network in old town and extending the network in the merged villages for a length of 280 km.

Presently water is being supplied daily for about ½ hour to 1 hour throughout the town. The ULB is presently incurring about Rs.74 lakhs/annum on power charges, down from the earlier Rs.105 lakhs as a result of energy efficient pumping systems.

It wants to further minimize this expenditure by going in for an alternate water source of Ranganayakasagar, under construction by Irrigation Department under the Kaleswaram Project.

The ULB has also initiated work from March 2017 towards graduating to 24x7 water supply which has been commenced on a pilot basis in Mangammathotaarea consisting of 705 HSCs.

Figure 4: Interaction with Water Supply Staff



2. CITY SEWERAGE SYSTEMS

In the present situation, the sullage and or wastewater flowing after usage at household level and commercial establishments, the excess (black) water overflowing from 40,000 septic tanks and the storm water - all are getting mixed up and flowing out through open side drains and ultimately polluting the water bodies. It is estimated that about 80% of the 14 MLD water supplied by the Municipality plus the underground water drawn by the users is coming back to open drainage network. Currently the Municipality has mix of pucca (225 km) and kutchra (286 kutchra) drains totalling to about 511 km length. Although there is a limited length of outfall drains (10 kms), their section is neither adequate nor streamlined to drain out the storm water. The total length of roads in Siddipet town is 261 km. Out of this, about 92.4 km is CC road, 31.5 km is black topped, 21 km is WBM road and remaining 116.2 km is kutchra road. In a phased manner, the Municipality has planned under AMRUT to develop sewerage network in the city.

The sewerage scheme is being taken up in Siddipet town in three phases under the AMRUT programme of Govt. of India with a total cost of Rs. 197.77 Cr. (Rs. 158.34 Cr+ Rs. 39.43 Cr inadmissibles). This includes a STP of 7.25 MLD

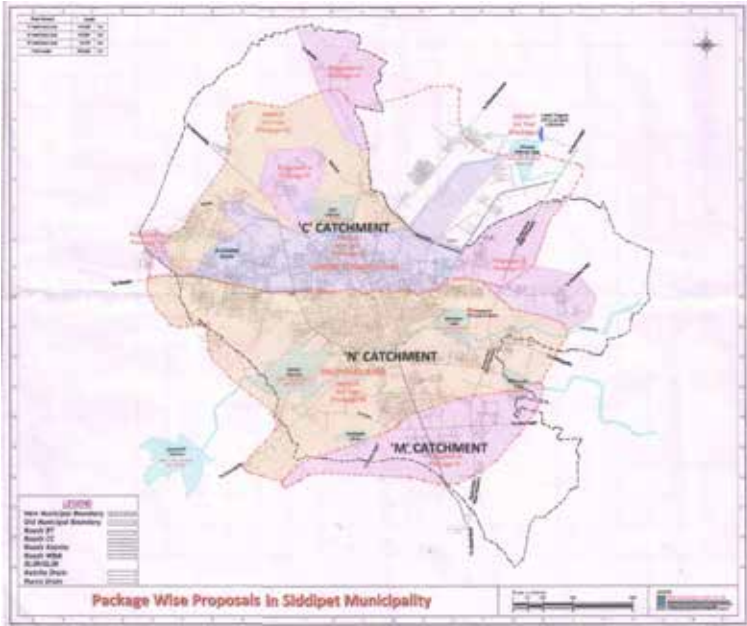
capacity adopting MBBR process at Chintal cheruvu with a sewer network of 91.16 km for 'C' catchment which is draining into Mandapallivagu about 5 km d/s of Chintal cheruvu. Another STP of 10.85 MLD capacity with SBR process is proposed near Narsapur tank which drains into Madanapallivagu with SBR process with a sewer network of 158.00 km for 'C' and 'N' Catchments, the effluent being diverted from Narsapur tank and joining the Madanapallivagu.

Figure 5: STP work in progress at Chintal cheruvu Tank



The other namely 'M' catchment covering 20% of total area (population of about 13,000) is developing on the outskirts on the southeastern side of the town for which 74 km sewerage system comprising 4 smaller STPs totaling 2 MLD capacity with CAMUS-SBT technology, costing a total of about Rs. 73.37 Cr. is proposed to be taken up with a loan from the state Govt. The proposal includes 74 km of sewerage network in 'M' catchment and left over portions of 'C' and 'N' catchments with appropriate treatment processes. There is a major drain d/s of the area by name Madanapallivagu to the south east of the M catchment, which may be the probable disposal point for the sewerage from the M catchment if a conventional sewerage system is adopted. But, the density of the area is sparse and the population scattered necessitating review of the possible options for cost effective sanitation option. The details of ongoing plans and implementation of works for developing the UGD system are shown in the map below.

Map 3: Siddipet Catchment wise UGD Network Map



Source: PHED office Siddipet 2017

Present stage of implementation

As of now, about 20% of value of work has been done. The 7.25 MLD STP at Chintal cheruvu is in full stream of construction and the sewerage network in many areas in 'C' catchment is in progress. The procurement process for the 10.85 MLD STP at Narsapur Tank has been completed and is entrusted to the contracting agency.

The sewer network is being executed with HDPE DWC pipes up to 250 mm and with RCC NP3 & NP4 pipes for 300 mm dia and more. The work is progressing from the upstream end, against the standard practice of locating the manholes, fixing the invert levels of sewers and laying the sewers starting from the down stream end as per the Longitudinal Section, for fear of crossing the water supply mains or cables.

Machinery is being used for sewer line excavation in lanes of normal width, and manual excavation is being done in narrow lanes where for a 40 m length, 10 labourers are working, the number being double that of a sewer line excavated with machines. Provision of sign boards and barricading in both the cases is absent.

Sewers are being laid at the centre of the road with Inspection Chambers (ICs) on the road beside storm water drains, each IC connecting 3 or 4 households. The ICs are again connected to the manholes on the street sewer at a slope. No Y connections are being used for connecting households to street sewers. The vertical and horizontal clearance between water mains and sewer lines seems to be inadequate.

Provision for temporary living accommodation and toilets for workers is made at the 7.25 MLD STP at Chintal cheruvu.

Disposal arrangements

The effluent of the 7.25 MLD STP is proposed to be disposed to the Chintal cheruvu which is a water body. However, the effluent of the 10.85 MLD STP near Narsapur tank is proposed to be disposed to the surplus escape of the tank, which is a better proposal.

Adequacy of Water Supply to make the sewerage system functional

The present per capita supply is 113 lpcd. However, with addition of 7.5 MLD from the Mission Bhagiratha scheme, the total available water for supply will be enhanced to 22.04 MLD which comes to about 153 lpcd which will be more than the 135 lpcd required to enable effective flushing of the sewerage network in the 'C' and 'N' catchments, and for the proposed sanitation system in the peripheral areas in the 'M' Catchment.

Sustainability of water supply and sanitation systems

The cost of the sewerage scheme being executed under AMRUT programme is Rs.197.77Cr. With the present 14,456 water supply HSCs issued against the total households of 26,065,, there is still a gap of 11,609 households to be covered assuming elimination of 52 existing Public Stand Posts eventually. To ensure sustainability of O&M and service delivery it is imperative to make Sewerage systems self- sustaining by fixing the sewerage charges as a percentage of the water tariff (a sewerage cess of 35% of water tariff as in HMWSSB, Hyderabad) with provision for annual increase of about 5% and aim at full cost recovery of O&M expenditure, while cross subsidizing the vulnerable sections.

Figure 6: STP work in progress at Chintal cheruvu Tank



In Siddipet, the estimated capital cost (CAPEX) of sewerage system for the entire town is about Rs. 261.68 Cr. which comes to Rs. 13.46 Cr./MLD or Rs. 14,538/capita or Rs. 58,152/Household considering the prospective population of 1,80,000 for which the major components of the scheme have been designed. This cost however includes the cost of land, permissions, taxes, price variations and other lump sum provisions.

More than the CAPEX, the OPEX (Operation & Maintenance Cost) is key to financial and operational sustainability of any sanitation system. For the Sanitation system being implemented in Siddipet, the total OPEX comes to Rs. 2.35 Cr./annum, or Rs. 15.67 lakhs/MLD/annum, or Rs. 4.29/kl. Similarly the O&M cost per sewer connection comes to Rs. 97.79/month and the per capita O&M cost comes to Rs. 26.63/month assuming the potential no. of connections for the present population of 1,38,690 as 20,000. This is for a city sewerage system with a combination of SBR, MBBR and CAMUS-SBT based STP technologies.

It is observed that the present guideline of designing the STPs for the prospective population after 15 years from the base year (year of commissioning) seems to be leading to over design of the required STP capacity, resulting in significant under-utilization of (75% of designed capacity) STP capacity. For example in Siddipet, while the STPs are designed for a total capacity of 20.10 MLD ($= 7.25 + 10.85 + 0.8 + 3 \times 0.4$) for a prospective population of 1,80,000 in the year 2033, the total influent (sewerage inflow) assuming complete immediate coverage of sewer connections would be only 14.97 MLD, which is about 75% of the installed capacity. This is leading to high OPEX per Household or high per capita OPEX.

However, it is pertinent to note that these OPEX values are indicative and are based on normative flows and designed influent sewerage quantities which vary widely based on actual coverage of connections, time, season, biological loading etc.

Water Quality Analysis

I. Raw Water Sources results and analysis:

a. Microbiological

Lab ref. no. 5495 sample from a Hand Pump found to be contaminated with a Total Coliform count of MPN 93/100mL and harmful Faecal Coliform, E. coli also 'present'. This may be because of the dumping of wastes nearby or sewerage flow.

Lab ref. no. 5502 & 5504 both the bore wells have no bacteriological contamination although they are located near the dumping yard.

b. Physico-Chemical

All the tested parameters are found to be within the limits of prescribed standards of drinking water quality.

II. Piped Water Supply samples:

a. Microbiological

Lab ref. no. 5489 & 5491 samples from Manair river prior to treatment found to be highly contaminated with total coliform MPN count of >1609 and harmful Faecal, E coliforms are present.

Lab ref. 5493 sample collected after treatment found to be 'satisfactory' with Residual Chlorine 1.5 mg/L and no bacterial count available.

Lab ref. no 5497, 5498, 5499, 5500& 5501 samples from treated water reservoirs and household/end user level samples are found to be microbiologically safe and 'satisfactory' with Residual Chlorine 0.2 mg/L and no bacterial count available.

b. Physico-Chemical

All the tested parameters are found to be within the limits of prescribed standards of drinking water quality.

III. Wastewater Samples:

a. Microbiological quality

all 4 samples **Lab Ref no. 5507 & 5512** from ponds and **lab ref.no 5510 & 5515** sewerage sources found to be highly contaminated with Total coliform >1609 and Faecal coliform, E. Coliform are 'present'

b. Physico-Chemical

Lab ref. no. 5508 Chintala cheruvu colour intensity found to be as high as 40 hazen units, and COD is 32 which is 10 times higher than BOD in the same source. Therefore, BOD & COD need to be tested again.

Lab ref. no. 5515 Narsapur cheruvu Ammonical nitrogen is 5.0 mg/L and colour of 30 hazen units are the parameters on higher levels. BOD is as high as 15 mg/L and COD more than double of the standards indicates sewerage inflow into the pond.

Lab ref. no 5509 & 5514 both the sewerage water Amonical Nitrogen levels are 5.0 mg/L and BOD values 30 mg/L and 14 mg/L respectively, while COD is 192 mg/L and 162 mg/L.

For the reasons of cost effectivity and Governments acceptability of the results all the water samples from three cities were tested at Director of IPM, Public Health Lab which is a State Government facility and which also provides regular water quality surveillane services to the state Rural Water Supply department, and independent report sharing with the district Collectors and ULBs. However for comparative analysis the same source samples from Siddipet town were also given to a third party organization, Institute of Health Systems which has expertise both in water quality testing and public health, the details are given below.

Table 7: Comparative analysis of Siddipet water samples by 2 different laboratories

S.No	Sample	Parameter	IPM, PH Lab	The IHS lab	Remarks
1	Borewell of Bussapur Ch. Balaiah	Total Coliform	0	14	
		Faecal coliform	0	0	
		E. Coliform	0	0	
		Turbidity	2.0	0	
		TDS	621	522	
		pH	7.1	6.9	
		Fluoride	0.8	1.31	
		T Alkalinity	308	269	
		T Hardness	280	362	
		Nitrate	42	32.5	
		Chlorides	40	119	
	Sulphates	19	21.5		
2	Kamarapally filter bed – treated water	Residual Chlorine	1.5	0.5	
		Total Coliform	0	0	

S.No	Sample	Parameter	IPM, PH Lab	The IHS lab	Remarks
		Faecal coliform	0	0	
		E. Coliform	0	0	
		T Alkalinity	160	134	
		T Hardness	144	198	
		Nitrate	0	9.3	
		Chloride	32	7	
		Sulphate	16.5	8.5	
		Fluoride	0.3	0.3	
3	GLSR Khaderpura	Residual Chlorine	0.2	Nil	
		Total Coliform	0	32	
		Faecal coliform	0	Present	
		E. Coliform	0	Present	
4	Public Stand Post 1	Residual Chlorine	NA	0	
		Total Coliform	NA	79	
		Faecal coliform	NA	Present	
		E. Coliform	NA	Present	
5	Public Stand Post 2	Residual Chlorine	NA	NA	
		Total Coliform	NA	0	
		Faecal coliform	NA	0	
		E. Coliform	NA	0	
6	Kamarpally filter bed Untreated	Residual Chlorine	0	0.5	
		Total Coliform	>1609	13	
		Faecal coliform	Present	0	
		E. Coliform	Present	0	
		TDS	279	236	
		T Alkalinity	168	113	
		T Hardness	140	186	

S.No	Sample	Parameter	IPM, PH Lab	The IHS lab	Remarks
		Nitrate	0	0	
		Chloride	32	21	
		Sulphate	16	9	
		Fluoride	0.3	0.3	
7	Hand pump	Total Coliform	93	32	
		Faecal coliform	Present	Present	
		E. Coliform	Present	Present	
		TDS	1494	1307	
		T Alkalinity	292	338	
		T Hardness	596	791	
		Nitrate	9	32.5	
		Chloride	384	412	
		Sulphate	16	48	
		Fluoride	0.9	0.9	
8	Tap water H No: 6-4-164	Residual Chlorine	0.2	0.2	
		Total Coliform	0	8	
		Faecal coliform	0	Present	
		E. Coliform	0	Present	
9	Bore well Bussapur Ch. Sattiah	Total Coliform	0	49	
		Faecal coliform	0	Present	
		E. Coliform	0	Present	
		TDS	440	468	
		T Alkalinity	288	290	
		T Hardness	268	356	
		Nitrate	40	21	
		Chloride	52	23	
		Sulphate	22	9	
		Fluoride	0.9	0.9	
10	Chintal cheruvu inlet sewerage	COD	192	108	
		BOD	30	37	

S.No	Sample	Parameter	IPM, PH Lab	The IHS lab	Remarks
11	Chintal cheruvu	COD	32	8	
		BOD	3	2.4	
12	Sewerage narsapur	COD	160	88	
		BOD	14	35	
13	Narsapur cheruvu	COD	112	96	
		BOD	15	37	

Conclusions

The proposal to dispose the effluent of the 7.25 MLD STP into Chintal cheruvu will result in pollution of the tank and its catchment area, pollute the ground water and endanger the aquatic organisms in the tank, as the effluent quality may be erratic and continuous inflows will lead to accumulation of effluent and eutrophication and result in algal blooms and pose serious threat to survival of aquatic organisms.

The present practice of commencing the laying of sewer pipes from upstream end may compromise with the levels of sewerage network and may also lead to delay in commissioning the sewerage system.

The vertical and horizontal clearance between water mains and sewer lines seems to be inadequate in narrow lanes.

In view of the low density, scattered and peripheral nature of 'M' catchment, conventional sewerage and conventional STP may not be appropriate and viable, Hence providing conventional sewerage system in 'M' catchment at the present juncture may not yield the desired benefits.

The sewerage treatment capacity created (for the year 2033) of 20.1 MLD is excess by about one- third of the present requirement which has the potential to make the sewerage system financially unsustainable for the ULB and higher tariff for the households.

Recommendations

Technical

1. A proactive and sustained awareness campaign, procedural streamlining, strategies for addressing issues related to connection charges and cost of service connection work are required to ensure that all households mandatorily take sewerage house connection which is imperative for achieving universal sanitation, resultant health outcomes, financial and O&M sustainability.
2. The vertical and horizontal clearance between water mains and sewer lines

needs to be provided as per CPHEEO manual particularly in slum areas and in narrow lanes to eliminate the risk of contamination of water supply and for easy maintenance of sewer network.

3. It is important to ensure climate resilience to protect the sanitation installations like STPs and sewerage pumping stations against extreme weather events like flash floods in their design w.r.t. their location and elevations, and provision must be made for All households with toilets, either with single/twin pit with the pits bottom lined with Cement Concrete may be connected to sewer network for the sewerage system to function effectively.
4. The households with toilets constructed as per Twin Pit Pour Flush toilet design and with minimum 30m horizontal distance to water source located in permeable soils may be given the option not to connect in view of its integral design closing the nitrogen cycle.
5. All the households with existing septic tanks may be directed to connect directly to the sewerage network bypassing the septic tank, duly dismantling the septic tanks.
6. It is advised to divert and dispose the effluent of the 7.25 MLD STP and that of 10.85 MLD STP to the downstream of Chintal cheruvu and Narsapur tank into their surplus escapes respectively or to or to other water bodies to prevent pollution of the tanks (endangering the survival of aquatic organisms) and of the surrounding ground water by the effluents.
7. It is recommended to install effective quality control systems, lab facilities and monitoring mechanism to ensure compliance to CPCB's effluent discharge standards. Accurate record of the influent and effluent parameters and third party verification may be arranged to realistically assess the power charges and other O&M costs.
8. In peripheral areas and slums like those in the 'M' catchment of about 10,000 population for small communities, it is recommended to explore use of appropriate alternate sewerage systems like Simplified Sewerage or Small Bore Sewerage (Settled Sewerage) for network provision in place of conventional sewerage, and suitable DEWATS (Decentralized Wastewater Treatment Systems) which result in low maintenance like Anaerobic Baffled Reactors, Anaerobic Filters, Constructed Wetlands, Soil Bio-Technology and Phytoid.
9. In future, a modular approach for construction of only the required STP/DEWATS capacities in the short/medium term may be thought of, instead of creating excess capacities which will emerge as white elephants for the ULB.
10. The present practice of laying sewer network from upstream end may be dispensed with. The sewerage network should commence from the STP end towards the upstream. The STP should be constructed first which makes it possible for faster commencement of the treatment operations soon after the closest blocks are saturated with sewer network connections.

This approach will also prevent compromise with the levels of sewerage network. Further, it will also ensure delivery of the intended benefits to the public promptly and without any hitch.

11. Whenever a part of the sewerage system becomes dysfunctional, standby options should be conceived and integrated into the design and O&M to minimize its impact on the rest of the system. This can be done by flushing system, bypass lines/connections/valves at STP and through sewer cleaning machinery.
12. STPs must provide option for receiving and treating the septage and/or faecal sludge which may be coming from unconnected areas and isolated households in future.
13. In the peripheral areas and merged villages, it is essential to develop accurate base line data like: the number of toilets constructed as per original design number, design, capacity and condition of septic tanks in each zone to enable assessing their impact on the future sanitation system and to make design decisions for providing appropriate, safe and sustainable sanitation.
14. It is essential to build inspection tracks adjacent to trunk sewers to enable easy access to inspection vehicles, and to enable prompt repair and maintenance of sewerage facilities.
15. It is important to ensure climate resilience to protect the installations against extreme weather events like flash floods etc. in the design of STPs, sewerage pumping stations etc. w.r.t. their location and elevations, duly providing for diversion of excess run-off away from critical sewerage facilities.
16. During the planning, implementation and O&M stages, it is very fruitful to hold periodical intra (planning, water supply, health etc.) and inter (NHAI, Railways, Electricity, Revenue, APPCB) departmental coordination meetings with all line departments to address problems related to aligning trunk/main sewers, land acquisition for STP etc., obtaining permissions, trouble shooting and to comply with the timelines.
17. Last, but not the least, a clear plan should be developed upfront for reusing the effluent. Compliance to standards should be ensured for discharging effluent into water bodies, so that selection of technologies and execution can be planned accordingly with optimum cost while ensuring environmental quality.

Community Involvement

1. Engage the city councilors, RWAs and TLF/SLF/SHG members and inform them about the proposed works, appropriateness of the design and pipe size, execution schedule of the work etc. so that they are well informed and do not spread any unnecessary apprehensions about the work and their cooperation is assured during the execution and subsequently.
2. Their services can be particularly utilized in campaigning and sensitizing the slum dwellers to take sewer connections promptly to make the

sewerage system function effectively and for achieving financial & O&M sustainability.

3. Toll free number to respond to any public queries and posting the basic information in the website of the Municipality would also be helpful in keeping the public informed of the execution details of the project.
4. Plan for developing IEC strategy to ensure that users have appropriate behavioural practices required for sustainable use and maintenance of the sewerage network, eliminating the malpractice of pushing solid waste and silt into the sewer lines.
5. MEPMA Team and the Women leaders from TFs, SLFs and SHGs need to be engaged to ensure participation of poorer neighborhoods and slums in planning, execution and sustainable use and maintenance of the sewerage infrastructure.
6. Area based committees to be formed for ensuring good public cooperation in sustainable use and maintenance of the sewerage network.
7. The labour component of the earth work in sewerage projects is normally about 20%. This must be utilized to the optimal extent to benefit the local labour and also enhance their income so as to facilitate that the project investment contributes to improving livelihoods of the local labour.
8. Proactive efforts should be made to ensure that the contractors fulfill the conditions of contract related to fair wages, safe working conditions and facilities for the human labour engaged for the execution of various works.

Operation and Maintenance (O&M)

1. Evolve an institutional mechanism like O&M Monitoring Committee at Council level with the Chairperson, Commissioner, City Engineer, interested Councilors, local expert / academia and one TLF/SLF office bearer as members to oversee the O&M of the sewerage facilities, for trouble shooting to accomplish prompt maintenance and to make the O&M really effective and sustainable environmentally, financially and service delivery wise. They can also act as a pressure group in the Council in approving the funding required for effective O&M of Sanitation related services.
2. Identify the potential candidates from the sanitation wing of the Municipality and engage them from execution phase so as to thoroughly familiarize them with the O&M of sewerage system, reskilling them if needed. Employment opportunity to the local poor may also be extended in the O&M of STPs, pump stations and sewer network to the by providing them necessary skillsets.
3. An exit strategy and a reasonable overlapping period between PHED and Municipality is required after completion and handing over of the project to ensure that the operation part is handled efficiently and the ULB staff are ready for taking up the mantle.
4. Build the capacity of the decision makers in the Municipality to realistically

- estimate the cost of O&M of the sewerage system and accordingly initiate the process for resolutions, obtaining Council approvals for collection of user charges and ensure adequate budget provisions for O&M.
5. Right from day one, the user charges must be collected and the defect liability period of maintenance by the contractor must be used as cushion period to build own reserves of the Municipality for the maintenance.
 6. Field diary /memoirs to be prepared for guiding the future staff who are going to handle the O&M responsibility of the sewerage system.
 7. In view of the need and demand for expanding the sewerage facilities to various other cities in the state, it is important that learning and best practices from the execution of the project are properly documented for future usage in other cities of the state.

3. Plans and Programmes for City Development

Siddipet Municipality has produced four key planning documents so far and there is varying degree of actual integration of the same in its day-to-day management and administrative functioning. Except the AMRUT scheme, no other plan documents have any note worthy focus on sewerage management.

Figure7: UGD Pipeline work with manual labour



Master Plan: The City has a Master Plan including land use plan produced about 20 years ago for its 2,165 acres area from the revenue villages of 1. Siddipet, 2. Prashanth Nagar, 3.Hanuman Nagar, 4. Narsapur, 5. Gadicherlapalli, 6. Imambad and 7. Rangadhampalli. There is a strong feeling that these plans did not have a long term vision to be able to address the emerging issues and development priorities. Under the GIZ supported initiative, the city has produced a fairly comprehensive.

City Sanitation Plan: It was also approved by the Council vide Council Resolution no.413, dated: 28-02-2017. With respect to sewerage, the City Sanitation Plan has briefly talked about existing situation but did not make

any specific recommendations nor suggested any strategy for sustainable sewerage management. Also the Municipality falls short of capacity building and resource mobilization efforts required for systematic implementation of the whole plan.

Amrut: A detailed DPR prepared under AMRUT covering a period of 5 years with a budget of Rs. 183 crores has components related to parks, drains and UGD and the project is already under implementation. The total estimated cost for developing sewerage system with 5 STPs is Rs. 271.14 Cr.

Other sanctions/proposals/schemes

During the reorganization of districts, the Chief Minister promised Rs. 100 crore aid for development of the town into A-Grade Municipality for which different infrastructure development plans are made. The Municipality has also prepared a solid waste management plan. The Municipality is also covered under the State's Mission Bhagiratha for augmentation of drinking water supply. More detailed information on the proposed works and progress of UGD works is shown in the following table.

Table 8: Summary of the Phasewise and Componentwise summary of the UGD works being taken up in Siddipet Municipality

Year 2015-16

Name of Work: Siddipet-AMRUT-Construction of STP including interception and diversion facilities, outfall facilities and drainage in Siddipet Municipality under AMRUT

S. NO	Name of the Component	Quantity	Amount in lakhs
1	Construction of Outfall Sewer RCC NP3 pipe from I&D structure to proposed STP at Chintal cheruvu	696 m	37.28
2	Designing, providing, constructing, installing and commissioning of Sewerage Treatment Plant of 7.25 MLD capacity based on Moving Bed Bio Reactor (MBBR) including collection well at Chintal cheruvu tank for 'C' catchment area	7.25 MLD	805.03
3	Construction of SWD in 'C' catchment area	5467.00	970.03
4	Construction of outfall storm water drain of size 5m x 2.5m section including I&D structure near Chintal cheruvu	30 m	21.65
	Sub- Total		2148.00

Year 2016-17

Name of Work: Sidipet-AMRUT-Construction of Under Ground Drainage System in “C” Catchment area of Siddipet Municipality

S. NO	Name of the Component	Quantity	Amount in lakhs
1	Laying of sewer lines of various diameters in Catchment "C"	91.16 Km	2091.36
2	Manholes of various dia and different depths in Catchment "C"	4637 Nos	1203.08
3	Inspection Chambers 600mm dia and 900mm depth in Catchment "C"	8337 Nos	526.094
4	Providing DWC pipelines from IC to Manholes	25011 Rmt	179.49
	Sub- Total		4919.00

Wards covered: 26part, 28, 30,31,34,1part,33,32part,2,3,5part,7part,4part = 7wards completely & 5 wards partially in “C” Catchment

Year 2017-18

Name of Work: Siddipet-AMRUT-Providing Under Ground Drainage System in “C&N” Catchment area of Siddipet Municipality

S. NO	Name of the Component	Quantity	Amount in lakhs
1	Laying of sewer lines of various diameters in Catchment "C & N"		
2	Manholes of various dia and different depths in Catchment - "C & N"		
3	Inspection Chambers 600mm dia and 900mm depth in Catchment "C & N"		
4	Providing DWC pipelines from IC to Manholes		
5	Sewerage Treatment Plant of 10.85 MLD Capacity with SBR Technology at Narsapur Tank		
	Sub-Total		13515.00

Wards covered : 26part(C&N), 29part (C), 32part(N), 4(C&N), 5(C&N), 7(C&N), 10(N), 11(N), 12(N), 13(N), 14part(N), 15(N), 16(N), 17(N), 18(N)//// 19(N), 20(N), 21(N), 22(N), 23(N), 24(N), 25(C&N), 6(N), 8(N)

Name of Work: SIDDIPET-UGD PH-IV –Construction of Under Ground Drainage system “M” Catchment and in left over localities in C&N Catchments.

S. NO	Name of the Component	Quantity	Amount in lakhs
1	Construction of Under Ground Drainage system "M" Catchment and in left over localities in C&N Catchments. (Loan proposal is submitted to Govt. of Telangana for approval)		7337.00

Source: PHED, Sub Division, Siddipet

Figure 8: UGD work in progress



Figure 9: Pipelines used for developing UGD network



Table 9: Phase wise Plans for developing UGD System

S. No	Name of the Project	Estimated Cost (Rs.)	Sanction Ref	Funding (Rs.)	Progress as on 11th Nov 2017
1	AMRUT-SIDDIPET-1st Year - Construction of STP including interception and diversion facilities, outfall facilities and drainage in Siddipet Municipality under AMRUT	2148.00 lakhs	G.O.RT. No.293, Dated: 29.04.2016	GOI - 917.00 lakhs State Govt. - 366.80 lakhs ULB - 864.20 lakhs Total - 2148.00 lakhs	Construction of Storm water drains and Construction of Sewerage Treatment Plant of 7.25 MLD capacity based on Moving Bed Bio Reactor (MBBR) at Chintalacheruvu in Siddipet Municipality. 32% of work completed, Further Work is in progress, Expected to be completed by 31-03-2018
2	AMRUT-SIDDIPET-2nd Year- Construction of Under Ground Drainage system in "C" Catchment in Siddipet Municipality	4919.00 lakhs	G.O.RT. No.218, MA&UD(UBS) Dept, Dated: 10.04.2017	GOI - 2000.00 lakhs State Govt. - 800.00 lakhs ULB - 2119.00 lakhs Total - 4919.00 lakhs	Laying of 91.16Kms of Sewer Lines including Construction of 4637 No's of Manholes and 8337 No's of Inspection Chambers in "C" Catchment in Siddipet Municipality. 21% work completed, further work is in progress. Expected to be completed by 23-08-2017
3.	AMRUT-SIDDIPET-3rd Year- Construction of Under Ground Drainage system in "N & M" Catchment in Siddipet Municipality	135.15 Crores	Go.RT. No.507, MA&UD (UBS) Dept, Dated: 22.08.2017		Laying of 158Kms of Sewer Lines including Construction of Manholes and Inspection Chambers in "N & M" Catchment in Siddipet Municipality & Construction of 10.85 MLD STP at Narsapur Tank. Tender is under finalization.(COT Approved and submitted for Govt approval)
4	SIDDIPET-UGD PH-IV – Construction of Under Ground Drainage system "M" Catchment and in left over localities in C&N Catchments.	73.37 Crores	Loan Proposal is submitted to Government of Telangana.		Construction of Under Ground Drainage system "M" Catchment and in left over localities in C&N Catchments

4. Storm Water Drains

The elevation in the ULB ranges from 507 m to 453 m above MSL. The Average Annual Rainfall is 745 mm. The town is blessed with a copious natural gradient from northwest to south east with no major drainage issues.

The major chain of tanks (Cheruvus) in the town in the order of the flow are Matsyavenikunta, Shankaraiahkunta, Yerra cheruvu, Chintal cheruvu finally draining into Madanaapallivagu. The fall available is about 50m. This forms part of the C catchment, which has been prioritized for addressing the flooding issue and is being taken up under AMRUT programme for provision of Storm Water Drains for a length of 5.46 km costing about Rs.9.50 Cr. out of the required 16 km length in C catchment. The sections proposed vary from 0.6m x 0.6m to 1.75m x 1.75m and drains into Yerra cheruvu in the North. Out of 10 outfall drain stretches, 3 stretches have been prioritized namely 2, 3 and 6. Stretches 2 and 3 drain to Shankaraiahkunta, and stretch 6 drains to Yerra cheruvu.

The other major chain of tanks are Komati cheruvu in south which drains into Narsapur tank in the east which again drains into Madanaapallivagu and into Mittapalli cheruvu.

The fall available in the N catchment is about 40 m.

Conclusions

Although only 26% of the total road length is covered with storm water drains, there are no significant flooding issues in the town due to the ample gradient available across the town. The outfall drains are by and large able to drain off the excess run off satisfactorily except few instances of flooding at locations subjected to encroachment in C catchment where outfall drains are proposed.

The planning process is not geared up to safeguard the water bodies and their surplus channels and The M catchment drains into Mittapalli tank on the south east and the fall available in M catchment is about 20 m.

The major deficiencies observed in the drainage system of Siddipet Municipality are Lack of drain/ culvert sections, deposition of solid waste, obstructions due to water, telephone lines, silt and weed growth, lack of proper cleaning of drains and removal of silt.

During heavy rains, some of the drains over flow with mixed drainage and sewerage and the same is being cleared in 4 to 6 hours, using machinery in major drains and manually in minor drains.

It is informed by municipal officials that there is heavy flooding in Srinivas

nagar near the irrigation nala on Hyderabad road. It can be seen from google map that the heavy encroachment of the feeder channel to Narsapur tank from Komati cheruvuseverely reducing the drainage capacity of the feeder channel might have caused overflowing of the channel leading to flooding of Srinivas nagar, despite the ample gradient available.

While Yerra cheruvu, Komati cheruvu and Narsapur tank are continuing to exist as surface water bodies, all the other tanks have been reduced to small kuntas which are filled during monsson, or gone into oblivion due to heavy encroachment consequent to rapid urbanization. Even the Chintal cheruvu could not be located which shows the gravity of the encroachment.

The drainage paths from encroachment, which is leading to flooding in certain areas.

Further, in view of the sewerage scheme being implemented under AMRUT programme, there is no necessity of taking up tertiary (internal) storm water drains unless absolutely necessary, since the roads themselves act as partial drains due to the adequate gradient available.

Out of the 21 km of outfall drains (primary drains) required, about 3.6 km still need to be provided. There is also need for taking up secondary (collector) drains to streamline the storm runoff during heavy rains and to prevent the compulsion of diverting storm water into sewer network to prevent inundation etc.

Entry of solid waste and other obstructions due to utility lines are leading to avoidable flooding.

The chain of tanks used to act as flood absorption basins during heavy rains. They were gradually encroached upon due to pressures of urbanization, inadequate planning and enforcement.

Recommendations

1. The planning process and regulatory mechanism needs to be strengthened to ensure prevention of encroachment of water bodies like tanks, their surplus channels, paths of outfall drains etc. to prevent urban flooding in vulnerable areas.
2. In the next tranche of funding from any source, remaining outfall drains of about 3.6 km may be taken up on first priority, followed by secondary (collector) drains.
3. Interconnectivity of primary, secondary and tertiary drains and their continuity may be given attention, to ensure efficient drainage flow and disposal.

4. Entry of solid waste may be prevented by effective segregation of waste and by removing obstructions like water supply mains, electrical and telephone cables etc.
5. The storm water drains (outfall drains) may be constructed beginning from the downstream end towards upstream duly maintaining a minimum clearance of 0.30 m above the MFL/MWL of the receiving water body below the MFL of the outfall drain at the confluence/outfall point to prevent backflows.
6. Silt traps may be provided at the culverts, bridges and at sharp turnings to prevent deposition of waste and clogging of drains and to prevent flooding and inundation.
7. It is preferable to cover the drains with light weight RCC/Ferrocement slab/ stainless steel grill to prevent solids entering the drains and to prevent accidents.
8. It is suggested to allow storm water run-off on the pavements also up to 0.15 m so that the roads also act as partial drains, to reduce load on regular drainage network, to prevent flooding of residences and to achieve economy.
9. Sustainable Urban Drainage design principles may be applied in the design of storm water drainage to make it environment friendly and to effect economy. Now that sewerage system is also being implemented, allowing recharge with drain/rain water is advisable to improve ground water table and resilience.
10. The chain of tanks may be revived by removing encroachments, protecting and developing the tanks into recreation spots and flood absorption basins. The surplus escapes of tanks may be restored by removing encroachments and appropriate design for discharging maximum flood. It is important to construct balance outfall drains and secondary drains to ensure proper disposal of flood water from habitations. The internal (tertiary) drains may be dispensed with, except inundation prone/low lying areas, in view of provision of Sewerage by designing the roads to act as partial drains.
11. Latest machinery need to be utilized for drain cleaning to prevent contract of drainage mixed with sewerage by manual labour.

5. Solid Waste Management

Table 10: ParticularsofWasteGeneration-2016

S. NO	Particulars	Details	Percent (%)
1	Domesticsourcewastegenerated(in tons)	35.25	62.31
2	Commercial sourcewastegenerated(in tons)	6.96	12.31
3	Markets	2.76	4.88
4	HospitalWasteGenerated(non-hazardous)	1.34	2.37
5	Street Sweeping	1.91	3.38
6	Drain Silt	8.35	14.76
7	Construction&DemolitionWaste	Not Available	100

Source: DPR on Solid Waste Management for Siddipet Town - Dec, 2016

About 56.57 tons of daily waste is generated in the Municipality in which the domestic household waste and commercial waste is 35.25 and 6.96 tons respectively. The remaining sources of waste include Markets, street sweeping, waste removed from open drains, construction and demolition waste and waste from the hospitals. Out of the total solid waste, 16.90 tons is the estimated dry waste, 19.00 tones is wet waste and the remaining is silt and debris from demolished construction. While there is a separate waste collection system for hospitals, the remaining waste is collected by the Municipality with almost 100% efficiency. Collection from households is done through 12 routes. Normally collection is on alternate days with the exception of some areas where it is once in three days. Siddipet Municipality has distributed free of cost 35,000 sets of blue and green bins to promote household level segregation of wet and dry waste. In all other commercial establishments and market places, the collection is on daily basis. Depending on the quantities of waste, the commercial establishments are charged Rs. 100- 1,000 for picking up their waste. During the Financial year 2016-17, against the demand of Rs. 7.25 lakhs, actual collection under this head was Rs. 4.56 lakhs. With the support of ITC's WOW project, the Municipality has made good progress in source segregation of waste into dry and wet waste which has begun to change the practices at household level. Altogether, 21 vehicles of varying capacity are deployed to collect and transport the waste to landfill areas and mostly the waste is dumped in mixed form. For management of solid waste the city has three facilities i) Dry Resource Collection Center (DRCC), ii) Wet waste Composting center and iii) Landfill / dumping yard. DRCC is operated by women from SHGs wherein the waste collectors are selling the dry waste sorted by them manually. The SHG women managing the DRCC would do further sorting, aggregate the same to quantities viable for transport and sell the material to scrap dealers who supply them to recycling chain. This seems to be working as good business model. Currently

the DRCC godown rent is paid under the WOW project and the Municipality is in the process of developing permanent infrastructure for the same.

Table 11: Buying and selling rates of dry waste by DRCC

S. No	Item	Price Rate/Kg.		S. No	Item	Price Rate/Kg.	
		Buying	Selling			Buying	Selling
1	Unsorted Mixed Dry Waste (Paper, Plastic, LVP, Metal)	2.00	4-5	8	Old Note Books /Text Books	6.00	00
2	Sorted Mixed Paper Waste (Paper & Board)	4.00	7.00	9	Metal (Iron)	8.00	19.00
3	Pet Bottles	15.00	22.00	10	Slippers	1.00	2.00
4	Milk Pouches	6.00	12.00	11	HDPE Bags	2.00	3.00
5	Hard Plastic	7.00	15.00	12	Bottles (per piece)	1.00	2.00
6	Kraft/Carton Boxes	6.00	9.25	13	Beer Bottles (per piece)	1.00	2.00
7	Old News Papers (ONP)	6.00	9.00				

Source: Documentation at DRCC

Table 12: Profit and Loss statement of DRCC

S. No	Month	Purchases		Sales		Hub Expenses		Profit / Loss
		Qty.	Amount	Qty.	Amount	Man Power	Hub	
1	Jan. 2017	21,984	81,247	20,312	215,500	86,000	3,500	44,753
2	Feb. 2017	22,737	79,571	21,701	182,670	58,000	3,500	41,599
3	March 2017	38,220	111,680	29,616	231,746	64,500	6,000	49,566
4	April 2017	43,470	125,345	30,450	235,746	64,000	6,000	40,401
5	May 2017	31,316	101,670	35,575	200,550	52,000	6,000	40,880
6	June 2017	32,748	116,070	30,998	226,050	64,000	6,000	39,980
7	July 2017	25,680	152,760	25,484	260,210	63,000	6,000	38,450
8	Aug 2017	27,765	104,694	26,321	235,569	78,500	7,000	45,375
9	Sept 2017	27,369	110,058	27,672	233,690	75,940	7,000	40,692
10	Oct 20 17	34,339	137,903	30,456	260,691	73,055	8,635	41,098
	TOTAL	305,628	1,120,998	278,585	2,282,422	678,995	59,635	422,794

Source: Documentation at DRCC

**Table 13: Municipal Solid Waste Management in Siddipet:
Requirement Vs availability of staff and facilities**

S. NO	Indicators	Sanctioned	Filled	Gap
1	Sanitary Inspectors	2	2	-
2	Health Assistants	2	2	-
3	Sanitary Jawans / Mastries	9	6	3
4	One Worker per every 500 population	277	247	30
5	Drivers	32	1	31
6	Worker @ 5000 population for each worker (Compost Yard)	28	-	28
7	Pushcarts / Try-Cycles	11	4	7
8	Autos	16	6	10
9	Tractors	15	5	10
10	Dumpers	1	1	-
11	Trucks	1	1	-
12	Compactors	1	-	1
13	Mini JCB	1	-	1
14	Compost Yard @ 1 Acre for 5000 Population	28	11	17
15	Compound Wall	1	-	1
16	Sheds with Water Supply & Power Supply	1	-	1
17	Pulvarizer	1	1	-
18	Bailing Machine	1	-	1
19	Sever	1	-	1
20	Weighing Machine	1	-	1

Source: Documentation at DRCC

Wet waste composting at Mandapally resource Park: This is located at 6 km distance from the city in an area of about 1 acre. Mostly bio-degradable waste from market yards is transported to this place by tractors and dumped in the open area available in the site. Partially decomposed material is put into pulverizer and then fed into vermi composting beds and high quality vermi compost is produced at this place. Compost is used for nourishing plantation in public places and also sold at Rs 5 per kg. Only alimited quantity of wet waste is put into vermi compost production and there is good scope for upscaling the same.

Bussapur Landfill: This is a recently delineated site located at a distance of 22 km from the city in an area of 10 acres. All the remaining waste is dumped in this site in mixed form. The Municipality has plans to develop required infrastructure for scientific and environmentally safe disposal system.

Honourable Minister for MA & UD instructing all the Municipal Commissioners in the state to ban usage of plastic bags below 50 microns with effect from 1st January 2017. The same is being enforced sincerely by the Siddipet Municipality and efforts are being made to educate people on the adverse effects of usage of low grade plastic. From the observation during the field visit, it is quite evident that people are increasingly shifting to use of the alternative material. The actions implemented by the Municipality like imposition of penalties (Rs 6.82 lakhs collected) on the vendors using low value plastics and seizure of such material from the stocking points induced required behavioral change in public towards avoiding plastic bag usage. In line with the guidelines circulated by MOUD-GOI, Siddipet Municipality has also developed draft byelaws named as ‘Solid Waste (Management & Handling), Cleanliness and Sanitation Bye laws for Municipal Council, Siddipet which is likely to be tabled for approval in the next Council Meeting.

Figure 10: Interaction with Ragpickers in slums



Conclusions

Significant progress in keeping the litter free streets could be witnessed in Siddipet Municipality. Solid waste collection routes for residential and commercial areas are also very much streamlined. Entrepreneurship model of recycling high value dry waste through DRCCs has been successfully demonstrated on pilot basis. Vermi composting of wet waste and waste collected from vegetable and fruit markets has also proved to be very successful. Adequate land has been secured for the purpose of scientific disposal of solid waste. Mass awareness and intensive efforts from the Municipality built a

good momentum on solid waste management which was also given good score during the Swachh Sarvekshan. However there is need for consistent efforts to mobilize multi stakeholders and share the responsibility of making progress towards sustainable solid waste management in the city. Municipality has invested huge amount of money on free distribution of blue and green bins and in reality less than 20% residents are practicing source segregation which is mainly due to lack of proper understanding on the importance of segregating dry and wet waste and there is also no clear understanding of what is dry and wet waste. The residents feel demotivated to segregate when they see the waste collectors mixing up the waste at the time of dumping in the vehicle. This is happening for two reasons that all the vehicles do not have separate compartments for dry and wet waste; secondly the load of houses to be covered in each collection schedule is too high due to which the waste collectors only separate high value dry waste and rest is all dumped into the vehicle in mixed form. Waste collectors should have time to interact with residents to explain the need for segregation and they should also be allowed to refuse to collect the mixed waste.

Recommendations

1. Instead of spending huge sums of money on free distribution of bins, there is need to invest in effective public education and distribution of IEC material. A simple wall poster on the need for segregation with pictures of wet and dry waste could be of great use in promoting right understanding. Separate compartments for dry and wet waste should be arranged in the garbage collection vehicles to ensure continuity of the system and to convince the citizens.
2. Safety, dignity and livelihood aspects of the rag pickers and scrap vendors need to be integrated into the City Solid Waste Management plan. Rag pickers can be trained and supported with Rikshaws and Autos to share the responsibility of waste collection from the residents and other establishments for which they should be entitled to collect reasonable collection charges as decided by the Municipality. Wherever possible the welfare schemes and livelihood programmes of the Municipality and State Government need to be leveraged for improving the livelihoods of the families engaged in waste collection. Counseling services for de-addiction, and children's education need to be provided for these families in which MEPMA Team can play a very meaningful role. Scrap vendors stock points can be developed into alternate DRCCs by training them on hazard free methods of sorting, storing and optimizing the quantity of dry waste put into recycling chain. This would also be helpful in creating a reliable data base on the quantities of diverse dry waste and its value and demand in the recycling industry.
3. Introducing the system of daily wet waste collection and weekly dry waste

collection would improve the consistency and effectiveness of segregation. The quality of compostable wet waste and recyclable dry waste can be improved through this system.

4. Considering that about 50% of waste is garbage and bio-degradable, the composting in Mandapalli Resource center should be scaled up and supply chain can be established to channel the same to agriculture in the villages surrounding the city. Organic vegetable production for Hyderabad market, roof top vegetable production for self- consumption of the residents in the town, nourishing the massive plantation done in the city under 'Haritha Haram' programme are other avenues for creating demand for the vermi compost. Entrepreneur based strategy need to be considered for upscaling the composting activity.
5. Siddipet is known to be an educational hub with large number of schools and colleges and there is need to promote awareness of the students in these institutions and also engage them to spread the awareness and monitor waste handling practices of their families, peer groups and neighbours. Similarly the 2040 member based Women SHGs and 62 SLFs network promoted by MEPMA need to be creatively engaged to ensure that all sections of people understand and practice source segregation of waste.
6. Multiple handling of waste may be minimized to make the SWM collection efficient and prevent manual handling. The vehicles, tricycles and bins should be designed so as to achieve this purpose.
7. Effective and speedy composting processes like the Berkeley method which enable fast composting with higher nutrient content may be piloted to utilize the bio- degradable waste for productive use and for environmental sustainability.
8. There is need for taking care of Bio-medical waste and electronic waste.
9. The drain silt needs to be carried in separate vehicles, or in the same vehicle in separate trips. If carried in the same vehicle, it should be separated from other waste.

6. Sanitation Value Chain

With the launch of SBM, the Municipality has made intensive efforts and promoted construction of 1828 IHHLs and converted 889 insanitary latrines into sanitary latrines and declared the city as ODF in October 2015. The twin (leach) pit toilets promoted at individual households are built with varying deviations from the standard design and in terms of functionality they are more like septic tanks. Where twin pit toilets are provided, the pits are lined at bottom with Cement Concrete, there is no junction (distribution) box, and the connection is made from toilet to the first pit which is connected to the second pit by a straight pipe. The two pits are located side by side almost touching each other, and are interconnected, which leads to non-digestion of the sewerage

in the first pit due to moisture infiltration from the 2nd pit. The bottom lining results in non-percolation of filtered sewerage or effluent into the surrounding soil and not serving the purpose of twin pit pour flush toilet. Further, they do not serve either as a twin pit pour flush toilet or as a septic tank. Thus the effluent from the twin pit toilet is discharged to the storm water drains with very little primary treatment, which is hazardous.

Figure 11: Twin pit Toilets constructed in Siddipet Urban



It is also observed that people are spending nearly Rs.5,000 more for the toilet over and above the Rs. 12,000 being paid by the Govt., and paying more than twice the estimated cost of toilet if they go for bath room and almost thrice the subsidy amount is spent when the beneficiary constructs Toilet with septic tank and bath room.

Water is by and large available for flushing, but carried with a bucket into the toilet.

In all, Siddipet Municipality has about 42,000 toilets which are mostly with septic tank system. No uniform design is followed for construction of septic tanks and size is also varying depending on the available space, choices of household, knowledge of the mason etc. The faeces mixed with water is let into the septic tank. Once the tank is full, the excreta gets settled at the bottom of the tank and the supernatant (effluent) is diverted into open drains. Common indicator considered for the need to emptying of the septic tank is when there is no free flow of faeces from the squatting pan or when raw sewerage is noticed through the outlet. Thus the frequency of emptying septic tanks varies from 3 to 12 years. There are about 6 local Septic Tank emptying tankers whose details are available with the Sanitation wing of the Municipality. There are

also some operators coming from outside the city but the data for the same could not be collected. All the local operators are from 'Erukula' tribal (Ethnic code AUG06b) community. Traditionally this community has been living in isolation in the outskirts of the main villages. Pig rearing (in open defecation areas, drains and in fields after crop harvesting) has been one of their main traditional livelihood activities. For reasons of social exclusion and poverty, some of them got engaged as labour for manual emptying of Septic Tanks. In Siddipet town they are owners cum operators for the emptying tankers. Normally the pre-used goods carrier trucks (Eicher 10.90 HP) are fitted with a Tank of 5000 l capacity, sucking motor and 20 to 50 feet long pipes and used for emptying septic tanks. These are designed and dedicated for the purpose of septic tank emptying and not used for any other purpose. The clients reach them on mobile phone (numbers advertised on the walls) to find out the charges and availability. This is normally followed by a home visit to assess the tank size and the effort required to reach out the location of the septic tank. The charges and date of emptying tank are also finalized in this home visit. The charges vary from Rs. 1,500 to Rs. 3,500 and the emptying is mostly done in the late nights. The process of emptying is managed by two persons which include the driver cum operator and helper and it takes about 1 to 3 hours depending on the size and accessibility of the tank. The liquid mixture with water, 5 l of kerosene, phenyl, bleaching powder and detergent surf is put into the septic tank for control of bad odours, disinfecting and viscosity. The same is thoroughly mixed with the sludge in the septic tank using a longhand spade. Normally the client is not around while the emptying is done and all payments are in cash. Though the operators claimed that they discharge the sludge in the agricultural fields of interested farmers, it is difficult to believe as no one confirmed such practice in the city, and also it is difficult to have such viability for round the year. On the contrary, the sludge is released into open areas and streams around. When the idea of nominal charge for discharging the sludge at upcoming STP was mooted, the operators have very much appreciated the same. The average investment on converting a old vehicle with necessary fittings is Rs. 10 to 12 lakhs. The average monthly earning of the operators is about Rs. 35,000 to Rs. 40,000 in which estimated net income is about Rs. 25,000 which is shared between owner cum driver and the helper. It is also common practice to engage one of the family members as helper. However for many of them this is not considered as full time employment.

One of the difficulties shared by the operators is that they have very few mechanics to provide repair and maintenance services. Whenever they need such service the vehicle has to be thoroughly washed before taking to the mechanic shed.

There are 13 public Toilets including 2 SHE toilets, with a total of 79 (53 Men and

26 Women) toilet seats, and 17 Urinals (13 for men and 4 for women) and these facilities are run by private entrepreneurs mostly from Bihar or Jharkhand under pay and use model (Rs. 5 for latrine and Rs.1 for urinals). In addition, 11 local Petrol Bunks are pursued to keep their toilets accessible for the public. Except the toilet in new bus stand no other public toilet is accessible for persons with disabilities. There are no community toilets in this city.

Conclusions

The city has made good progress in ensuring that every household has a toilet and there is no practice of open defecation. For full realization of health and environmental benefits of this progress of construction of IHHLs and behavioural practice require immediate focus on improving practices related to on site collection /containment and discharge of faecal sludge and septage.

The knowledge and practices of hand washing and personal hygiene are very low across the city and there is need for coordinated effort from all the concerned agencies to create awareness, motivation and enabling conditions for improving hygiene practices.

Availability of 13 public toilets and public access to toilets in petrol bunks is a significant progress achieved in Siddipet town. But the areas of improvement are design of the public toilets to ensure that they are child friendly, easily accessible to PWDs and elderly and there is proper ratio of toilet seats for men and women. Standards for maintenance (ventilation, floor dryness, functional taps and flush, hand wash facility etc.) need to be ensured.

The toilets which are being constructed with either single pit or with two pits being bottom lined with Cement Concrete and laid adjoining each other and interconnected do not lead to the intended safe sanitation and health outcomes to the community.

The single pit toilets connected to storm water drains result in septicity, odour and pathogens leading to environmental pollution and public health hazard.

The above instances show that creating stakeholder awareness, capacity enhancement regarding design concepts, construction procedure, correct usage and maintenance system aren needed, apart from efforts to change the consumer behavior.

Concomitant with continuous expansion of the city, there is rapid growth of commercial establishments (restaurants, shopping complexes etc., educational institutions, clinics and hospitals and many of them are operating without proper toilet facilities.

Recommendations

1. Appropriate design of onsite sanitation facilities like toilets and septic tanks considering the soil and water table conditions, and their usage should be promoted by building awareness and capacities of the engineers and other stakeholders.
2. The engineers, masons and the community need to be trained in proper construction, use of toilets, and their maintenance. Awareness campaigns to be undertaken to change the behavior pattern relating to use of toilets, personal and environmental hygiene.
3. Awareness and monitoring measures must be initiated to ensure that Twin Pit and Pour flush Toilets are not directly connected to a storm water drain in view of its integral design closing the carbon and nitrogen cycle.
4. For the extended and peripheral settlements, a Faecal Sludge and Septage Management plan with regulations and guidelines at ULB level for collecting septage from septic tanks and other faecal matter from community toilets, public toilets and pit toilets need to be developed urgently to ensure safe sanitation.
5. Essential norms and standards for septic tank construction, emptying and discharge of sludge and septage must be popularized at all levels. Town Planning wing of the Municipality should have technical knowledge to ensure that all building permissions incorporate proper designs for septic tanks and monitor their compliance. Municipality needs to develop the inventory of Septic tanks in the city, their size and emptying intervals to be able to estimate the discharge quantities and to send alert messages on their emptying.
6. They should also earmark necessary spaces in their Master Plan for trunk facilities like STPs, pump stations, trunk mains, sanitary landfill etc. in consultation with Engineering section. The operators and personnel involved in septic tank emptying should be trained in personal safety and environmental safety aspects of emptying, transportation and discharging of faecal waste from the septic tanks. Municipality needs to initiate proactive measures to ensure that faecal waste is discharged in an environmentally safe manner, personal safety gear is locally available and provide support system for low cost capital for investing on emptying trucks. Operators should be mandated to maintain diary of the emptying operations done and share the same on a monthly basis. In addition, the sanitation wing of the Municipality should have periodic interactions with operators to reinforce messages on personal and environmental safety practices. Guidelines on septic tank design, emptying and the contact details of the listed / registered service providers should be shared on the website of the Municipality.
7. Periodic consultation and sensitization meetings should be organized with Builders, Architects, Civil Engineers, Residents Welfare Associations, Masons Unions, leaders of Slum and Town Level Federations of SHGs and

other stakeholders to raise awareness and seek cooperation for proper construction and emptying of septic tanks.

8. Engineering wing of the Municipality should update its knowledge and adopt an improved Universal Design for promoting all inclusive 'Public Toilets'. The operators need to be sensitized on all round maintenance of public toilets. Comprehensive check list based self- monitoring by the operators, supervision by local community organizations and Sanitation wing of the Municipality need to be institutionalized.
9. Stationary Bio-toilets/Bio-digester toilets and public urinals may be installed at critical locations and Mobile toilets and urinals during festivals to ensure environmental sanitation, hygiene and for prevention of communicable diseases.
10. Comprehensive guidelines for shops and establishments should be issued by the Municipality for ensuring WASH facilities on the premises with access to clients / customers of respective establishments. For the purpose of public vigilance and accountability, the shops and establishments should be mandated to display a self- declaration that they are complying to the WASH guidelines of the Municipality. Such a self-declaration or affidavit should be made a precondition for annual renewal of trade licenses.

Table 14: List of Public Toilets

S. NO	Location	No. of floating population depe	No. of Seats		No. of Urinals		Waste disposal arrangement connected	Functional status (water, light)	Design consideration for men & women	Complaint redressal systema va	Owned & Maintained by	User charges (Rs.)	Remarks
			M	W	M	W							
1	Near Municipal Office	55	2	2	0	0	Septic tank	Yes	Yes	Yes	Private Operator	₹5	₹1 Urinals
2	Near Municipal Park	100	2	2	2	2	Septic tank	Yes	Yes	Yes	Private Operator	₹5	₹1 Urinals
3	Musthabad 'X' Road	80	2	2	2	2	Septic tank	Yes	Yes	Yes	Private Operator	₹5	₹1 Urinals
4	Beside Old Busstand	60	3	1	1	0	Septic tank	Yes	Yes	Yes	Private Operator	₹5	₹1 Urinals
5	Near Govt. MCH	90	2	1	2	0	Septic tank	Yes	Yes	Yes	Private Operator	₹5	₹1 Urinals
6	Hospital	60	2	2	0	0	Septic tank	Yes	Yes	Yes	Private Operator	₹5	₹1 Urinals
7	Near High School	100	2	2	2	2	Septictank	Yes	Yes	Yes	Private Operator	₹5	₹1 Urinals
8	Near Old Market	200	2	2	2	2	Septic tank	Yes	Yes	Yes	Private Operator	₹5	₹1 Urinals

S. NO	Location	No. of floating population depe	No. of Seats		No. of Urinals		Waste disposal arrangement connected	Functional status (water, light)	Design consideration for men & women	Complaint redressal systema va	Owned & Maintained by	User charges (₹s)	Remarks
			M	W	M	W							
9	Old Busstand	200	2	2	2	2	Septic tank	Yes	Yes	Yes	Private Operator	₹5	₹1 Urinals
10	New Busstand	100	2	2	2	2	Septic tank	Yes	Yes	Yes	Private Operator	₹5	₹1 Urinals
11	Rythu Bazar	70	2	2	2	2	Septic tank	Yes	Yes	Yes	Private Operator	₹5	₹1 Urinals
12	Komati Cheruvu	150	2	2	2	2	Septic tank	Yes	Yes	Yes	Private Operator	₹5	₹1 Urinals

7. Slum - Sanitation and SWM issues

The city's jurisdiction includes 41 slums in which 12 are notified and 29 are non-notified. About 48,299 people from 13,019 households are inhabiting in these areas which is about 1/3rd of the city population. Siddipet attained the status of special grade Municipality in 2012 after amalgamation of 6 Gram Panchayats and thus in most slums the houses are spread out with reasonable open spaces. High density is an issue only in the core / central part of the city. Under the Double bed room housing scheme of the State Government the city got a sanction of 1,960 houses. The State Government of Telangana has introduced a special scheme to provide water connection to the poor with a charge of Re. 1 which significantly improved household connections and still about 1/3rd houses in the slums of Siddipet lack water connection in the house. MEPMA team played active role in awareness building, motivation and facilitating SHG loans to beneficiaries as a result of which all the households have a functional toilet at home and they are also using the same.

As indicated above, while every household has access to toilet, the functionality of leach pit technology is not ensured due to technical lapses in construction. The base of the pits is cemented, junction boxes are missing in most cases, sullage from bathing cubicle is also diverted into pits, the overflow from the pits is directly connected to open drains. Under these circumstances realization of ODF benefits in terms of public health and environmental safety.

The side drains are mostly kutchha flowing with effluent from the septic tanks and bottom sealed leach pits. The particles of excreta are also seen in the open drains. Due to construction debris and siltation in many places side drains are stagnant and or overflowing on roads. Stagnation, overflows, storm water overflows and silt removed from the drains are causing contamination of surroundings with faecal matter and septage. Maintenance of side drains and

ensuring free flow of the same is perceived as exclusive responsibility of drain cleaners of the Municipality. Observations at the toilets in use and interaction with community members revealed low level of hand washing practice. Also there is not much participation nor understanding by the slum people about upcoming sewerage system.

The solid waste collection in slums, particularly in the newly merged far flung areas is not very regular. Particularly at the time of festivals and major official events in the city, the sanitation workers are diverted resulting in gap in household waste collection in these slum areas. There are about 22 rag picker families in the city slums belonging to Dakkili community which is a sub-caste of Dalit community and they depend on waste collection from the streets and public places. In addition there are 40 rag pickers spread out in the city and so far their livelihood issues are not considered in the solid waste management plans of the city.

MEPMA is the lead agency for implementing urban poverty alleviation programmes under which 2,040 SHGs are formed covering 21,335 women which are organized into 62 Slum Level Federations and 2 Town Level Federations. Women SHGs have leveraged bank loans to the tune of Rs. 96.00 crores. In addition 360 Persons With Disability are also organized into 72 groups. 3,604 old age pensions, 3,714 widow pensions, pensions for PWDs, 4,770 Beediworkers' pensions, 850 pensions to marginalized artisanal families are the other social welfare programmes being implemented in the Municipality. There is a City Livelihood Center managed by SHG women which caters to variety of services (Electrical, housekeeping, plumbing, dry cleaning etc.) required for the town population. One septic tank cleaner is also a member of this CLC.

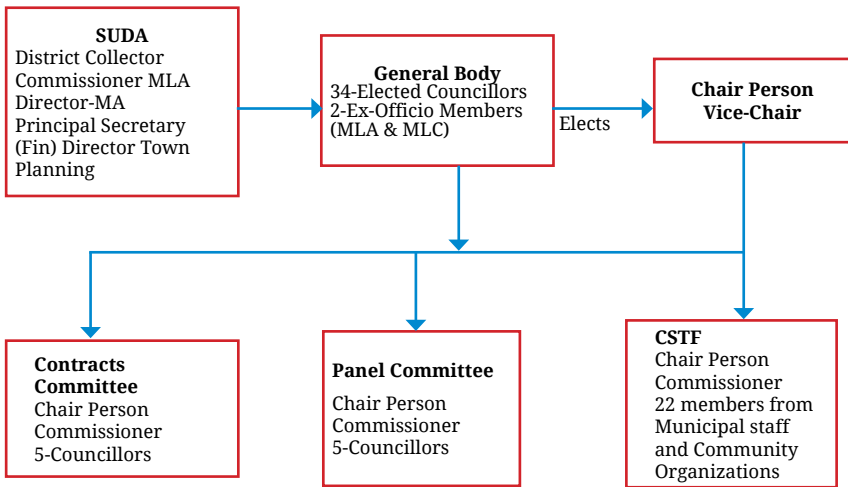
8. ULB organisation Structure and Governance

Governance

Siddipet was constituted in the year 1952 as a 3rd grade Municipality, promoted to 2nd grade in 1980 and since 2012 upgraded to special grade Municipality. On 30th October 2017 State Government of Telangana passed GO constituting Siddipet Urban Development Authority for the geographical area consisting of Siddipet Town and 21 adjacent Gram Panchayats. The town is divided into 34 wards and thus the Municipal council consists of 34 elected Councilors (16 Women) who in turn elect Chair and Vice Chair. Contracts Committee, Panel Committee (recruitments), the City Sanitation Task Force (CSTF) are the three committees that exist. While the first two are actively functioning the CSTF has not yet become functional. All the committees are headed by the Chairperson and the Commissioner of the Municipality. The Honorarium for the Chairperson, Vice Chair and Councilors is Rs. 15,000, 7,500 and 3,500 respectively. Local

MLC and MLA are also members of the council with voting rights. The current Council was formed on 16th April 2016. Since then Contracts Committee met twice and adopted 208 resolutions, Panel Committee met twice and adopted 2 resolutions and the General Body of the Council met 18 times and adopted 681 resolutions. Focus on sanitation in the council meetings is more in terms of the infrastructure development rather than review of sanitation situation and planning interventions for improving services and standards.

Figure 12: Governance Structure



Staffing Pattern: The staff structure of the Municipality mainly consists of 6 wings (Engineering, Town Planning, Public Health /Sanitation, Finance & Revenue, Administration, Urban Poverty). Currently there is a total staff strength of 446 in which 334 are outsourced and 112 are regular appointed staff of the Municipality. The design and execution of infrastructure works is managed by the PH&MED and upon completion, the same is handed over to the Municipality for day to day operation and maintenance. Operation of Drinking water supply system, Storm water drainage, sewerage and construction of Public Toilets are managed by the Engineering Wing of the Municipality. Sweeping, solid waste management, household toilets, maintenance of public toilets is managed by the sanitation wing of the Municipality.

Sanitary Inspectors, Sanitary Supervisors, Health Assistants, Jawans and workers are the various levels of functionaries in the sanitation wing of the Municipality. The number of filled in posts are much less than required and mostly the contract or outsourced personnel are deployed in the field.

Table 15: Staff Structure in Sanitation Wing

S. No.	Position	Total Sanctioned	Filled	Vacant
1	Environmental Engineer (AE Cadre)	1	0	1
2	Sanitary Inspectors	2	2	0
3	Health Assistants	2	2	0
4	Sanitary Jawans	9	6	3
5	Drivers	3	1	2
6	Cleaners	1	0	1
7	Garden Malis	3	3	0
8	Public Health workers	76	54	22
	Total	97	68	29
Outsourced Staff				
9	Sanitation workers		116	
10	Total current staff in sanitation wing		184	29

Lack of skills and capacities, and work pressure are apparently critical issues affecting the performance efficiency of the sanitation wing. Since the launch of SBM there is growing emphasis on sanitation, service standards are raised, citizens' expectations are growing and there is an aspiration at the Municipality level to be rated high in the next Swachh Sarvekshan. All this is causing growing work pressure on the sanitation staff which needs interventions for capacity building and increasing the staff strength. Religious festivals like Ganesh Chaturthi, Batukamma, Bonalu, elections, frequent breakdown of old vehicles used for sanitation work, lack of responsibility sharing by the public etc. are also causing additional burden to the limited staff in the sanitation department. Staff are also diverted for other purposes like office support etc which is also reason for growing work pressure. It may be noticed that the post of Environmental Engineer which is crucial for technical initiatives like composting, bio-methanation, and for implementation of pilots in DEWATS is also vacant.

9. Financing

Income from taxes, non-taxes and assigned revenue are the own income sources of Siddipet Municipality which amounts to Rs. 881.95 lakhs in 2015-16 FY. Whereas the capital income in the form of grants and loans for the same FY was Rs. 2,385.53 lakhs which indicates that there is a high level of external dependency. Total Revenue expenditure for the year was Rs. 1,893.38 lakhs which includes an expenditure of Rs. 260.32 lakhs (13.75%) on account of O&M of sanitation and SWM. The capital expenditure during the FY was Rs.

948.49 lakhs. The status of revenue expenditure reflects a revenue deficit of Rs. 1,011.43 lakhs. The capital grants and loans include allocations from the Finance Commission's per capita based allocations, IHSDP, UIDSSMT, Special Development fund from the State Government, SBM, SCSP Sub-plan, TSP Sub Plan, CDP Grants, AMRUT etc. It can be inferred from the following graph that the revenue deficit has been mounting in the past couple of years.

Figure 13: Income vs Expenditure

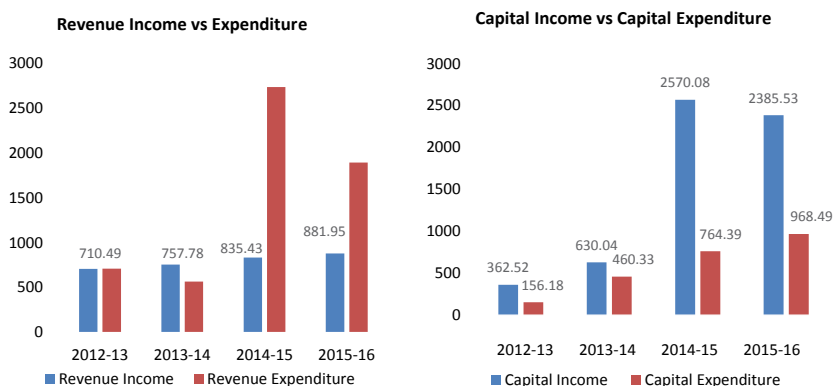


Table 16: Demand Collection Balance Statement

#	Particulars	2015-16 (in lakhs)			2016-17 (in lakhs)		
		Demand	Collection	% of Collection	Demand	Collection	% of Collection
1	Taxes	422.63	367.63	87.0%	754.94	655.27	86.8%
2	Non-Taxes	853.63	647.43	75.8%	558.32	357.91	64.1%
3	Assigned Revenue	124.48	124.48	100.0%	144.49	51.07	35.3%

Table 17: Demand Collection Balance Statement - Water Charges

#	Particulars	2015-16 (in lakhs)			2016-17 (in lakhs)		
		Demand	Collection	% of Collection	Demand	Collection	% of Collection
1	Water Charges	315.79	122.90	38.9%	353.54	164.84	46.6%
	a) Private Properties	314.08	122.90	39.1%	351.71	164.84	46.9%
	b) Govt. Properties	1.71	-	0.0%	1.83	-	0.0%
2	Receipts from Sale of Water	-	-	-	-	-	-
3	Receipts from Sale of Water through Tankers	-	-	-	-	-	-
4	Water Supply Donations	6.85	6.85	100.0%	1.62	1.62	100.0%

The Siddipet Municipality is one of the fastest growing Municipality, especially, after the formation of the new State of Telangana. The Municipalities of any area are primarily posted with the responsibility of the maintenance of the town. The two important responsibilities are provision of infrastructure (Utilities like water connection, lighting connections, roads etc.) and maintenance / neatness of the City, through clearance of garbage etc. and maintenance of capital assets. Obviously, money is required for the above two important functions as well as provision for the maintenance of establishment personnel, administrative expenses etc. There are two sources of money to the Municipality - money is provided by Government / other Authorities through Grants, primarily towards incurring of Capital Expenditure (Infrastructure like lighting, water and electricity facilities) and also towards incurring revenue expenditure, if required. The second source of money is through revenue income of the Municipality, comprising of Taxes, Non-Taxes and Assignment Taxes etc. mainly intended to incur the maintenance of the Infrastructural facilities as well as meet the establishment and administrative expenses of the Staff members of the Municipality.

Figure 14



Table 18: Summary of ULB Budget

S. No.	Description	Fin. Year 2013-2014	Fin. Year 2015-2016	Fin. Year 2016-2017	Fin. Year 2017-2018
		(Upto 31st Dec. 2017) (Rs. in lakhs)			
1	ANNUAL BUDGET	N.A.	4,865	5,013.00	3,605
	(GENERAL + CAPITAL)				
2	TOTAL OWN INCOME (Total -Op. Balance)				
	Taxes	304	368	655	2,484
	Non-taxes	198	647	358	
	Assigned Income	109	125	51	
	Grant Trf. From Govt. (C)		106	8	1,457
	Other Receipts/Dep. etc. (Net)		803	1,198	210
	TOTAL	611	2,049	2,270	4,151

S. No.	Description	Fin. Year 2013-2014	Fin. Year 2015-2016	Fin. Year 2016-2017	Fin. Year 2017-2018
		(Upto 31st Dec. 2017) (Rs. in lakhs)			
3	GENERAL FUND EXPENDITURE				
	Establishment ***	N.A.	301	327	242
	Administrative###	N.A.	480	232	357
	Infrastructure Maintenance	N.A.	739	559	429
	Fixed Assets purchased	N.A.	9	36	24
	Other Payments		-	-	
	TOTAL		1,529	1,154	1,052
4	DEMAND / COLLECTION				
	Taxes	350 / 304	423 / 368	754 / 655	N.A.
	Non-taxes	322 / 198	854 / 647	558 / 358	N.A.
	Assigned Income	109 / 109	124 / 125	144 / 51	N.A.
5	CAPITAL GRANTS	N.A.	2,539	3,073	662
6	CAPITAL FUND EXPENDITURE				
a	Infrastructure Maintenance including capital expenditure	N.A.	1,942	1,080	968
b	Grant Trf. To Revenue /Others(C)	N.A.	273	83	81
c	Purchase of Fixed Assets	N.A.	46	44	158
7	OWN INCOME / GRANTS	N.A.	1,140 / 106	1,064 / 8	2,484 / 1,457
***	Establishment Expenses	represents expenditure relating to salaries, wages, Rent, Electricity Expenses			
###	Administrative Expenses	represents expenditure relating to Stationery, Conveyance, Petrol charges, Veh. Maint. Postage etc.			

Note: The Municipality is in receipt of Grants of varied types from various government agencies, including (special) Swachh Bharat Grants. All the figures in the above Statement are considered from the Receipts and Payments Account furnished by the Municipality. Owing to non-consideration of the opening and closing balances of Bank and Cash, obviously the figures under Clause 1 and 5 together, would not tally.

COMMENTS ON THE ABOVE FINANCIAL CONDITION

Clause No.1 : ANNUAL BUDGET :: This is a total sum of Grant Receipts received from Government and other bodies towards Capital Expenditure AND Revenue Receipts, represented by Taxes, Non-taxes and Assigned Taxes. At times, Grants are received towards Revenue Budgeted Expenditure too.

Clause No.2 : REVENUE RECEIPTS :: Basically, the Municipality's REVENUE Receipt income is Taxes, Non-taxes and Assigned Income. In addition, there are other Receipts, like grants, loans etc. to meet Revenue Expenditure detailed under Clause 3. The income from the above main sources, comprising of Taxes, Non-Taxes and ASSigned Income is Rs.611 lakhs, Rs.1,140 lakhs and Rs.1,064 lakhs indicate increase in incomes in absolute terms. For relative remarks, refer to Clause 4 supra. in the This is a total sum of Grant Receipts received from Government and other bodies towards Capital Expenditure AND Revenue Receipts, represented by Taxes, Non-taxes and Assigned Taxes. At times, Grants are received towards Revenue Budgeted Expenditure too.

Clause No.3 : REVENUE EXPENDITURE :: The major components of Revenue Expenditure is Establishment, Administrative expenses relating to the offices and maintenance of Capital Assets. Such expenditure incurred for the last three years are Rs.1,529 lakhs, Rs.1,154 lakhs and 1,052 lakhs respectively against total revenue Receipts of Rs.2,049 lakhs, Rs.2,270 lakhs and Rs.4,151 lakhs respectively, which include other Receipts also, including Loans or Grants etc. implying that the current income from taxes (not merely total receipts) are insufficient. When compared with income from TAXes, such figures for the three years are Rs.1,1,40 lakhs, Rs.1,064 lakhs and Rs.2,484/- lakhs, respectively, which implies that there is deficit income.

Clause No.4 : Demand / Collection :: The gap between demand and collection of varied nature of taxes as detailed above, requires to be improved appreciably. The Collection of Taxes during the F.Y.2016-17 is less F.Y 2015-2016, while it is improving appreciably during the current financial year 2017-2018. The ultimate aim of any Municipality should be that each such Municipality should be self-sufficient, which is indicated by as low gap between demand / collection, as possible.

Clause No.5 : Capital Grants :: This represents Grants of varied nature received by the Municipality, which is included in the Annual Budget -- Rs.2,539 lakhs, Rs.3,073 lakhs and Rs.662/- and includes Other Receipts or Loans

Clause No.6 : Capital Expenditure :: This represents expenditure incurred on infrastructural facilities like road laying, water lines etc., out of the funds received as Capital Grant as referred to under Clause No.5 supra. It also includes grants given to others and purchase of fixed assets for its own offices. as detailed under the three heads of the clause

Clause No.7 : Own Income / Grants :: This indicates the REVENUE incomes of the Municipality received during each of the financial years and the grants received therein, even as Capital Grants received and spent are dealt under clauses 5 and 6 supra.

Conclusion

In the past 3 years the capital grants and expenditure has increased three fold and the same is likely to continue for the next two years due to sewerage system and other infrastructure being executed with funding under AMRUT and other

state grants. Overall capital expenditure and asset creation in 2015-16 FY is very high in the Municipality. The ongoing projects and assets created provide good potential for revenue generation. However, realizing this potential and assuring adequate income for efficient O & M of the infrastructure and provision of services is going to be a huge challenge to the Municipality.

The tax collection efficiency of Siddipet Municipality has been improving and for 2016-17 it is 86.8% and the deficit is due to low property tax collection (25.52%) from Government properties. Much lower non tax collection (64.04%) for the same year indicates the need for capacity development and improved strategies to reduce the over dues under the non-tax sources of revenue. Water charges is one of the key components of non-tax revenue and the same for financial years 2015-16 and 17-18 stands at 38.9% and 46.6 % respectively. Siddipet Municipality falls short of meeting 14th Finance Commission's performance indicator of recovering 70% of revenue expenditure (sum of O&M, establishment and salary expenses).

For ensuring a sustainable resource base, Siddipet Municipality needs to focus on increasing own revenue and saving on the revenue expenditure without compromising on the standards for provision of basic services. To ensure equitable and inclusive progress of the city the Municipality should have disaggregated allocations and full utilization of the same towards improving infrastructure and services of the poor.

Recommendations

1. There is need for establishing an exclusive Resource Mobilization Committee at the Municipality level to regularly review and analyze the expenditure and income, and their trends and plan for measures including technology interventions like GIS required to reduce the gap between revenue income vs expenditure, 100% collection of taxes and non taxes as per the demand and aim to achieve financial self-sustainability of Siddipet Municipality.
2. The Annual audit of the Municipality should not only focus on scrutiny of the expenditure but also make recommendations for improving the income of the Municipality and to prevent revenue leakages.
3. Staff capacity development, increasing number of staff, robust real time MIS and incentivization need to be introduced for efficient assessment, identifying un-assessed and under-assessed properties, appropriate taxation of change of land use, trade and businesses, advertisements etc. The current gap in both assessment and levying of the taxes should be avoided.
4. There is need for introducing periodic (at least half yearly) third party engagement for auditing systems and controls to plug the loopholes causing leakages in both revenue and expenditure.
5. Revenue collection is currently perceived as the exclusive responsibility

of Revenue wing of the Municipality which should change and all the departments should have a team approach in targeting and collecting the taxes. There is need for inter departmental coordination committee which should meet frequently to exchange the information, review revenue and expenditure and plan measures to reduce the gap.

Figure 15





Section III

Urban Sanitation Management in Mahbubnagar

1. General Profile

Mahabubnagar Town is formerly known as ‘Palamoor’. The name of the town was changed to Mahabubnagar in honor of Meer Mahaboob Ali Khan Aseef Jah, during rule of Nizam of Hyderabad. It is about 100 Km away from Hyderabad, the Capital city of Telangana. Mahabubnagar is located at 16° 43’ 60” North Latitude and 77° 58’ 60” East Longitude on the Secunderabad-Guntakal section of the South Central Railway and on Hyderabad-Raichur State Highway. Mahabubnagar has become a well noted district for high rate of migrant labour to almost all the places in the country seeking construction or agricultural labor. With the onset of more irrigation projects like Jurala, Sriramsagar, Koilsagar etc., the migration has reduced considerably in the recent years. The average annual rainfall is 882 mm and the average temperature is 27 degrees with summer temperatures reaching as high as 42 degrees.

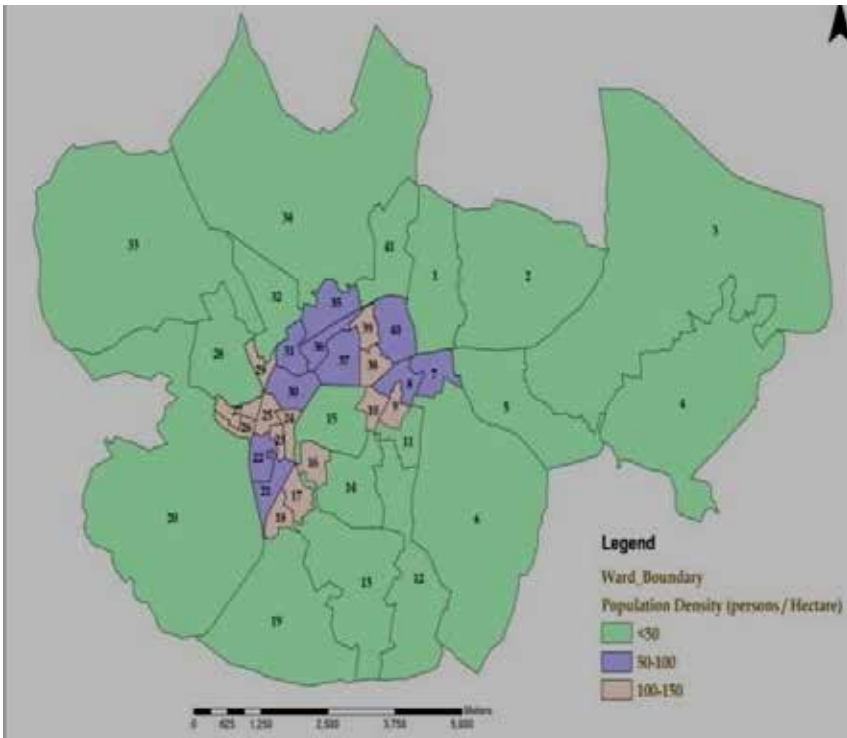
Table 19: Demographic Profile

Municipality	Mahabubnagar	
Year of constitution	1952	
Extent	98.64 sq. km.	
No. of Election Wards	41	
No. of Revenue Wards	18	
Population as per 2001 census	1,30,986 Males: 66,803 Females: 64,183	
Population as per 2011 census	2,17,942 Males: 1,10,995 Females: 1,06,987	
Population as per SKS 2014	2,60,000	
No. of House Holds	Census 2011 43,624	SK Survey 2014 56,500
No. of slums	41	
A. Notified	28	
B. Non-Notified	13	
Slums/BPL Population as per 2011 census	61,288	
% of Slum/BPL Population to the total population	28.12%	

Mahabubnagar is the biggest Municipality in the district spread over an extent of 98.64 sq km. It was constituted as 3rd Grade Municipality in the year 1952 by merging erstwhile five Gram Panchayats. It was upgraded as Grade – II Municipality in the year 1959 and Grade- I Municipality in the year 1983. It was

further upgraded as Special Grade Municipality in the year 2004. Recently in the year 2012 as per the G.O Ms.No.215, MA&UD (Elec-1) Dept, dated 29- 05-2012 another 10 Gram Pancayats have been merged. The merged villages include Appanapally, Yenugonda, Yedira, Palkona, Chirtian pally, Bandameedipally, Chinnadarpally, Boyapally, Doddalonipally, Timmasanipally. Mahabubnagar town has been divided into 41 wards of which more densely populated wards are located in the central town while the peripheral or merged wards have less dense population. The details of popualtion density are shown in the map below.

Map 4: Population Density of Mahabubnagar Municipality



Source: Mahabubnagar Municipal Corporation, 2017

Current slum population reported as per the ODF declaration format is 72, 581 and the women from these poor families are federated into SHGs, Slum Level Federations and Town Level Federations. As on today there are two townlevel federations (Navabharthi pattana samakhya and Pillalamarri samakhya) and there are 89 SHGs actively functioning with a membership of 29,676 women.

Civic amenities and services provided by the Municipality

The basic amenities and services provided by the Municipality include construction and maintenance of CC (80 km) and BT roads (56 km), Kutcha (180 km) and Pucca (175 km) drains as well as Storm Water drains of 14 km. Storage of water in the 17 Ground Level Service Reservoirs (GLSR) and Elevated Service Reservoirs (ELSRs) and supply through household connections and Public Stand Posts. Along with that, provision and maintenance of markets (vegetable (2), meat, fish (1) and grain) burial grounds (8), water bodies, playgrounds, auditoria, local marriage halls, provision of street lighting, solid waste management and sanitation services constitute the municipal amenities and services.

Table 20: Water and sanitation Profile of Mahabubnagar

S. No	Particulars	Status
1.	Swachh Sarvekshan Rank for 2017	249
2	Date of ODF declaration	Third party evaluation is due
3.	No of Household Toilets	45,000 of which 39,000 with Septic Tanks
4	No of Public Toilets and seats	6/58 (includes men and women)
5	No. of Community Toilets	6
6	% of Schools with toilet and urinals for Boys and Girls	100% (Total Schools-150)
7	Quantity of withdrawal for city water supply (Ramanpadu 3 MLD + Koilsagar + 17 MLD + Bore Wells 6 MLD	26 MLD (work in progress under Mission Bhageeratha for 26 MLD)
8	Current water supply (once in two days/ alternate days)	60 LPCD
9	Water Supply charges (flat rate per domestic connection per month)	Rs 100/-
10	No. of household tap connections	17,244
11	Public stand posts	460
12	commercial connections	68
13	Solid waste generated per day	75 MTs
14	Daily Collection by the Municipality	72 MTs (96%)
15	Collection charges for Households	Nil
16	Collection charges for commercial establishments	Rs 200- 500 (based on the waste)
17	Length of Pucca and kutcha side drains	175 kms / 180 Kms

S. No	Particulars	Status
18	Length of Pucca and Kutcha storm water drains	14 kms
19	Length of UGD Sewer Lines	No UGD
20	No of STPs	Small STP of 1000KL based on DEWATS model but there is only absorption.

Source: Mahabubnagar Municipality 2017

The service level bench marking of Mahabubnagar town is given in the table below as reported in 2015- 16, 2016-17 and the target for the year 2017-18

Table 21: Service level Benchmark data of Mahabubnagar

S. No.	Proposed Indicator	Bench-mark	Status in		Target In Year 2017-18
			2015-16	2016-17	
1	WATER SUPPLY SERVICES				
1.1	Coverage of water supply connections	100.0%	34	33	65
1.2	Per capita supply of water	135 lpcd	88	71	90
1.3	Extent of metering of water connections	100.0%	0	0	10
1.4	Extent of non-revenue water (NRW)	20.0%	43	30	26
1.5	Continuity of water supply	24 hours	0.43	0.5	1.0
1.6	Efficiency in redressal of customer complaints	80.0%	44	70	75
1.7	Quality of water supplied	100.0%	99	98	99
1.8	Cost recovery in water supply services	100.0%	13	12	20
1.9	Efficiency in collection of water supply-related charges	90.0%	35	76	80
2	Wastewater MANAGEMENT (SEWERAGE AND SANITATION)				
2.1	Coverage of toilets	100.0%	72	81	95
2.2	Coverage of sewerage network services	100.0%	NA	0	0
2.3	Collection efficiency of sewerage network	100.0%	NA	NA	0
2.4	Adequacy of sewerage treatment capacity	100.0%	NA	NA	0

S. No.	Proposed Indicator	Bench- mark	Status in		Target In Year 2017-18
			2015-16	2016-17	
2.5	Quality of sewerage treatment	100.0%	NA	NA	0
2.6	Extent of reuse and recycling of sewerage	20.0%	NA	NA	0
2.7	Extent of cost recovery insewerage management	100.0%	NA	NA	0
2.8	Efficiency in redressal of customer complaints	80.0%	87	75	95
2.9	Efficiency in collection of sewerage charges	90.0%	NA	NA	0
3	SOLID WASTE MANAGEMENT				
3.1	House hold level coverage of solid waste management services	100.0%	91	90	100
3.2	Efficiency of collection of municipal solid waste	100.0%	86	85	100
3.3	Extent of segregation of municipal solid waste	100.0%	1	1	15
3.4	Extent of municipal solid waste recovered	80.0%	1	1	5
3.5	Extent of scientific disposal of municipal solid waste	100.0%	NA	NA	0
3.6	Extent of cost recovery in SWM services	100.0%	1	1	1
3.7	Efficiency in redressal of customer complaints	80.0%	86	84	100
3.8	Efficiency in collection of SWM charges	90.0%	0	78	80
4	STORM WATER DRAINAGE				
4.1	Coverage of storm water drainage network	100.0%	64	0	5
4.2	Incidence of water logging/ flooding	0	10	4	2

Source: Mahabubnagar Municipality Service Level Benchmarks at a Glance (SLB): Declaration to 14th Finance Commission

Based on data given in the table, Mahabubnagar Municipality needs to improve its efficiency under various parameters, though there is a progress over a period of time. Further the targets set for the year 2017-18 are too ambitious for certain parameters such as efficiency of solid waste collection, cost recovery, complaint redressal systems and efficiency of collection of SWM charges, given the current performance of the Municipality. etc.

Drinking Water Supply

The two main sources of drinking water supply are namely the Ramanpad & Koilsagar both origin from the Jurala Project on Krishna river, with the capacity to pump 18 and 48 MLD respectively. However the current draws are only 3 MLD and 17 MLD. The water is being treated with rapid sand filter systems. The filtered water is pumped from Water Treatment Plants to the existing 17 Nos of ELSRs/GLSRs with total storage capacity of 12.00 MLD. The water is supplied through 18,448 household service connections (against the total of 56,500 households) and 1340 Public Stand Posts with a pipeline network running into 290 km including 68 commercial connections. A total of 6 MLD is also being supplied through 690 power bore wells through direct connections, 63 Hand Pumps and one municipal tanker and 28 private tankers in un- served and ill served peripheral and slum areas including the merged Gram Panchayats. Thus the total supply is 26 MLD and the per capita supply is only 60 lpcd. The district officials are planning to shut down the Ramanpadu project because of the high maintenance costs and low production and distribution of water. Under Urban Mission Bhagiratha the Municipality has plans to secure 10 MLD. As per the AMRUT city reporting, the Service Level improvement data on the drinking water supply is as shown in the table below

Table 22: Current status of Drinking water Supply as per SLIP

S.No	Indicators	Present status	MOUD Benchmark
1	Coverage of water supply connections	40%	100%
2	Per capita supply of water	75 LPCD	135 LPCD
3	Extent of metering of water connections	0.1%	100%
4	Extent of non-revenue water	51%	20%
5	Quality of water supplied	90%	100%
6	Cost recovery in water supply services	16%	100%
7	Efficiency in collection of water supply related charges	65%	90%

Source: City Sanitation plan / SLIP data of Amrut

Figure 16



2. City Sewerage Systems

At present, there is no sewerage system in place in the town. Earlier UGD estimates were worked out with a tentative cost of Rs. 197 Cr. including 4 STPs totaling 18 MLD capacity and sewer network of 200 km length as per SLIP (Service Level Improvement Plan) for sewerage sector under the AMRUT programme. In fact, sewerage system is not feasible in the town at the present juncture in view of the inadequate water supply in the town at 60 lpcd against the 135 lpcd required for towns with a population of up to 1 million with sewerage system as per CPHEEO Manual on Sewerage. Further, the recent merger of 10 surrounding gram panchayats in the town making the total area of the town as 98.64 sq. km leading to an urban sprawl, needing colossal resources for providing water supply.

Adequacy of water supply vis-à-vis sewerage system

The present per capita supply of about 60 lpcd amounts to only about 33% coverage against the SLB of 100%. Further, the frequency of water supply is once in two days and in some areas it is once in four days also. The duration of supply varies from 30 min to one and half hour per day. Presently, 18,448 HSCs for water supply have been issued against the total households of about 56,500 with 66% gap in coverage of HSCs. There is also a huge gap of 75 lpcd in per capita supply presumably because of the very high Non- Revenue Water (NRW) at 51%. There is a gap of 370.89 km in distribution network to cover the entire town. Metering is almost non-existent, cost recovery of water supply charges is only 16% and collection efficiency of only 65%.

From the above analysis, it is evident that the provision of sewerage system will be technically challenging as self cleansing velocities in sewers are not possible due to the supply of low quantities of water. To make the sewerage system functional and to meet the SLBs when planned and implemented, the required water supply infrastructure should be ready upfront duly complying with its core SLBs like universal coverage, adequate quantity and daily supply.

Thus, the Operation & Maintenance (O&M) of the proposed sewerage system will also be truly daunting in view of the limited financial capacities of the ULB. Hence, the technical, financial and institutional capacities of the ULB to effectively address these issues of concern need to be addressed upfront.

Figure 17



Measures initiated in water supply by the ULB

However, under the ongoing AMRUT programme, the ULB has taken up construction of additional distribution reservoirs of total 7.5 ML capacity, 300 km of distribution network including extension, and rehabilitation of existing damaged and leaking network and metering of water connections which is likely to be completed by 2018-19. Additional 10 MLD of surface water can be sourced from Telangana water grid (Urban Mission Bhagiratha) for which proposals have been submitted by the ULB. Thus the water supply infrastructure essential for making any sewerage scheme functional are likely to be ready only by 2018-19.

Sustainability of water supply and sanitation systems

As discussed above, the inadequate household tap connection coverage, high NRW and low cost recovery are matters of grave concern w.r.t. sustainability of O&M of water supply and service delivery. To ensure sustainability of

investments, O&M and service delivery, it is imperative to make at least the O&M of the Sewerage and Water Supply systems self sustaining. This can be done by making them cost centres, ring fencing the revenues and by fixing the sewerage charges as a percentage of the water tariff (a sewerage cess of 35% of water tariff as in HMWSSB, Hyderabad) with provision for annual increase of about 5% and aim at full cost recovery of O&M expenditure. The Commissioner has categorically stated that the revenue leakages in Property Tax, Vacant Land Tax, Water Tariff etc. should be plugged to augment the revenues and to make the infrastructure being provided sustainable. The reforms funding under AMRUT scheme may be suitably leveraged to augment the revenue by improving the efficiency of assessment, billing and collection.

Figure 18: Open Drains in Mehbubnagar



3. Plans and Programmes for City Development

Mahabubnagar Municipality does not have any large sectoral planning document but there is a Master and Land Use Plan which were prepared nearly 20 years back. Currently the city is selected under AMRUT and the officials started preparation of Detailed Project Reports (DPR) for Water Supply under Service Level Implementation Plan (SLIP), draft DPR for Solid Waste Management under Swachh Bharath Mission (SBM) etc . Under the GIZ supported initiative, the city has produced a fairly comprehensive City Sanitation Plan which was also approved by the Council vide Council Resolution No. 24th may, 2016 vide circular Roc.No.C1/14429/CSP 2016 despite the availability of the Plan and the CSTF as a mechanism for implementation of the CSP, the Municipality falls short of a proper resource base for the implementation of the plan in a systematic manner.

Further Mahabubnagar is one of the eight Municipalities selected under AMRUT program. As part of the AMRUT, detailed projects are proposed to improve the drinking water supply and also to develop the parks. Abstract of the proposal is given below.

Table 23: Proposed activities under Amrut

S. No.	Name of Sub Works	Quantity	Amount In lakhs
1	Construction of 2500 KL Capacity 15mt staging Over Head Balancing Reservoir at Ayyappa Swamy Temple Hillock.	1	301.08
2	Laying of Feeder Main With all accessories including railway crossing from Grid Tapping Point to OHBR at Ayyappa Temple Hillock - 5.20 km length of 900 mm DI-K9 pipe		1,340.21
3	Laying of Feeder Main With all accessories from OHBR to OHSR's in Uncovered/ Extentnded Areas in Municipality - 24.698 km length of 250 - 900 mm DI-K9 & DI-K7 - providing 100KL, 200KL CW sumps and pump house at Boyapally, Chinnadarapally and Verannapet OHSRs including bulk flow meters and railway crossings		1,897.92
4	Providing Distribution Network with DI K7 & HDPE pipes across Uncovered/Extended Areas in Municipality (370.89 km length of HDPE & DI-K7 Pipes)		7,210.28
5	Construction of Over Head Service Reservoirs in Uncovered /Extended aresa - 13 Nos across the Town.	13	1,587.86
	500 KL GLSR at Chinnadarapally, Sanjay Nagar		
	500 KL 15mt Staging OHSR at Bandameedipally, Edira and Bhrahmanwadi		
	500 KL 20mt Staging OHSR at Boyapally		
	600 KL 15mt Staging OHSR at Veerannapet.		
	800 KL 15mt Staging OHSR at Marloo.		
	1000 KL 15mt Staging OHSR at Yenugonda, Municipal Office and Palasabgutta		
	1200 KL 20mt Staging OHSR at Christianpally and Doddavanipally		
6	Providing House Service Service Connections to 40,000 House Holds across the town with meters	40,000	1,387.95

S. No.	Name of Sub Works	Quantity	Amount In lakhs
7	Replacement of Damaged airvalves, Scour Valves, Sluice Valves & Interconnection Arrangements of Existing BWSC Gravity Main	1	87.98
8	Construction approach Road to the Hillock	1	98.12
9	Providing DG Set and Tranformers and other Electrical Arrangements for Pumping Stations	1	23.43
10	Construction of Watchman Quarters	14	162.26
	Sub Total		1,4097.00
11	Add Vat @ 5%		704.85
12	Add Labourcess @ 1%		140.97
13	Add NAC @ 0.1%		14.10
14	Add for Seignorage Charges		28.19
15	Provision towards Taxes @ 5%		704.85
	Sub Total		15,690.00
15	Provision for Physical contingencies		281.94
16	Add Consultancy for Fees for Preparation of Detailed project Report to M/s NSS Associates		101.99
17	Provision Payble to Other Departments like Railway/National Highway/R&B Crossings		119.00
18	Provision towards land acquisition		71.00
19	Provision towards unforeseen items		70.00
	Sub Total: Total Provisions		643.93
	Grand Total:		16,334.00

Source: SLIP under AMRUT, Mahabubnagar

4. Storm Water Drains

The topography and drainage pattern

The Mahbubnagar district falls under the Krishna River Basin with the Average Annual Rainfall (AAV) being 608.8 mm and the total rainfall in 2016 was 665.6 mm. The Mahbubnagar town is in an arid region with its average elevation being 498 m above MSL. Although its AAV is 882 mm, the maximum annual rainfall since 2009 has been only 635.51 mm during the year 2016. The town is surrounded by gorgeous hillocks Tirumalavanigutta on the west, a hillock on the north west near Chinnadharpalli shivar, smaller ones on the far south. The major hillocks on the west and north west are the source from which the major water bodies in the town emerge. The major drainage patterns are from north west to south east, and from north to south. The elevation of the town ranges from about 550 m to 480 m above MSL, indicating an abundant fall across the town, albeit with highly undulating terrain. The total drainage of the town outfalls into 4 major water bodies of Pedda cheruvu, (also called Mahbubnagar Old lake in the centre of the town), Palakonda cheruvu (also called Palamuru Chinna cheruvu, on the eastern outskirts), Immasabkunta cheruvu (also called Nalla cheruvu on the southern outskirts) and Yerrakunta (also called Nallakuntalake on the west). The details can be seen from the map below.

Map 5: Stormwater Drains in Mehbubnagar



Source: Mahabubnagar Municipality. Town planning Section 2017

The severity of flooding in extreme weather events

In spite of the ample gradient available across the town, due to the highly undulating terrain and heavy encroachments on the drainage path particularly of the outfall (primary) drains and the secondary (collector) drains, and possibly due to the impacts of climate change, the town suffered a disaster on

May 10, 2016 when it experienced a total rainfall of 122 mm in just 100 minutes leading to heavy flooding and inundation in several areas of the city like Ward no.27, Bhagiratha colony and slum areas like Kidwai peta, Veeranna peta, Patha palamuru and Ramaiah bowli paralyzing the life for at least one hour.

Inadequate storm water drainage networks

Against a total road network length of 590 km, the total length of pucca drains covered is 207 km thus leaving a gap of about 383 km. Lack of adequate storm water drainage network is leading to sullage and storm water flowing on the roads and leading to inadequate disposal of storm water, stagnation and flooding in vulnerable areas and mixing of storm water, sullage and sewerage. Extensive paving and vast built up areas are also leading to excessive storm water runoff leading to flooding. It is also observed that in the absence of silt and garbage traps in drains, and presence of continuous RCC slabs on culverts and drains in front of some residential and commercial complexes, the silt and garbage are getting deposited and clog the drainages and lead to stagnation and inundation during rainy season, necessitating cleaning at least on alternate days which the ULB is unable to perform due to limited staff and financial constraints. Further entry of solid waste like napkins, plastic covers, chappals, old clothes etc. is leading to unsatisfactory clearance of these solids with the implements available with the sanitary workers and they are forced to use their hands taking extra time in cleaning the drains. In most of the wards, the drains are being rehabilitated with rectangular section which is not enabling effective cleaning with the available implements with the sanitation workers, which needs attention.

Challenges in Storm water management

In Mahabubnagar town 14 kms length of storm water drain network has been laid before the city expansion which serves only partially to the current cities demands/ needs. The design of the drains can be seen from the photobelow, which has a provision for a small drain in the middle surrounded by a wider drain which can accommodate higher velocity flows during the rainy seasons. The storm water drains were connected upto the Pedda cheruvu where the entire rain water of the town used to drain into the tank. However these drains are now silted causing stagnation. Other challenges include removal of building debris from the nalas, connecting the disconnected drains, repair of irregular drains and culverts with kuccha beds and side linings, constricted drain/ culvert sections, deposition of solid waste and obstructions, weed growth, control of faecal matter flowing into the drains, avoiding solid waste disposal into the drains especially the plastics, napkins, old clothes and slippers etc. Some of these are shown in the pictures below.

Figure 19: Storm water and sewerage line



Figure 20: Storm water drain filled with silt



The smaller kucha and pucca drains runs into 175 and 180 km respectively along both the sides of the roads. As per the discussions with the staff members the older nalas (picture below) were in V shape with stone slabs which are very easy to clean. But as part of the modernization these drains are being replaced by flatter nalas with minimum slope causing obstruction to free flow. The drain cleaners and sanitation staff members were not happy with these new designs as the flat surfaces are more prone to stagnation with small obstructions and there is no free flow of water in the drains.

Figure 21: Old Drains with V shaped slope with shabad stone



Figure 22: New drains filled with silt and plastics



Figure 23: Indiscriminate closure of drains by the households making it difficult to clean



Figure 24: Disconnected drains resulting in stagnation



Water bodies

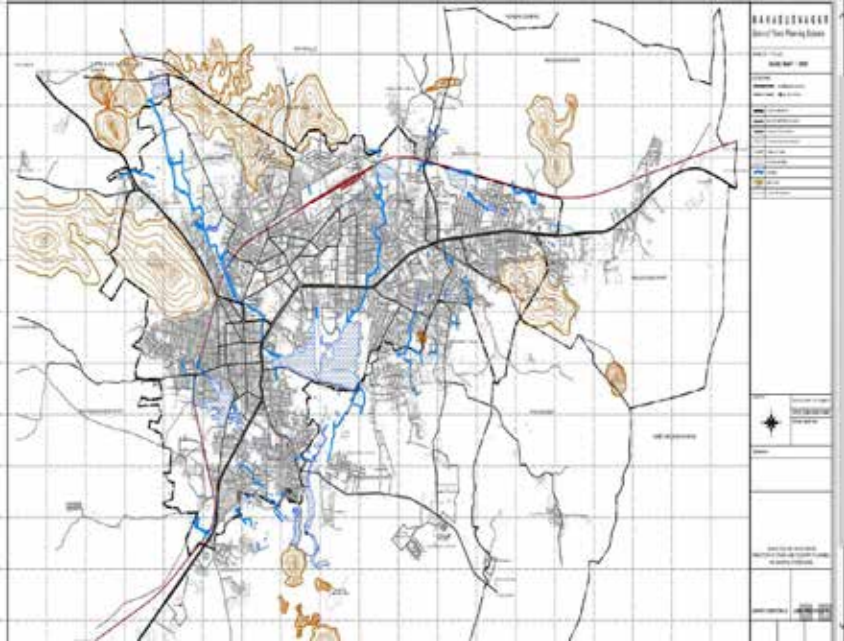
The town is blessed with abundant water sources like the Kotha cheruvu on the north west, Pedda cheruvu (Large tank) at the centre, the Yerrakunta cheruvu in the west (Nallakunta lake), two other smaller tanks on the north, Purana Talab on the north east, Nalla cheruvu in the south west and Palamur chinna cheruvu (Palakonda cheruvu) on the far east. In fact, there were minor chain of tanks earlier, which along with their surplus courses seem to have been encroached upon in course of rapid expansion of the town. The villages of Tatikonda, Atmapuram in the catchment area of Pedda cheruvu are getting affected not only with the foul smell but the contamination of ground water too. The desludging trucks just dump the septage into the main drains/ nalas of the Municipality or at the solid waste dump yard. There are no policies or guidelines laid down by the Municipality on the disposal of sludge and septage management. The map below shows the drainage pattern of the town with the three storm water drains discharging the storm drainage mixed with sewerage and sullage into the Peddacheruvu tank.

Contamination of water bodies

It is very disheartening to notice the heavy faecal pollution of Pedda cheruvu indicated by the wild growth of water hyacinth. The Municipal Commissioner has a proposal to divert the the three outfalls of the storm water drains into a

STP and the treated wastewater can then be let into Pedda cheruvu to maintain the pristine purity of the tank water. The bund beautification activities are already ongoing and cleaning of this cheruvu might make the bund serve as a recreation and entertainment hub of the town.

Map 6: Location of the water bodies on the Mahabubnagar base Map



The impact of the present continued discharge of the drainage mixed with sewerage and sullage on the DO (Dissolved Oxygen) levels and nutrient levels in Pedda cheruvu need to be scientifically studied, to evolve an eco-friendly solution to keep the aquatic organisms and the lake alive for the benefit of the citizens.

The Pedda cheruvu urgently needs cleaning up, and a healthy and hygienic environment can only be created by i) removing the weed growth in the tank, ii) preventing black water (sewerage, septage and sullage) from entering the lake to prevent faecal contamination and nutrient availability in the tank, duly diverting the same to downstream of the lake and treating the same through FSTM facilities, iii) divert only the excess runoff during floods into tanks like Pedda cheruvu and iv) cleaning up the lake through processes such as bio-remediation and phyto-remediation.

Figure 25: Pedda cheruvu with water hyasynth



Figure 26: Pedda cheruvu with solid and untreated liquid waste



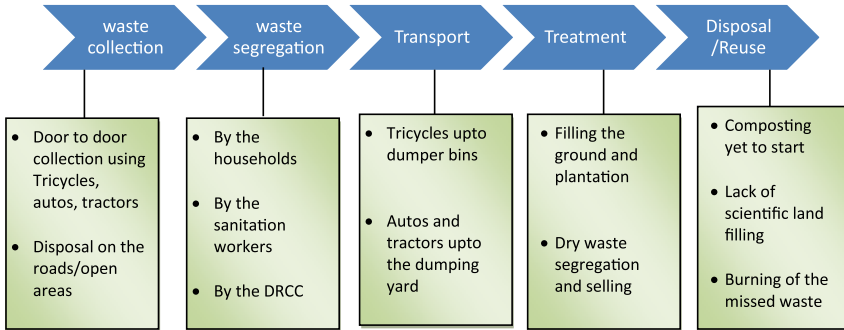
As can be seen at the site and on the google map, the Pedda cheruvu and the Yerrakunta are heavily encroached in their foreshore as well as in the outfall drains leading into them and their surplus escapes, which lead to flooding both on their upstream and on their downstream sides. This signifies the impact of urbanization and inadequate urban planning and regulation.

Regarding the Nalla cheruvu (Imamsab kunta on south) and Palakonda cheruvu (Palamuru chinna cheruvu on eastern outskirts), the pressures of urbanization are visible with encroachments and polluting the tanks with plastics and other impurities. All these tanks require an immediate action for purification and protection from encroachments.

5. Solid Waste Management

Mahabubnagar town has partial systems of solid waste management in terms of source segregation, dry waste resource centres and vermi compost units and the details are explained using a flow diagram of different steps as below.

Figure 27: Solid Waste Value Chain



Waste Collection

As per the instructions and guidelines issued by the Commissioner & Director of Municipal Administration, A.P. Hyderabad , Municipality started waste collection in Padmavathi Colony, Venkateshwara Colony, Rajendra Nagar, Ram Nagar, Brahaman Wadi by providing plastic dustbins to house owners in 1st Phase. During this phase 96,000 plastic dustbins have been supplied to the house owners. for the collection of garbage in the town and the plans are on to distribute to the entire town for which the bins have already been procured.

Table 24: Particulars of wastegeneration–2016

#	Particular	Details	%
1	Domestic source waste generated (in tons)	88.76	83.22%
2	Commercial source waste generated (in tons)	12.40	11.62%
3	Markets	1.25	1.17%
4	Hospital Waste Generated (non-hazardous)	1.07	1.00%
5	Street Sweeping	0.20	0.19%
6	Drain Silt	2.98	2.80%
7	Construction & Demolition Waste	Not Available	
8	Total Waste Generated Per Day (in tons)	106.66	100%

Source: City sanitation Plan, Mahabubnagar, 2016

As per the primary survey the waste generated is about 88.76 MTs but Municipality reported it as 75 MTs. The waste is collected from door to door by 300 plus sanitation workers from regular as well as outsourced employees. Mahabubnagar Municipality has 43627 Households and for sanitation purpose the town is divided into six zones. House to house collection of garbage is done with the support of 44 Tri-cycles and 8 Auto Trolleys covering 25,400 houses and the remaining houses are covered at the door level using 10 tractors. Garbage

collection points have been arranged for collection of garbage from shop complexes, market yards and other business centres which are not covered in door to door collection. 80% of the sanitation is privatized through DWCUA groups of SJSRY and private contractors.

Waste Segregation

There is no system of dry and wet waste segregation at the source i.e household level. Though the Municipality supplied two bins for segregating the wet and dry waste the households just mix all the waste and dispose into the plastic covers or bins. The household retain the waste which can be sold to the scrap vendors i.e the news papers, plastic bottles, iron pieces etc. The sanitation workers or waste collectors will undertake the second level of segregation and sell the sorted dry recyclable waste at the DRCC. The remaining mixed waste is disposed off at the dumping yard.

Primary collection: The waste collected from the households using the tricycles is deposited in the dumper bins placed in the corner of every street. The sanitation workers separate the useful dry waste such as plastics, iron scrap, news papers, pet bottles etc before they dump the remaining mixed waste.. There are 20 autos which also collect waste at the household level but they directly dispose at the dumping yard.

Secondary Collection: Tractors and autos are used for secondary collection and the drivers and workers segregate the useful waste and sell at the DRCC and the remaining mixed waste is dumped at the dumping yard. The tractors are used for secondary collection which includes transportation of dumpers from the streets to the dumping yard. The same tractors are also used for silt removal from side drains hence the mornings are dedicated for solid waste removal and the afternoons are for silt lifting. Though there is a separate agency that takes the hospital hazardous waste, many clinics and small hospitals dispose the hazardous waste into the dumper bins making the mixed waste hazardous.

Dry Resource Collection Centre (DRCC): started as a group initiative but now is being run as an individual enterprise by one of the SHG member by name Vijayalaxmi. The dry waste is collected in mini vans from 4 intermediary points and deposited at the DRCC. The collection and transportation is enabled at the transfer points by DRCC workers. At the DRCC the waste is segregated into nearly 12 different categories (given in table below). According to the DRCC owner, there have been attempts by the sanitation workers to sell the dry waste to private scrap vendors, but SHG member ensures that this is minimized by making random surprise checks to the collection and transfer points with the support from Municipal Staff. The DRCC initially was funded by ITC and located

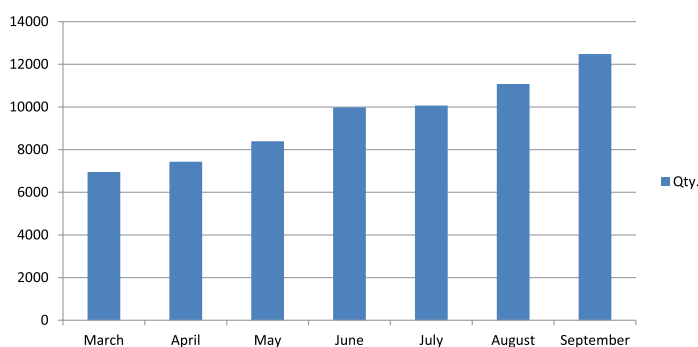
on private land. In the recent past there has been pressure from the land owner to vacate the area. The ITC now does not own the DRCC.

Table 25: Buying and selling rates of dry waste by DRCC

#	Item	Price Rate/Kg.	
		Buying	Selling
1	Unsorted Mixed Dry Waste (Paper, Plastic, LVP, Metal)	2.00	Segregates and sells
2	Sorted Mixed Paper Waste(Paper & Board)	4.00	7.00
3	Pet Bottles	18.00	22.00
4	Milk Pouches	6.00	12.00
5	Hard Plastic	10.00	14.00
6	Kraft/Carton Boxes	6.00	9.00
7	Old News Papers (ONP)	4.00	7.00
8	Old Note Books / Text Books	6.00	7.00
9	Metal (Iron)	8.00	12.00
10	Slippers	1.00	2.00
11	HDPE Bags (Urea bags)	2.00	4.00
12	Bottles (per piece)	1.00	1.50
13	Beer Bottles (per piece)	1.00	2.00

Source: Documentation at DRCC

Figure 28: Quantity of waste received at the DRCC from March 2017



Source: Documentation at DRCC

It can be seen from the graph, the DRCC is slowly becoming viable business and the waste collected at the decentralized unit is brought to the DRCC through auto rickshaws. SHG members are employed to segregate the waste and the

SHG member who is running the unit is making an average net profit of Rs. 30,000 to 35,000 per month on this enterprise. The market fluctuations do affect the business and the SHG member is looking for more stable and profitable markets.

Transportation

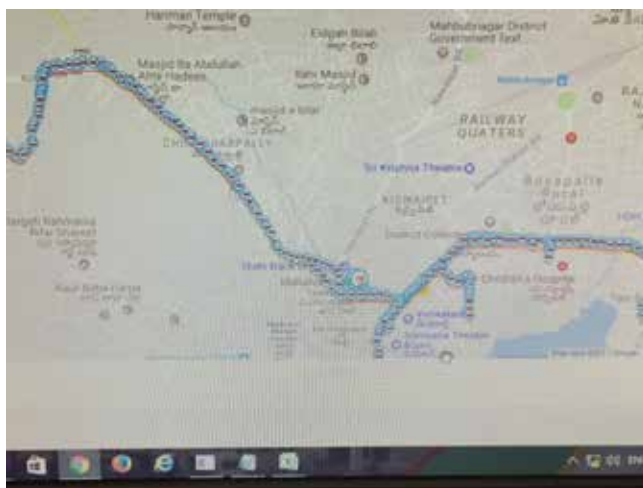
After segregation of the dry waste the mixed waste is transported to the dumping yard. There are 20 dumper bins at prominent and densely populated areas and they are being lifted on alternate days using the tractors and dumper placers. The table below gives the details of the vehicles used in waste collection and transportation as reported by the Municipality.

Table 26: Number of transportation vehicles for solid waste transportation

Number of Dumper Bins	Number of Tricycles	Tractors	Autos	Dumper Placers	Covered with tarpaulin	Total
49	44	19	8	2	No	29

Majority of these vehicles are in use for a long time and thus require frequent repairs and maintenance resulting in high cost to the Municipality. Because of the frequent breakdown and low efficiency of vehicles collection is getting adversely affected causing lot of public inconvenience and decreasing levels of public satisfaction on waste management services of the Municipality. However to improve efficiency of the system the vehicle tracking system is enabled as shown in picture.

Map 7: Solid waste transportation vehicle tracking system



Treatment

The Municipality does not have any processing facility for the solid waste management. Segregation of wet, dry and hazardous waste is not in practice which makes it very challenging to adopt any environmentally safe and cost effective means of waste treatment. etc. it is observed that the landfill site has a wide variety of waste comprising all the types mentioned. The dumping yard has been created with 20 acres of hilly area and the fringes of the same is claimed to be private land. There is no scientific procedure employed for the land filling which puts the entire groundwater within and surrounding area to great risk of getting contaminated by leachate. Further there is frequent self firing of the dumped waste due to the intrinsic heat generated which accounts for large scale environmental contamination.

The menace of plastic waste: Plastic waste has been observed everywhere to be a major hurdle to effective solid waste management, leading to clogging of drains, reduction of drainage capacities, flooding of vulnerable areas and even pollution of water sources. Use of plastics below 50 microns thick needs to be urgently banned totally as they are becoming a big obstacle to effective solid waste and liquid waste management. There is a special circular dated 8th December 2016 issued under the directions of the Honourable Minister for MA & UD instructing all the Municipal Commissioners in the state to ban usage of low value plastics with effect from 1st January 2017. This needs regulation and enforcement at both State level and ULB level. Behavioral change in citizens also needs to be inculcated through IEC campaigns, and regulation both at the ULB level and at the State level to ensure reuse of plastic bags etc. until the end of their useful life.

Reuse/Recycle

Grants were released by the Government under 12th Finance Commission, for development of compost yard and the Municipality has procured a pulverizing machine also for making the mixed waste into smaller pieces. The vermi-compost shed has been constructed but the unit is not yet functional and the water connection is still awaited from the water supply department. The technology used in the construction of the storage bins to be cross-checked as there is no scope for the draining of excess water from the storage bins. The front area of the dumpingyard is being planted with forest species by filling the area with the composted mixed waste which formed over the years and also by fortifying it with the top soil. The saplings have grown to 3 to 4 ft height and are giving a good ambience to the dumping yard as shown in the picture below.

Figure 29: Dumping yard with fire and smoke



Figure 30: Plantation at the Dumping yard in the filled in area



Staffing in Solid waste management

Currently there are 142 regular staff and 288 outsourced staff to undertake the solid waste management operations. However the staff is not sufficient to complete the operations effectively.

Though there are sanctioned positions they have not been filled up and the details of gaps in vacancy and outsourced staff are given below.

Table 27: Requirement vs availability of staff

S. No.	Sanitary Wing Category of Post	Regular			Out-sourced
		Total no of sanctioned posts	Posts filled up	Vacant Posts	
1	Sanitary Supervisor	1	0	1	
2	Sanitary Inspectors	3	1	2	
3	Health Assistant	1	1	0	
4	Horticulture Officer	1	0	1	
5	Municipal Health Officer	1	0	1	
6	Drivers	5	2	3	
7	Cleaners	2	0	2	
8	Sanitary Jawans	17	14	3	
9	P.H.Workers	169	124	45	288
	Sanitary wing	200	142	58	288

Source: Municipal Corporation, Mahabubnagar

Figure 31: Interview with Solid Waste Management Stakeholder



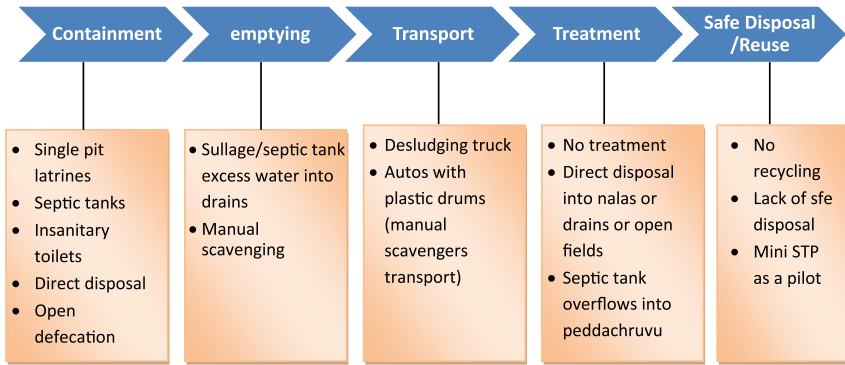
Given the open drainage system, the sanitation workers are required for both solid and liquid waste management operations. The Municipality has severe shortage of staff and as of now the drain cleaning and waste collection is carried out only on alternate days. But for effective functioning of the system the staff (both regular and out sourced) needs to be increased. As the Municipality is not charging for waste collection and sewerage services, maintaining the system is

becoming difficult and alternate revenues need to be generated by selling the compost, by levying charges for solid and liquid waste management.

6. Sanitation Value Chain

In Mahabubnagar the septage management and the faecal sludge management has been very poor and there are huge gaps in the system for safe and sustainable disposal of faecal sludge management.

Figure 32: Sanitation Value Chain



Containment

Individual Household Latrines: Out of the 56,500 households in the town, about 80% (45,072) have individual toilets. All the 41 wards comprising the present 56,500 households in the city have been declared ODF by providing a further 8,250 IHHLs either single pit or with twin pits, with or without bath rooms and in many cases with a septic tank. About 2900 insanitary toilets have been converted into sanitary toilets and 5,350 new toilets have been constructed. Still there are some households without toilets or where toilets are under construction. Verification by QCI team is awaited.

Deviations in Construction of IHHLs from Standard Technical Designs: The twin (leach) pit pour flush toilets promoted at individual households are built with varying deviations from the standard design and in terms of functionality adequate technical or social guidance has not been provided to the households. Some of them are built only with single pit, some with twin pits but bottom of the pit is concreted, many with no distribution box (Y junction), some with two pits provided side by side with no gap in between and the overflow from the pits is diverted into open drains. The faeces mixed with water is let into the toilet pit, and once the pit is full, the excreta gets settled at the bottom of the pit and the supernatant is diverted into open drains. In case of households where

there is a single pit, the residents have provided double the depth of the pit, indicating lack of proper understanding of the purpose of the twin pit system. The two pits are provided side by side almost touching each other, and are interconnected with no separation panel, which leads to contamination of the other pit also, and non-digestion of the sewerage in the first pit due to moisture infiltration from the 2nd pit. The bottom lining results in inadequate natural filtration and percolation of the clarified sewerage into the surrounding soil and not serving the purpose of twin pit pour flush toilet and do not serve either as a twin pit pour flush toilet or as a septic tank as they were not designed accordingly despite bottom sealing. Thus the effluent from the twin pit toilet is discharged to the storm water drains with little treatment, which is environmentally unfriendly.

Public and Community toilets: There are a total of 6 public toilets in the city for the use of floating population and for those who still do not have the benefit of individual toilets. Further, in an effort to put an end to open defecation, the Municipality has identified hotspots (areas used for open defecation, with shrubbery, etc.) and has taken up the exercise of clearing all of them while keeping a vigil to prevent violations. For households that cannot accommodate individual household level toilets a total of 3 Community toilets have been planned but construction has not been initiated yet. There are six public toilets with pay and use practice which are managed by Sulabh International. The details of the community and public toilets along with the number of seats given in the table below.

Table 28: Details of functional (in-use) community / public toilets

S. No.	Location of Toilet Block	Tick appropriate one				No. of Functional Toilet seats (both M&W seats)	Operated and Maintenance by		
		Type of toilet	Ward No.	Pay & use toilet	Ward No.		ULB	PPP	Community
1	Market Area	Public Toilet	25	√	25	16	--		--
2	TD Gutta Bus Stop	Public Toilet	25	√	25	12	--		--
3	Ambedkar Chowrastha	Public Toilet	37	√	30	3	--		--
4	Station Road Near R&B Guest House	Public Toilet	37	√	37	12	--		---

S. No.	Location of Toilet Block	Tick appropriate one				No. of Functional Toilet seats (both M&W seats)	Operated and Maintenance by		
		Type of toilet	Ward No.	Pay & use toilet	Ward No.		ULB	PPP	Community
5	Near Municipal Office	Public Toilet	30	√	30	7	--	--	--
6	New Bus Stand Premises	Public Toilet	15	√	15	8	--	--	--
7	Old Palamoor	Community Toilets	13	--	13	12	√	--	√
8	Veerannapet	Community Toilets	20	--	20	12	√	--	√
9	Pathathota	Community Toilets	30	--	30	6	√	--	√
10	Vepurigeri	Community Toilets	24	--	24	6	√	--	√
11	Ambedkar Nagar	Community Toilets	15	--	15	4	√	--	√
12	Kommugeri	Community Toilets	15	--	15	6	√	--	√

Source: Mahabubnagar Municipal Corporation, 2017

Emptying and Septage management

Presently, there is no institutionalized septage management system in the town. The septage from the septic tanks/cess pools, the faecal waste from public toilets and community toilets is being let into the drains or being collected informally by two private desludging vehicles (vacuum trucks). The ULB does not have any desludging machine believing that their O&M will be a burden. Hence, cleaning of the septic tanks is being informally carried out by 2 private operators belonging to weaker sections (methara community) with their family members also constituting their team, as a traditional occupation.

Manual Scavenging

Presently about 80% (accurate data not available) of the households with toilets are connected to septic tanks. There are about 15-20 families of "Methara" community who live in Mekalabanda slum involved in scavenging. Their main livelihood activity is pig rearing apart from cleaning of the septic tanks. The households approach these community members and the rate of cleaning is fixed after visiting the site based on the size of the septic tank. Cleaning

operations are undertaken during the night times and workers said that they usually consume liquor to undertake this operation. While emptying they pour water or Kerosene to dilute the faecal sludge and mix it up with a large stick, the slurry is emptied with buckets into the plastic drums.

Currently the people involved in this profession do not carry or wear any personal safety equipment like apron, gloves or gum boots, but work with bare minimum clothes and use minimal light as the households and workers both want to complete this operation in the dark. The women are generally not involved in these operations. However it is sad to know that the younger male children are being involved. Surprisingly even the younger generation of the Methara community said that they would like to continue the same profession. The sanitation business is growing day by day as the households have a notion that manual cleaning is better over machines. The ULBs and the scavenging families are aware of the Prohibition of Manual Scavenging Act but concrete action plan for its implementation is awaited.

Transportation

The septage collected in the drums or tankers is being transported using the auto trolley or tractor depending on the size of the septic tank and this is being dumped at town outskirts, open nalas near Pedda cheruvu, dump yards or low lying areas unnoticed by municipal officials or in agricultural fields.

Sanitation as a Business Opportunity

Absence of sewerage system and safe septage management throws a potential opportunity of business for the families who are involved in scavenging operations. Currently there is only one honey sucker or desludging truck in the entire town which was also bought in with permission from the “Methara” community by paying about Rs. 2,00,000 as a goodwill to operate. The truck owner bought a second hand vehicle (DCM model) for Rs. 8,00,000 modifying it as the desludging tanker. Each desludging team comprises one driver and two helpers and they make about 15 trips per month on an average. The desludging charges range from Rs. 1,500 to Rs. 3,000 per trip depending on the size of septic tank and distance to the disposal site. The O&M charges are about 50% of the total revenues, leaving them a net profit ranging from Rs. 30,000 to Rs. 45,000 per month per one desludging vehicle. The truck owners are following new marketing strategies like advertising the mobile numbers on the street walls and leaving the pamphlets at the shops in each street etc. They report that the revenues vary from season to season. There are some conflicts between the truck owner and the manual scavenging workers. At present, the desludging vehicle operators (owners) are neither organized, nor could be effectively regulated by the ULB in the absence of adoption of septage management guidelines and regulations by the Town Council.

These families can be rehabilitated by providing sludge cleaning machines and trucks with the financial assistance from Banks with a collateral agreement from Municipality. However they also need to be given trainings on use of safety equipment, safe disposal of sludge and how to avoid human contact with faecal matter etc. To promote this as a business they also need to provide repair and maintenance services as there are very few mechanics involved in this type of vehicles. Further they need to thoroughly wash the vehicle before taking to the maintenance shed. At present, the desludging vehicle operators (owners) are neither organized, nor could be effectively regulated by the ULB in the absence of adoption of septage management guidelines and regulations by the Town Council.

Need for septage management policy, guidelines and regulations

In view of the lack of any approved guidelines and institutional mechanism for faecal sludge and septage management, the sewerage from the toilets from households without septic tanks, the effluent from households with septic tanks and the sullage from residential and commercial establishments is finding its way to the storm water drains thus mixing with the storm water, and ultimately draining into water bodies like Pedda cheruvu.

Figure 33: Household toilet outlet into the sewer drain



Treatment

There are no STPs in Mahabubnagar town. The grey and black water is just let into the drains which directly drains into Peddacheruvu without any treatment. However with the initiation of the District Collector, a mini STP using Dwatts model has been established and the details are given below.

Mini STP – An Eco-friendly initiative

Although a sewerage system is not in place in the ULB, it is heartening to visit a 10 KLD STP at Lakshmi nagar costing Rs.10 lakhs so as to treat the sewerage from about 50 households, on a pilot basis, has been constructed based on Constructed Wetlands (SFCW - Sub-surface Flow Constructed Wetlands) technology (a DEWATS i.e., DEcentralized WASTewater Treatment System). Initially, the influent is pumped from a sump into the Baffled Holding Tank through a single HP pump which is the only energy consuming device in the systems, followed by Constructed Wetlands, adding microbial inoculum in the influent stream for bio-remediating the sewerage. Three types of plantation - some tall, some medium and some short are planted to further biodegrade the sewerage and remove the nutrients like Nitrogen from the sewerage. The effluent (treated sewerage) is stored in a collection tank and is being used in parks, for horticulture and agriculture. The system has been installed by Blue Drop Enviro Systems and it is still under observation. This was taken up at the initiative of the District Collector, Mahbubnagar District and is working well. The influent and effluent samples have been sent for testing in an environmental lab and the reports are awaited to assess the performance of the DEWATS unit. The Constructed Wetlands can be suitably designed and sized to comply with the latest CPCB Effluent Discharge Standards for discharge to water bodies.

Figure 34: Sub-surface Flow Constructed Wetlands Treatment process

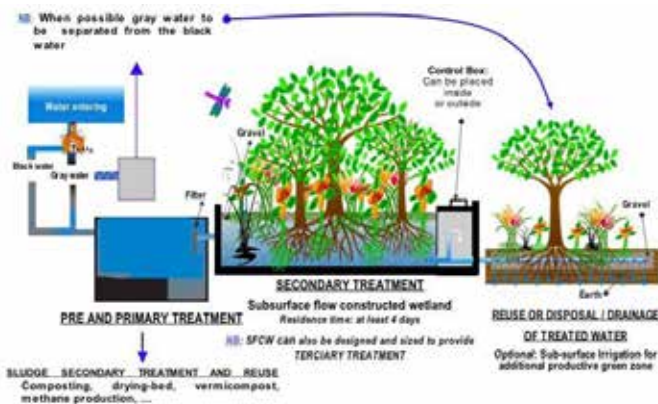


Figure 35: Different plantations at Mini STP at Laxminagar



More and more such DEWATS technology systems need be established in this town to ensure safe and sustainable sanitation. The Dy. Executive Engineer also opined that these environment friendly technologies should be adopted more and more connecting the new areas based on topography procuring the necessary land in such areas.

Drain cleaning and maintenance

In each ward there are three members allotted for cleaning of the drains who are supervised by 17 jawans in 41 wards. The drains are cleaned on alternate days and the silt is removed and kept to the sides of the roads. The tractors come and lift the silt which is then disposed at the dumping yard. The plastics and other useful waste is collected and sold at the DRCC and the remaining waste is dumped along with the silt. The drain workers complain of smell in the areas where the insanitary toilets are directly let into the open drains. The houses where the drains are covered with cement slabs or stones, workers complained of blockages due to stagnation of plastic covers, clothes, napkins and pet bottles as they cannot clean the portion of the closed drains. Though safety equipment is provided to the cleaners, they are not using them with the complaints that “masks make breathing difficult”, “gum boots are heavy and loose making it difficult to walk” “gloves are loose and getting grip is difficult” etc.

Recycle/resue of wastewater

As of now there is no recycle and reuse mechanism in Mahabubnagar town. But there is potential for recycling of wash water from the Water Treatment Plants, and also the grey water from households by providing the required treatment for non-potable uses like agriculture or horticulture.

Water sample Analysis

I. Raw Water Sources results and analysis:

A. Microbiological	B. Physico Chemical
<p>Water samples from bore wells found to be highly contaminated with microbiological sources and the count of Total Coliform varies from MPN 75 to as high as >1609. Faecal coliform is also present in all the above samples. The water sources are located downstream of the dumping yard and this clearly indicates that the seepage/leachate from the dumping yard is contaminating the ground water in the locality. Drinking water samples must be tested negative for microbiological quality or the count should be Zero as per the standards but the samples assessed are microbiologically contaminated, with MPN of 15/100mL.</p>	<p>Fluoride: amples have elevated concentration of Fluoride ranging from 1.76 to 2.06 mg/L which is above permissible limits</p> <p>Hardness: samples are found to have hardness levels above permissible limits</p> <p>TDS: Total dissolved solids are more than 2 times higher than maximum permissible limits</p>

II. Piped Water Supply Samples:

Microbiological	Physico Chemical
<p>Water samples collected prior to treatment at filter beds shows high contamination with harmful coliform bacteria, Total coliform count in both the samples is >1609 MPN/100mL and Faecal coliform & E. Coliform are present.</p> <p>Water sample collected from treated water reservoir contains sufficient concentration of Residual Chlorine (2.0 mg/L) and the bacterial is nil, therefore the water is safe and ready for distribution.</p> <p>Although the sample collected at reservoir is safe for consumption, the samples collected from the 'public supply pump' and at household level are found to be contaminated with harmful faecal and E.Coli bacteria. This may be because of the leakages/damages in distribution pipelines between the treated water reservoir/OHSR and the end user. Criss-cross of drinking water pipelines and sewerage is also possible reason behind the contamination.</p>	<p>All samples are within the permissible limits for tested parameters.</p>

III. Wastewater Analysis Report

Geeral	COD and BOD
<p>All critical parameters of water quality found to be almost same in inlet, direct and outlet of the pond, which indicates that the pond is totally filled with sewerage and no dilution with fresh water/ surface run off/rain water is taking place. The water in Pedda cheruvu is virtual sewerage which has a BOD of 19 and Nitrite of more than 1 (exact figure not indicated). In addition, the physical and chemical parameters are of grave concern, with the colour on Pt-Co scale of 40, TSS of 297 mg/l against the permissible 100.</p> <p>The water in Outlet of Pedda cheruvu and at Inlet to Pedda cheruvu leaves no solace with the Colour at 45 and Blackish, the BOD at 35 and 56, and TSS at 216 and 306 respectively which indicates highly degenerated sewerage with no scope for survival of aquatic organisms, leave about safety of human beings. Therefore, immediate installation of sewerage treatment plant (STP) is highly recommended to comply with the Standards and to protect the surface water bodies as well as ground water from contamination.</p>	<p>COD & BOD values are found to be drastically reduced from inlet water to direct water and the values increased in outlet water. The possible causes of such grave situation are sewerage mixed with sullage and solid waste, inlet of sewerage direct into the drains and water body, no scope for escape of the sewerage due to heavy encroachments of the surplus escape, deposition of solid waste into the water body, no diversion or treatment of sewerage mixed with sullage away from the water body. However more information is required on availability of any aerators in the pond and more raw sewerage water is mixing with the outlet of pond.</p>

Specific parameters quality of Inlet water comparison with standards (i.e Effluent discharge standards for STPs as per ‘The environment (protection) amendment rules, 2015’ and Standards for Discharge of environmental pollutants into inland surface water as per ‘The environment (protection) rules, 1986’) indicate the following findings.

- Total Suspended Solids are 15 times higher than standards
- Ammonical Nitrogen is as per the standards
- Chemical Oxygen demand is 4 times higher than the standards
- Biological Oxygen Demand is more than 5 times higher

This grave situation of the water quality signifies the imperative need for immediate initiation of Faecal Sludge and Septage Management (FSSM) in the town with FSTPs complemented by DEWATS (Decentralized Wastewater Treatment Systems) technologies to improve municipal and environmental sanitation and health outcomes to the public.

7. Slums - Sanitation and SWM issues

The total number of slums in Mahabubnagar is 41. Out of these, 28 slums are notified and the remaining 13 are non-notified slums. The details of notified and non-notified along with number of households is provided as Annexure 1. The total slum population is 61,631 persons which is about 28.42 percent of total population of the town. The women members of the slums are being formulated into the SHGs which are federated into the Slum Level federations and town level Federations. Currently there are Navabharthi pattana samakya and Pillalamarri samakya and there are 89 SHGs actively functioning with a membership of 29,676 women.

SLWM issues: The slum solid and waste disposal facilities are moderately functioning. Though Mahbubnagar is declared as an ODF town, the open defecation is quite rampant in many places. Field visits to Motinagar slum reveal that both men and women still defecate openly though there are toilets being constructed. The open areas on the hillocks and the railway tracks are used for open defecation. Further the households which converted or constructed the new toilets had their own ways of deviating from the standard twin pit toilet designs such as base of the pits is cemented, non provision of junction boxes , sullage from bathing cubicle is also diverted into pits, the overflow from the pits is directly connected to open drains.

The slums in the centre of the town are being modernized with new houses being constructed utilizing the two bed room scheme. Also the migrant workers who are abroad especially in the Middle East also pumping back lot of money

on the household infrastructure. However it is disheartening to note that even for these renovated houses the toilet outlets are drained into the open nalas. The side drains are mostly kutchra flowing with sullage and septage from the septic tanks and bottom sealed leach pits. The particles of excreta are also seen in the open drains.

Stagnation due to plastics, old clothes, slippers and napkins are common, the silt is deposited in many nalas causing overflows, and storm water drains partially blocked with cemented building debris are common sites observed during the site visits. Maintenance of side drains and ensuring free flow of the same is perceived as exclusive responsibility of drain cleaners of the Municipality, however given less manpower they are cleaning only once in two days. Observations at the toilets and open drains do reveal that the households do care a very little about the safe sanitation practices.

The door to door collection of solid waste is on alternate days and upon observation it was noted that the households do through litter, and other solid waste into the drains across the houses causing the blockages. Some of the poor families from the slums of Mothinagar and pathapalem are involved in waste collection i.e. rag picking. Most of the drain workers and Municipal labor also live in Pathapalem. The poorest of the poor households live in Ambedkarnagar and Ramaiah Bowli and incidentally these two slums also have the threat of inundation in every rainy season. Many men and women from the slums work in Hyderabad and near Hyderabad industrial areas as daily wage workers. Quite a handful also sell fruits, vegetables and other eatables in the local trains which operate between Mahabubnagar and Hyderabad.

The conditions in the non notified slums are comparatively unimproved and most of these slums i.e Christian pally, Bandameedi pally, Chinnadar pally, boya pally, Doddaloni pally, Appana pally and Srinivasa Colony etc which are part of the newly merged Panchayat areas and the infrastructure facilities to these areas still needs to be provided.

Out of these 17,244 HSCs 9,238 HSCs have been issued in slum areas which is about 50% of the total HSCs indicating near equitable access to safe potable water to the vulnerable, considering that the slum population is about 62% of the total population. But the total supply to the slum areas is only 9 MLD constituting only 34% of the total supply.

8. ULB Organisation Structure and Governance

Mahabubnagar was constituted in the year 1952 as a Grade III Municipality by merging three Gam Panchayats, and was later upgraded to Grade III

Table 29: Staff Details of Mahabubnagar Municipality

Sl. No.	Category of Post	Regular			Out Sourcing
		Total no of sanctioned posts	Posts filled up	Vacant Posts	
1	Administrative wing	32	24	8	10
2	Engineering wing	55	47	8	138
3	Town planning	14	5	9	0
4	revenue wing	10	9	1	0
5	Sanitary wing	200	142	58	288
6	Accounts wing	7	4	3	0
7	Birth and Death section	3	2	1	0
		321	233	88	436

Lack of skills and capacities and work pressure are apparently critical issues affecting the performance efficiency of the sanitation wing. The staff felt that they are being involved in various activities apart from the water and sanitation such as bathukamma festival, harithaharam etc. Further they felt that that new programs such as SBM, AMURT and Urban Mission Bhagiratha has added additional workload. The staff capacities and finances are other major constraints expressed for successful program implementation.

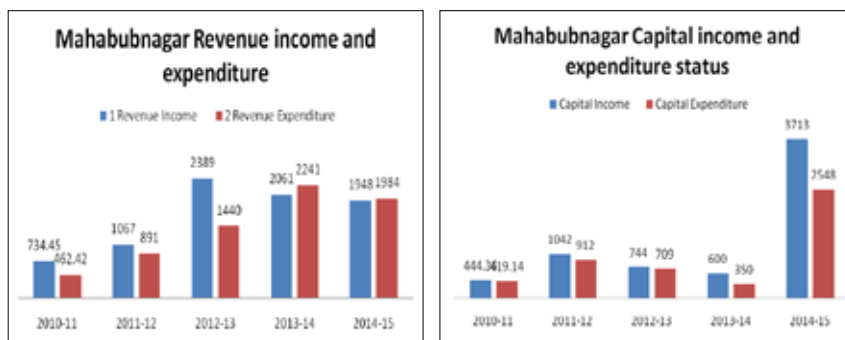
Figure 37: Interview with ULB Officials



9. Financing

Mahabubnagar Municipality has a computerized system of maintaining accounts with the hard copies of the all the registers for the receipts, expenditures and balances. Income from taxes, non-taxes and assigned revenue are the own income sources of Municipality and the estimated income for the year 2016-17 is Rs. 10,788 lakhs. The estimated expenditure for the year 2016-17 is Rs. 10,687 lakhs which shows that there is an almost balance of income and expenditure. However these figures are estimated based on the revised and increased property taxes and rents to the shops in the market places etc, however the financial sustainability can be ensured only if all the cost recoveries are made for delivering services such as water and sanitation which are almost free currently. The revenues generated from advertisements and property tax etc are utilized for operation and maintenance.

Figure 38: ULB Income vs Expenditure



Demand Collection Balance Statement

Table 30: Summary of Demand and Collection

S No	Particulars	2015-16 (in lakhs)			2016-17 (in lakhs)		
		Demand	Collection	% of Collection	Demand	Collection	% of Collection
1	Taxes	1,660	1,462	88.10	1,714.15	1,214.90	70.86
2	Non-Taxes	1,013	6,71	66.28	846.66	781	65.37
3	Assigned Revenue	1,544	1,466	94.90	400	272	68

The demand collection balance sheet reveals that the tax collection is about 70 to 88 percent, however this needs to reach to 100 percent collection rate. The

10. Conclusions and Recommendations

Under this section, the conclusions and recommendations are given for each of the important components of sanitation i.e Household toilets, septage and faecal sludge management, sewerage and storm water management, solid waste management. Other recommendations cover operation maintenance, community involvement and finances.

Conclusions: (IHHLs, community toilets, insanitary toilets and septic tanks)

- Mahabubnagar Municipality has made an extensive effort to make sure that every household has access to toilets. However there is still open defecation in slums and peripheral merged villages. The households who have upgraded their toilets or constructed new toilets have modified the toilet designs deviating from the technical norms and there are still some households with insanitary toilets. Visits to some schools and public toilets reveal that they are functional but facilities like hand washing station, buckets, mugs soap etc are not being provided making it difficult to use.
- The labor and masons involved in construction of the toilets are not aware of the technical details and purpose of various parts of the toilets such as junction box, conditions where vent pipe fixing is necessary, water seal, pit emptying etc. hence compromise on the design. It was observed that in some single pit or double pit toilets, the pits are bottom lined with Cement Concrete, preventing the infiltration of the liquid portion into the surrounding soil, and may result in very little digestion of the sludge. Further some of them are connected to storm water drains resulting in septicity, odour and pathogens leading to environmental pollution and public health hazard.
- The operators and personnel involved in septic tank emptying do not follow any safety measures and do not use the safety equipment exposing themselves to the health hazards of faecal contamination and this requires an immediate attention.

Recommendations: (IHHLs, community toilets, insanitary toilets and septic tanks)

1. The technical staff of Municipality, masons and the key community members need to be trained in proper construction, detailing the purpose and technical utility of each of the component of the toilet. Households also need to be made aware of the use and maintenance of the toilets.
2. All households with toilets, either with single pit or twin pits with bottom lined with Cement Concrete, and toilets with septic tank may be connected to current sewer network till the UGD starts.
3. Municipality must have a special technical team available on payment basis to the households to provide advice and guidance on technical designs,

material availability, construction process etc including suggestions on the septage management.

4. Town Planning wing of the Municipality neither have sufficient man power nor options of technical designs of the toilets to suit to different soil and hydrogeological conditions. Municipality needs to develop the inventory of Septic tanks in the city to be able to estimate the discharge quantities and to send alert messages on the emptying.

Conclusions: (Sewerage and Septage Management)

- Conventional centralized sewerage system may not be appropriate, nor technically and financially viable for the town. This is due to the highly undulating topography of the town, low population density and scattered development in peripheral areas in the east, south east and south west of the town. Further, providing conventional sewerage system at the present juncture may not yield the desired sanitation outcomes in view of the low water supply coverage and quantity, and inadequate technical, financial and social capacities of the ULB and low affordability of the population in peripheral areas.
- There is no need to connect the existing IHHLs to sewerage network when it emerges since the IHHLs are complete in their technology and integrate collection, containment, treatment and disposal in an eco-friendly, sustainable manner.
- The faecal matter from insanitary toilets, from desludging tanks and also from the manual scavenging is ultimately reaching the water bodies which needs remedial measures immediately.

Recommendations: (Sewerage and Septage Management)

1. The ULB is advised to get the faecal sludge and septage management policy, guidelines and regulations approved by the Council and implement the same through a suitable institutional mechanism for making the faecal sludge and septage properly collected, transported, treated and disposed in an environmental friendly manner. The national guidelines and framework are available and they have to be disseminated to the Municipality adapting to the city context.
2. The mini STP designed at Laxminagar is functioning well for the last four months, but the system efficiency needs to be measured by calculating the BOD and COD values on a continuous basis and the treated water needs to be recycled. If the system proves efficient many such mini STPs can be promoted in the peripheral areas of the expanded town. Further alternative technologies like DEWATS (Decentralized Wastewater Treatment Systems) can be promoted which are environment friendly, requiring low O&M, skill sets for maintenance, low power consuming etc. Anaerobic Baffled Reactors, Anaerobic filters, Constructed Wetlands, Soil Bio-technology,

- Phytorid, electro oxidation etc. or a combination of them with a design period of about 15 years duly customizing the same to the local context, location, affordability and acceptability.
3. Proper estimation of the sewerage and septage to be assessed by building a systematic data base of the various types of toilets , estimated sullage, faecal matter, grey water, black water etc. to enable efficient disposal systems with options for reusing the treated wastewater from FSTPs.
 4. As suggested by the Municipal Commissioner, it is essential to divert the sewerage water which is let into the Pedda cheruvu (which is being beautified for public entertainment). The decentralized mini STPs could be planned in the already secured 2 acres land. Further the effluent discharge standards of CPCB need to be followed while ensuring environmental quality with optimum costs. The surplus recycled water could also be utilized for agricultural or other purposes.
 5. The existing septic tanks whose outlets are connected to the storm water drains may be connected to the sewerage network to be provided at a later date, so as to act as solids interceptor tanks as they reduce the solids load on the sewer network, enabling lower costs of sewer network, easier flushing and maintenance of sewers. The biological loading on the STP also will be reduced leading to reduced treatment costs and maintenance.
 6. ULB needs to have a technical strategy and training calendar to create stakeholder awareness and in changing user behavior patterns, capacity enhancement regarding toilet design concepts, construction procedures, correct usage and maintenance system with safe septage disposal systems and management.
 7. The detailed norms and guidelines for faecal sludge management need to be issued by the Municipality and a systematic, integrated, institutionalized septage management mechanism to collect the septage from the septic tanks and other faecal matter from unconnected households and public toilets need to be properly integrated.
 8. The communities and operators involved in desludging needs to be organized for carrying out sanitation as business be it is to facilitate the finances, organize trainings or for monitoring the safe septage disposal and management processes.

Conclusions: (Storm Water Drainage)

- Mahabubnagar town has a old storm water drain system and there is lack of data on drainage network coverage with pucca sections and outlets which needs to be addressed to arrive at a proper strategy for designing the effective storm water drainage with necessary modifications to the existing system.
- In rainy season the town experiences significant flooding issues at few locations in the core area as well as in the peripheral areas despite the ample fall/slope available across the town. Highly undulating terrain, flash floods,

entry of solid waste, non-use of silt traps and light weight precast cover slabs / stainless steel grills on drains and culverts, lack of continuity in drainage network and lack of proper disposal for outfall drains, heavy encroachments in the drainage paths etc leads to the stagnation and floods in the town. Further the mix of sullage, sewerage in storm water is leading to the excess flows and pollution of water bodies. Extensive paving and vast built up areas are also leading to excessive storm water runoff leading to flooding.

- The outfall drains (primary drains) and secondary drains are not properly linked or networked to the main storm drains causing the difficulty for storm runoff during heavy rains and causing flooding and inundation in downstream stretches.
- All the water bodies in the town need to be preserved and rejuvenated in view of the impending necessity of conserving water for future generations in view of the drastically reduced per capita water availability to 1123 m³ from the 3000 m³ about 50 years ago, and the predicted water scarcity by 22% in India by 2025 if business-as-usual situation prevails. Given this scenario the available water bodies need to be protected well. There is unanimity on preserving the Pedda cheruvu and developing it as a pristine recreation place for the population in the town.
- In the absence of silt/garbage traps, and solid continuous RCC slabs on culverts and in certain reaches of drains, the silt/garbage get deposited and clog the drainages necessitating cleaning at least on alternate days which the ULB is unable to perform due to constraints on its finances and staff. Further the drains are being rehabilitated with rectangular section which is not enabling effective cleaning with the available implements with the sanitation workers.

Recommendations: (Storm Water Drainage)

1. Interconnectivity of primary, secondary and tertiary drains should be given attention to ensure smooth flow of drainage and to prevent stagnation and resultant flooding. In the next tranche of funding from any source, the remaining outfall drains may be taken up on first priority, followed by secondary (collector) drains. While designing the MWL of the outfall drains should be maintained above the MWL of the incoming side drains to prevent backflows. Care also should be taken to lay separate lines/segregate the water supply mains, electrical and telephone cables etc.
2. Sustainable Urban Drainage design principles, sustainable pavement design and construction practices, sponge city concepts etc may be applied in the design of storm water drainage to make it environment friendly, economical and sustainable at least on a pilot basis in selected pockets of the city.
3. The main open drains can be covered with light weight RCC slab/stainless steel grill to prevent solids entering the drains and to prevent accidents. Further households are to be encouraged for waste segregation, provision

- of silt traps or steel grills at the culverts, bridges and at sharp turnings to avoid clogging of drains and to prevent flooding and inundation.
4. The storm water drains may be constructed beginning from the downstream end towards upstream duly maintaining a minimum clearance of 0.30 m above the MFL/MWL of the receiving water body below the MFL of the outfall drain at the confluence/outfall point to prevent backflows.
 5. The Sustainable Disposal Systems also need to include rain water harvesting, ground water recharging, grey water recycling, dykes, shoals, wadis (a channel usually dry except in rainy season), recharging structures, infiltration beds, percolation pits, forest strips, landscape based urban drainage, permeable parking lots etc. with rerouting of drains where necessary.
 6. More storm water (flood) retention ponds and underground retention basins need to be identified and developed to cater to the increasing storm runoff from increasing extreme weather events due to climate change.
 7. During storms, arrangements have to be made to divert the excess storm water direct to water bodies, while providing appropriate treatment to the dry weather flow through FSTM (Faecal Sludge and Septage Management) and discharge the same to flowing water bodies.
 8. To enable effective and easy cleaning by the workers to prevent flooding of certain vulnerable areas the storm water drains and culverts need to be covered with stainless steel grills or with light weight RCC precast cover slabs and provided with silt/garbage traps at critical points like culverts, sharp bends, junctions etc.
 9. In most of the wards, the drains are being rehabilitated with rectangular section causing drain cleaning difficult with the available implements for the sanitation workers. It is suggested to use the sections adopted for storm water drains in APUSP project, which provide for a smaller curette section at the bottom to enable higher velocities to carry the dry weather flow and silt and a larger section to carry the storm runoff.
 10. The ULB needs to adopt imaginative urban planning and strict regulations need to be issued to preserve and protect the water bodies like tanks and lakes from encroachments and also to prevent urban flooding.

Conclusions: (Solid waste management)

- In Mahabubnagar the solid waste disposal management systems are partially established. The Municipality distributed two plastic bins for waste segregation but household are not being sensitized. Insufficient staff and vehicles cause delays in waste collection and its being lifted only on alternate days.
- Though the DRCC is functional, the systems are not set up for full functionality on collection, segregation and marketing the segregated products. The data on the selling, buying, payments to the employees and profit and loss

calculations are not being maintained professionally. Though stated as a group initiative ended up in individual business.

- The rag pickers and scrap vendors are not being properly oriented and they are not being regulated for making better benefits with common marketing and infrastructural facilities of pressing, packing and sealing etc.
- Thought there is a specific area allocated for dumping yard, no scientific land filling is practiced increasing the risk of ground water contamination. The recycle and re use options of dry and wet resources are limited.
- Community is not the centre of the solid waste disposal and their participation and involvement is limited to mere disposal but not being accountable to establish the sanitation systems.
- Plastic waste has been observed everywhere which is a major hurdle to effective solid waste management, leading to clogging of drains, reduction of drainage capacities, flooding of vulnerable areas and even pollution of water sources requires special effort to limit.

Recommendations: (Solid waste management)

1. Vermi composting unit needs to be made functional and the water connection to be expedited. Marketing of vermi compost could be tied with farmers cooperatives or urban gardening societies for better profits. Keeping the fully functional vermi compost in view the autos, tractors and trolley trucks to be divided with separators for ensuring proper segregation.
2. The DRCC can be shifted to the dumping yard and it becomes easy for the sanitation workers to sell the dry waste before dumping. Further the employees of DRCC can also be involved in further segregating of the dry waste from the mixed waste which is not being practiced currently.
3. The rag pickers, sanitation workers and scrap vendors need to be oriented on safe solid waste handling practices and to segregate the recyclable waste for better profits. Safety, dignity and livelihood aspects of these vulnerable groups have to be addressed converging with other departments. The sanitation workers can tag with rag pickers and take their support in waste collection and segregation duly paying a share in the profits made.
4. Use of plastics need to be banned by levying high penalties. Plastics below 50 microns thick needs to be urgently banned totally as they became a major obstacles or blockers of the drains. An effective regulatory and enforcement mechanisms at both State and ULB levels need to be established and implemented with suitable incentive and disincentive package, including building awareness and bringing behavioral change in citizens through IEC campaigns. Alternatively cloth bags and paper bags can be promoted providing livelihoods to handloom weavers

Conclusions: (Community Involvement)

- Non segregation of waste, stagnation of the drains, indiscriminate usage of plastics, connecting sullage to storm drains etc indicate complete non accountability and responsibility of the communities. Lack of awareness and KAP (Knowledge, Attitude, practice) gaps are the main reasons for non participation and involvement of the communities.
- The MEPMA is the lead agency in Mahabubnagar to ensure the community participation through women groups. Though there are TLFs and SLFs actively functioning but their role in water and sanitation activities is minimal. Very few SHG women are being employed at the Dry resource centre.
- The youth groups, rag pickers and communities involved in solid waste and septage disposal are not given proper orientation or awareness or guidance on the safe practices and also how to make business out of the profession.
- Even the sanitation workers of the Non Government agencies, civil society organizations, youth and cultural groups of the Mahabubnagar town are not being actively involved to mobilize the communities and households for better solid and liquid waste disposal.

Recommendations: (Community Involvement)

1. Active SHG women leaders could be identified and used as sanitation change agents by entrusting the responsibility of sensitizing the households for waste segregation, drainage and safe septage disposal. Further in each ward a community vigilance group can be formed with SHG leader being the key leader on maintaining the sanitation in each ward.
2. Sensitizing the council members on the proposed works, appropriateness of the designs, execution schedule of the construction work etc. for ensuring the quality of the work. Close monitoring of the works also provide opportunities for rapport with the communities and gain grip over the issues in their wards.
3. Though there is an online grievance redressal system in place, the people are not aware of the system hence the toll free number or the complaint booking system need to be popularized using social media and through advertisements.
4. Social auditing and public review of the available data on the website etc. need to be promoted with transparent procedures for making the Municipality accountable for the successful delivery of the services and a continuous dialogue might improve the service delivery performance involving communities.
5. Proactive efforts to ensure that the contractors / operators fulfill the conditions of contract related to fair wages, safe working conditions and facilities for the human labour engaged for the execution of various works. Further continuous orientations, trainings and follow up meetings ensuring all the above needs to be mandatory at the Municipality level.

6. Many of the sanitation workers both men and women could be utilized for sensitizing the households while collecting the waste or during drain cleaning. Further sanitation workers also need to be sensitized on how to communicate the messages to the households avoiding any arguments.

Conclusions: (Operation and Maintenance)

- The operation and maintenance cost of ensuring water supply is a daunting task for Municipality. The monthly electricity charges itself are running into one crore burdening the daily maintenance. As in most towns and cities there are no preventive operation and maintenance practices for example: checking the leakages, oiling and greasing the pumps and power bores, desilting of all the major storm drains before rainy season, weeding, replacing the stones or bricks on the side walls of drains etc.
- The budget allocation for water and sanitation both area wise and special category wise are allocated but tracking the budgets unpacking the expenditure under various heads is difficult.

Recommendations: (Operation and Maintenance)

1. A separate operation and maintenance wing to be created in the Municipality with specific responsibility of O&M. This wing can prepare a O&M Plan for the water and sanitation sectors aiming at environmental sustainability including water and energy conservation and their efficiencies of use. The scheduled maintenance activities could also be made part of this plan.
2. O&M Monitoring Committee at the Council level with the Chairperson, the Commissioner, City Engineer, interested Councilors, local expert / academia and one TLF/SLF office bearer as members to oversee the Operation and Maintenance of the sewerage facilities, for trouble shooting to accomplish prompt maintenance activities and to make the O&M really effective and sustainable both environmentally, financially and for ensuring better quality of life for the people.
3. The water and sanitation wings need to create an O&M app which sends alerts to the council and also to the concerned area officers on the preventive maintenance / scheduled visits of operation and maintenance. This activity could also be outsourced by the Municipality to reduce the workload.
4. Build the capacity of the decision makers in the Municipality to realistically estimate the cost of O&M of the DEWATS or conventional sewerage system, comparison of the merits and demerits of both, and accordingly initiate the process for resolutions, obtaining Council approvals for collection of user charges and O&M budget for meeting the operational costs, including measures for augmentation of ULB's income from other sources like Property Tax etc. in view of the huge O&M cost burden of more than Rs.2 Cr. per annum.
5. Municipality must ensure recovery of all the taxes, user fees of water

and sanitation and the revenues from various forces keeping 100 percent targets.

6. Special focus needs to be laid on NRW reduction as this is accounting to 51 percent as reported by Municipality. Introduction of universal metering, migration to 24x7 water supply etc need to be introduced as part of the service level improvement plans under AMRUT program.
7. For all the infrastructure related works in the Municipality the life cycle costing approach can be adopted so as to ensure appropriate allocations for operation and maintenance and also for capital maintenance.



Section IV

Urban Sanitation Management in Karimnagar

1. General Information

Karimnagar is the fourth largest city in the state of Telangana with a population of 261,185 within its corporation limits, according to 2011 census and spanning an area of 23.85 sq km. Karimnagar district, of which the Corporation is the Headquarters, was originally called *Elagandala*. Later Kannada kingdoms such as Western Chalukyas ruled it. It was part of the great Satavahana Empire. Later, the ruling Nizams of Hyderabad changed the name to *Karimnagar*, derived from the name of *Shahenshah E Karimnagar Hazrath Syed Kareemullah*.

Table 31: Demographic Profile

Date of Constitution	1952
Type	Municipal Corporation
Extent (in sq. km.)	23.5
Population as per 2011 census	2,61,185
Population (SKS 2015)	3,01,885
Number of Households	62,887
Number of Municipal Wards	50
Slums: Notified	42
Non-notified	16
Slum Population	26,161/82,000
Road Length	579

After the carving out of Telangana as the 29th State in the country and the further division of the existing 13 districts to 31 districts for administrative convenience and better governance, Karimnagar district has been split into three districts namely, Karimnagar, Sircilla and Jagityal.

Demography

Karimnagar Urban Agglomeration comprising Municipal Corporation, its outgrowths and a Census town together constitute a population of 2,89,821 residing in 69,634 households (the geographic breakup given alongside). The estimated population within the City Corporation limits comprises 1,31,817 males and 1,29,368 females with a registered population growth rate of 27% in one decade. As per the recent survey i.e. the Samagra Kutumba Survey held in 2015, the population of the city was 3,01,885 living in 79,080 households.

Socio-economic background of the Corporation

The Population residing in urban poor areas or slums is 92,914, accounting for a little above 32% of the total population. In respect of the sex ratio, Karimnagar District ranks third in the state with 1008 females per 1,000 males, a steep rise from the previous decadal ratio of 998, wherein it was ranked second. The

district also ranks fourth with reference to the density of population, with 319 persons per sq. km.

Karimnagar urban agglomeration has a literacy rate of 84.93% which is almost equal to the National Urban average of 85%. The literacy rate for males and females for Karimnagar urban region stood at 91.06% and 78.69% respectively.

With reference to the Urban Poverty Alleviation initiatives in the city, there are a total of 3949 SHGs with a corpus of 1479.86 lakhs. These SHGs are further federated into 123 Slum level Federations which have a corpus of 166.36 lakhs. At the town level they are federated into 2 Town Level Federations with a corpus of 1.6 lakhs. Out of the SHGs 391 groups have availed bank linkages at various stages in different doses totaling to 1,694.72 Lakh rupees. Under the popular program of DAY-NULM, a total of 177 units were initiated under the Self-Employment Program (SEP) component with financial support to the tune of 106.6 lakh rupees. Under the Employment linked training Program component (Rajiv Yuva Kiranalu), a total of 41,946 candidates have registered for trainings for different categories of skill development programs. Of these, a total of 26,303 persons have been placed based on training accounting for a little above 63% of those trained.

Water & Sanitation Profile

Table 32: Water & Sanitation Profile

S. No	Particulars	Status
1	Swachh Sarvekshan Rank for 2017	201
2	Date of ODF declaration	2 October 2017
3	No of Household Toilets (Septic Tanks)	
4	No of Public Toilets and seats	17/143
5	No. of Community Toilets	
6	% of Schools with toilet and urinals for Boys and Girls(Total Schools-141)	
7	Quantity of withdrawal for city water supply	34 MLD
8	Current Daily water supply	27 MLD
9	Water Supply charges (flat rate per domestic connection per month)	Rs.100/-
10	No. of household connections and Public stand posts	37685/509
11	Solid waste generated per day	157 MT
12	Daily Collection by the Municipality	

S. No	Particulars	Status
13	Collection charges for Households	
14	Collection charges for commercial establishments	
15	Length of Pucca and kutcha side drains	
16	Length of Pucca and Kutcha storm water drains	
17	Length of UGD Sewer Lines	
18	No of STPs	1

Drinking Water supply

In the Telangana Data Sheet prepared in the year 2016, the performance of Karimnagar in terms of efficiency of coverage with water supply was 28st among 69 ULBs, while it was 3rd place for efficiency in supply of 108 lpcd out of 135 SLB. With reference to the quality of water supplied the corporation shared the First place with 18 other ULBs having achieved 100% supply of quality water.

The **source of drinking water** for the City is the Lower Manair Dam from which 34 Million Litres per Day (MLD) is sourced. The water is treated in a 48 MLD Water Treatment Plant with 3 filtration beds of 34 MLD, 24 MLD and 10 MLD with an overall treatment capacity of 68 MLD. Of these the 10 MLD Filtration bed is not functioning presently. With 14 Elevated Level Storage Reservoirs, (ELSRs) holding a total capacity of 16.7 ML, the city supplies 28 Million litres every day and covers the entire city over a two-day cycle so that each area gets water supply on alternate days for a uniform period of 1 hour. The quality of water is quite good and the quality is ensured by analysis of samples by the Institute of Preventive Medicine (IPM) which procures 10 samples each from source and reservoirs. Each of the 13 reservoirs has 4 linemen who take up the valve operation. In addition, there are 2 leakage repairmen for each of the 13 reservoirs. 15 watchmen are also employed for the security of the premises.

The 34 MLD treatment plant and reservoir, also called the Court Reservoir is located at the High Level Zone. It has a coverage area of 35 of the total of 50 divisions into which the city is divided. The plant functions in 3 shifts, each of which is managed by 3 persons. In addition there are 3 watchmen manning the premises. There is however no electrician for the plant and all the issues are looked after by the Assistant Engineer.

Chlorination of drinking Water is done at source only.

In terms of the distribution network, the treated water is collected in a 100 ML clear water Sump and pumped to the Court reservoir premises, also called

the High Zone and the Market reservoir premises also called as the Low Zone to the 14 ELSRs mentioned above. Water is distributed by a pipeline network spanning 315 km out of 579 km (193 out of 354 km and 122 out of 225 km street length from the High and Low Level Zones respectively).

In terms of the household level coverage of water supply, as per the SLIP template prepared in 2016, out of total of 49,650 households, house level connections are available in 41,974 households, accounting for about 85% coverage while the balance households procure water through Public Stand Posts (PSPs) and tankers. There are 591 PSPs and 7 tankers provided by the KMC.

The existing situation with reference to some important parameters as mentioned in the Service Level Improvement Plan (SLIP) template put together as part of the AMRUT Mission for the city stand as follows: the Water Connections in the Corporation are unmetered with a flat rate of Rs.100 imposed on single household connection; the extent of non-revenue water is 30%; quality water is supplied to the extent of 95% up to the standards; cost recovery in the corporation is 50% with 70% efficiency of water supply related charges.

One of the major problems related to the maintenance of the treatment plant is leakage. However leakages in the lines are very promptly addressed. There is no system of online registration of complaints and citizens have to either complain to the authorities by phone or make visits to the concerned sites for registration of complaints and look into their redress.

2. City Sewerage Systems

Sewerage system

In Karimnagar town, there was no sewerage system earlier, but sewerage system was contemplated for the town in the year 2007 under the UIDSSMT scheme of Govt. of India costing Rs. 76.5 Cr. The scheme was designed for projected population of 5,01,000, to be attained by 2036 for a probable discharge of 55 MLD at 108 LPCD (80% of 135 LPCD). The comprehensive system comprises a 38 MLD STP based on MBBR process along with a sewer network 303 km long, which caters to meet the prospective demand by 2026, and it envisages construction of 46095 Inspection Chambers (as per the estimation submitted for the construction of ICs and HH Connections in KMC vide letter of EE dated 28-08-17). The STP is designed for an effluent BOD of <20 mg/l and e-coli of 103 MPN/100 ml for its discharge to water bodies as against the latest CPCB guideline for discharge of effluent i.e., BOD <10 mg/l and faecal coliforms <100MPN/100 ml.

The STP work was earlier completed in 2012-13 with 285 km long sewer

network laid, but due to the lack of inspection chambers the house connections could not be given. In the note submitted by the PHMED division of Karimnagar corporation, the responsibility for sewerage network was awarded to M/S Ramky Infrastructure Ltd., Hyderabad under the EPC system in 2008 set for completion in 24 months, however the latest Extension of Agreement Time (EOT) proposal was submitted till end April 2018, nearly 10 years from the date of drawing the contract. Further it is also reported that due to various problems during execution like getting permission for cutting of R&B roads, new technology of STP, etc., only 95 % of the work was completed. As on end of February 2017, 5,114 ICs were completed and 2,207 household connections were given with the proposal to complete the remaining ICs and household connections were to be given by the Municipal Corporation. The trial run of the STP was started with the quantum of sewerage water collected from nearby areas of STP on 28-2-2017.

However due to financial constraints in taking up the works expressed by the city corporation, the Hon'ble CM of the State announced a sanction of Rs. 50 crores for completion of the pending work of Inspection Chambers and Household connections in 2014 for which a project report was submitted to government and sanction of Rs. 25 crores was done in August 2017. The details of the work are as follows:

1. Estimated requirement of Inspection Chambers to the extent of network laid is 20,000 (given an estimated households of 54,945 inclusive of 10 % unassessed houses, with 75% household coverage, deducting a proposed 10,000 direct connections to sewers in below 20 ft widths and an already constructed 5,114 ICs, inclusive of ICs for 2 households wherever feasible).
2. Structures proposed for construction with the sanctioned amount of 25 Crores is 17,933, including 8,280 direct connections for roads below 20 ft. width, 2,070 manhole chambers for direct connections above and 7,583 ICs for connectivity to 2 households wherever feasible.

IHHLs and Septage Management

It is observed that most of the households in Karimnagar are having individual toilets though they are not connected to the sewer network. There were 2,069 insanitary latrines in Karimnagar of which 134 insanitary latrines were converted to sanitary toilets, and 386 new toilets were built under Swachh Bharat Program. In most of the old town, the household toilets are directly connected to open drains.

There are 7 open defecation areas and 5 open urination spots identified and the night vigilance groups are making sure that there is no open defecation.

The ULB has already issued preliminary notification for ODF declaration. There are 15 public toilets maintained on pay and use basis by NGOs like Sulabh International. Tenders for two more public toilets are floated out the 10 contemplated. At present, there is no institutionalized sewerage and septage collection and conveyance mechanism in the ULB. Presently, some of the septic tanks and soak pits are connected to the storm water drains thus leading to faecal pollution of sullage water which is also being discharged to the drains. The current system of cleaning of septic tanks is provided by the private players as the ULB does not have any such vehicles like gulpers. The 6 private honey sucker truck owners who operate in the town indiscriminately dispose the septage into open drains, low lying areas or in water bodies. Usually the tank operators charge about Rs. 1,000 to Rs. 3,000 per household depending upon the size of the septic tank – residential or public toilets. There are no community toilets in the ULB. Desludging of septic tanks at the household level is required a little short of 2 years on an average. Recently the Municipal Commissioner held meetings with these players and requested them to dispose the septage into the STP only.

The septage cleaning truck operators (owners) are neither organized nor could be effectively regulated by the ULB in the absence of adoption of septage management guidelines or rules by the Council. Towards this end, the ULB is getting the policy worked out in line with the working model from the Warangal Municipal Corporation. Further the Municipality is planning for Vehicle Tracking System using GPS.

Present stage of Implementation of the Sewerage Scheme

Currently the STP is working at about 3% of its capacity as a cumulative effect of all the factors mentioned above. Further, there is apprehension and perceived unwillingness from households to pay separate sewerage tariff. Further the local residents are resisting the deposition of the septage from about 6 vacuum tanks (honey suckers or septic vacuum tanks) in the STP. They are also not happy with the high noise emanating from the air blowers, which the ULB is exploring ways to address.

Disposal arrangements for the effluent

The effluent of the STP is being discharged into Gopalpur cheruvu. The sludge treatment and disposal arrangements need streamlining and are in preliminary stage with the system under stabilization.

The sewer network is constituted with SWG pipes till 250 mm diameter, with RCC (NP2/3/4) for higher diameters. Further in order to avoid crossing the water supply network, the same is from the u/s end as against the standard practice of locating the manholes first and working from the d/s of fixing the invert levels of sewers.

While the sewer line excavation was done with the aid of machines for standard width roads, manual excavation was done on the narrow lanes.

Sewers were laid at the center of the road with Inspection Chambers (ICs) on the road beside storm water drains each connecting 3 or 4 households. The ICs are again connected to the manholes on the street sewer at a slope.

Connectivity of toilets and septic tanks to sewerage network

The coverage of toilets is slightly less than 100% with all the 50 wards having been ODF declared. About 80% (based on derived estimates from the City Sanitation Plan) of households are covered with septic tanks. Under Swachh Bharat, large majority of houses have been provided with twin pits with single pit, or septic tank either underneath the toilet or separately where there is paucity of space with connection to the storm water drains being the other options. In Rajivnagar near market yard, the houses have old toilets because of which the citizens said they were not so far sanctioned IHHLs and a decision is awaited from the ULB.

Deviations in the household toilets and disproportionate costs

In Kisannagar, some of the toilets are constructed with single pit with bottom lining and twin pit toilets with bottom lining were connected to the storm water drains. One was constructed with bathroom also, with distribution box, with

the toilet outlet leading to septic tank and the sullage outlet connected to the drain, incurring a total cost of Rs. 30,000 out of which 12,000 is the Govt. subsidy.

Another case is two toilets constructed side by side with septic tank and the outlet connected to side drain, with total cost of Rs. 45,000. Only one unfinished twin pit toilet was seen with distribution box. Another case is with bath cum toilet with septic tank underneath costing a total of Rs. 50,000 out of which subsidy element is Rs. 12,000, initially paid from SLF funds and later reimbursed by the ULB.

In very few instances, even where twin pits are provided, distribution box is missing, and the connection is made from toilet to the first pit. The two pits are provided side by side almost touching each other, and are interconnected, which leads to contamination of the other pit also, and non-digestion of the sewerage in the first pit due to moisture infiltration from the 2nd pit. The bottom lining results in non-percolation of filtered sewerage or effluent into the surrounding soil and not serving the purpose of twin pit pour flush toilet. Further, they do not serve either as a twin pit pour flush toilet or as a septic tank. Thus the effluent from the twin pit toilet is discharged to the storm water drains with little primary treatment, which is environmentally unfriendly.

These instances suggest that many variations in toilet construction were adopted based on the awareness of the community members, and inadequate technical guidance was available from the ULB staff to the masons or to the community members.

Adequacy of Water Supply to make the sewerage system functional

Water is by and large available for flushing, but carried with a bucket in slum and peripheral areas into the toilet where IHHLs have been constructed.

Water is supplied to the people in the service area by a pipeline network of 315 km and 7 mobile tankers for the unserved/ peripheral areas. There are plans for another 264 km length of pipeline. The water supply including from sub-surface sources like 852 bore wells and 941 hand pumps is coming to 107 lpcd to about 85% of the present population of about 3 lakhs consisting of about 60,000 households, through 41,974 HSCs (House Service Connections) and 509 Public Taps. The supply is on alternate days for about 5 hours. The present drawal of 48 MLD will be supplemented shortly by a further 10 MLD from the same source through HUDCO scheme and will be commissioned very soon. This will pave the way for adequate water of about 135 lpcd to enable effective flushing of the sewerage network in the areas to be served by the sewerage scheme, and also for the proposed sanitation system in the peripheral areas and slums. The slums are also by and large covered with HSCs for water supply.

It is heartening to mention here that the ULB has proposed to implement 24x7 water supply in the KMC limits with technical support of ASCI and VISHWAS Agency which had pioneered the benchmark in parts of the Nagpur City Corporation. This project is set to be piloted in KMC due to the compact city diameter of 23.5 km and estimated to cost between Rs. 130 crore to Rs. 150 crores, to be completed by end of year 2018.

Sustainability of water supply and sanitation systems

The significant gap of 15 % in the issue of Household Service Connections (41, 974 HSCs against 60,000 total households) stands as a significant deterrent to the sustainability of service delivery. Further, a substantially high 30% of non-revenue Water combined with just 50% cost recovery add to pose a challenge to the sustainability factor. There is need to levy a realistic amount for the monthly water tariff which is based on a pre-determined cost recovery mechanism with suitable augmentation to meet the costs of providing these services. Further this should include O&M cost for sewerage, at the same time building the possibility of annual increase of the water charges targeting to achieve self-sustenance over a defined period. This has been reiterated by the Municipal Commissioner who suggested tightening up the revenue through Property Tax, Vacant Land Tax, Water Tariff etc. to augment the revenues and to make the infrastructure being provided sustainable. The reforms funding under AMRUT scheme may be suitably leveraged to augment the revenue by improving the efficiency of assessment, billing and collection. The resident welfare associations are also made important stakeholders in the entire process for management and O & M and participate to demand and pay for the services received.

CONCLUSIONS

Sewerage

The engineers, masons and the community need to be trained in proper construction, detailing and use of toilets and their maintenance.

All households with toilets, either with single pit or twin pits with bottom lined with Cement Concrete, and toilets with septic tank may be connected to sewer network for the sewerage system to function effectively. The outlet of the existing septic tanks may be connected to the sewer network so that the septic tanks can act as interceptor tanks and reduce the load on the sewer network and on the STP.

A systematic, integrated, institutionalized septage management mechanism to collect the septage from the septic tanks and other faecal matter from unconnected households and public toilets also may be developed for the city to ensure adequate and safe sanitation which alone can result in desired health outcomes.

In peripheral areas and slums like those in the Jagtial road and n south west and south east areas of the town wherein small habitations with about 10,000 people exist, use of Simplified Sewerage or Small Bore Sewerage (Settled Sewerage) for network provision as discussed in the CPHEEO Sewerage Manual in place of the conventional sewerage, and adopt suitable DEWATS (Decentralized Wastewater Treatment Systems) environment friendly, low-maintenance, low life cycle cost processes like Anaerobic Baffled Reactors, Anaerobic filters, Constructed Wetlands, Planted Gravel Filter, Electro oxidation, Electro coagulation, Soil Biotechnology, Phytorid etc. with a design period of about 15 years duly customizing the same to the local context, location, affordability and acceptability.

The noise level of the air blowers may be measured using microphones combined with intensified camera system and sound level meters, and adopt appropriate noise reducing techniques (like reducing the blower's fan speed or fixing the blowers with scilencers) as suggested by domain experts.

Whenever a part of the sewer line or the STP becomes dysfunctional, alternative fall back options may be resorted to and integrated into the design and O&M to minimize its effect on the rest of the system. This can be done by flushing system, bypass lines, sewer cleaning machinery, buffer units to cater to emergencies etc.

STPs must provide option for receiving and treating the septage and faecal sludge coming from unconnected areas and isolated households in future.

It is essential to develop accurate base line data like: the number of septic tanks in the city or locality, number connected to sewerage network etc. to enable assessing the impact of sewerage system on which considerable scale of investment is being made.

It is essential to build inspection tracks adjacent to Trunk sewers to enable easy access to inspection vehicles, and to enable prompt repair and maintenance of sewerage facilities.

A proactive and sustained awareness campaign, procedural streamlining, removal of entry barriers (like reduction/elimination of initial connection charges (donation) and minimization of house service pipeline charges i.e., cost of pipes, fittings and labour etc.) to ensure that all households take sewerage house connection is imperative for achieving universal sanitation and the resultant health outcomes.

The vertical and horizontal clearance between water mains and sewer lines needs to be given special attention particularly in slum areas and in narrow

lanes to eliminate the risk of contamination of water supply and for easy maintenance of sewer network.

It is important to ensure climate resilience measures to protect the installations against extreme weather events like excessive rainfall and flash floods, and extreme temperatures etc. in the design of sewerage system including location and elevations of the STPs and sewerage pumping stations, diversion of excessive run-off away from sewer man holes and other critical sewerage facilities.

During the planning, implementation and O&M stages, it is very fruitful to hold periodical inter- departmental coordination meetings with Planning, Public Health, Water Supply and Taxation wings within the ULB and with PHED, R&B, Railways, National Highways, Electricity, PR, Telephone departments to address problems related to aligning different networks, obtaining permissions and for prompt trouble shooting and to comply with the timelines of the project.

It is advisable to discharge the effluent to the downstream of Gopalpur tank into its surplus escape instead of on the upstream side.

Clear plan should be developed upfront for reusing the treated wastewater, actions essential to comply with the required effluent discharge standards into the water bodies for the desired end use so that the selection of technologies and execution can be planned accordingly with optimum cost while ensuring environmental quality. As far as possible, it is important not to discharge the effluent from the STPs into water bodies like tanks and lakes directly, but divert the same to d/s of these water bodies into their surplus course so that the same can be utilized for agricultural or other purposes.

Options for Co-generation of compost from sewerage sludge and municipal wet waste may also be explored.

Recycling and reuse of wastewater is the need of the hour and their possibility needs to be vigorously explored with meticulous forward planning with detailed logistics.

Sewerage and Septage Management

Toilets in KMC are not sound in terms of their type, i.e septic tank or leach pit. As a result the twin pit connected toilets have cemented bottom and inadequate gaps between rings where cemented rings are used leading to inadequate facility for leaching. Further in the supposed absence of space for two pits, a single pit is dug with double the depth, increasing the time for total digestion of the excretory matter. The toilets do not lead to the intended safe sanitation and health outcomes to the community.

The septic tanks are directly connected to the storm water drains without the soak pit which enhances the risk of septicity, and odour with enhanced risk of pollution. Further the transfer of pathogens directly into the SWD increases the risk of contamination through oral and other routes.

The faulty designing of the sub-soil structure related to the toilets are not technologically sound, bringing to light the lack of awareness among the municipal sanitation staff as well as the consumers. While the concept behind the choice of design is important, the translation of the design into a robust construction, use and maintenance are equally important factors leading to correct incorporation of the technology. The lack of this comes across as a glaring gap.

The STP is designed for an effluent BOD of <20 mg/l and e-coli of 10^3 MPN/100 ml for its discharge to water bodies as against the latest CPCB guideline for discharge of effluent i.e., BOD <10 mg/l and faecal coliforms <100MPN/100 ml. This makes it hazardous for aquatic organisms to survive.

As mentioned earlier, the air blowers within the STP need to be fitted with silencers, the absence of which threatens to take its toll on the health of the citizens residing in the neighborhood and increase in the overall nuisance value.

The sludge treatment and disposal arrangements are not yet established and need streamlining to ensure environmental sanitation.

In view of the low density scattered development and peripheral nature of the catchment like towards the north, south west and south east, conventional sewerage network and conventional STP may not be appropriate and viable. Further, providing conventional sewerage system at the present juncture may not yield the desired benefits in view of the sparse density and low affordability. Alternative low cost maintenance technologies need to be explored to make them appropriate to the location, context and affordability.

The existing septic tanks whose outlets are connected to the storm water drains need not be considered redundant when they will be connected to the sewerage network. They will function as solids interceptor tanks and reduce the solids load on the sewer network, enabling easier flushing, easy maintenance of sewers. The biological loading on the STP also will be reduced leading to reduced treatment costs and maintenance.

3. Plans and Programs for City Development

There are four planning documents prepared for the Karimnagar Corporation dealing with various town planning and development aspects. These documents are the Master Plan, City Sanitation Plan, the Detailed Project Report prepared as part of AMRUT, SMART City Proposal.

Map 8: Karimnagar Municipal Corporation Boundary



Master Plan

The earliest document pertaining to the city is the Master Plan prepared in the year 1976 with the details thereof and the zoning regulations published in the AP Gazette dated September 8, 1983. The Master Plans were updated again in 1998. In the light of reorganization of the ULBs, the Base Maps and Master Plans are in the process of being modified by procuring the satellite imagery of Quick Bird with a 0.61 M resolution from NRSC. As per the web portal of the DTCP, the Master Plan for the Corporation is slated to be completed by Mid-2018.

City Sanitation Plan

Karimnagar Corporation has developed a comprehensive City Level Sanitation Plan (CSP) in 2016 consequent to the training of Municipal Staff on the CSP preparation by the GIZ. Karimnagar developed the CSP following the major steps of formation of the CSTF, carrying out the baseline survey of sanitation and identification of gaps, working out the institutional framework and other technical and financial specifications for the phase-wise implementation of

the city sanitation plan. This has been prepared with the technical support of CDD Society. While the document covers the existing situation of the various dimensions of Sanitation, inconsistent demographic figures and incomplete analysis of reasons for incomplete works like underground sewerage network limit quick action to set the same in order.

AMRUT

The corporation has developed proposal for AMRUT and has been sanctioned an amount of Rs. 22.7 cr. for water supply and Rs. 0.57 cr. for development of parks and green spaces during the year 2015-16 while during 2016-17 the allocation was Rs. 52.44 cr. and Rs. 1.29 cr. based on the prioritization principles of gaps in Service Levels as well as national priority of GoI, namely Water Supply and Sewerage.

SMART City

Karimnagar as one of the 100 SMART cities has proposed a 5 Vision Theme and Priority Goals of Vibrant Economy, Employment and Business; Pristine and Sustainable Environment; Seamless Mobility; Universal Access to Inclusive Best-in-class Civic Services and; Citizen-centric, technology-led Governance with 4 Themes of Area Based Development with a project outlay of 1878 crores

4. Storm Water Drainage

About 35 km long major pucca storm water drains are present in Karimnagar city, which include 2 major outfall drains which drain the entire drainage of the city from the north west to the south east into the Manair river ultimately through gravity in view of the abundant fall of about 34 m available. Coverage of pucca drains is around 60%. The desilting of drains is done annually but there was measurement problem to pay to the outsourcing agency. Usually the Corporation outsources the desilting activity.

Flooding happens in some areas of the city because of the undulated terrain and encroachments into the natural tanks of the city as revealed by the officials. There is still one water body (tank) existing in the east of the city which needs to be preserved. Commissioner is of the impression that the storm water drains require modernization with some extended drains to cover the new parts of the city.

The town is blessed with a copious natural gradient from North West to south east with no major drainage issues.

It is observed that the major obstacles in the drainage system of KMC are lack of interconnectivity among the drains, irregular drains and culverts with kuccha

beds and sides, constricted drain/ culvert sections, obstructions due to water, telephone lines etc., silt and weed growth, lack of proper cleaning of drains and removal of silt. Both the major outfall drains are clogged by huge amount of solid waste which needs attention by the ULB to make the drainage system functional.

During heavy rains, most of the drains over flow with mixed drainage and sewerage and the same is being cleared in 4 to 6 hours, using machinery in major drains and manually in minor drains.

The Storm Water Drainage System Study has been entrusted to a consultant and will be ready in a few months for further storm water drainage initiatives to reduce flooding and inundation of the core area around the collectorate, Ambedkar stadium, GSJ Hospital etc. and other flood prone peripheral areas.

CONCLUSIONS

Storm Water Drainage

- There is lack of data on the storm water drainage network coverage with pucca sections, which needs to be addressed to arrive at a proper strategy for effective storm water drainage.
- There are no significant flooding issues in the town except at few locations in the core area and a few in peripheral areas due to the abundant gradient available across the town.
- Further, in view of the sewerage scheme in advance implementation stage under the UIDSSMT programme, it is felt that there is no urgent necessity of taking up tertiary (internal) storm water drains since the roads themselves act as drains due to the excellent gradient available.
- There is need for taking up outfall drains (primary drains) to streamline the storm runoff during heavy rains and to prevent the compulsion of diverting storm water into sewer network to avoid inundation etc.
- Entry of solid waste and other obstructions due to utility lines are leading to avoidable flooding.
- Only one water body (tank) is left on the east of the city which badly needs to be preserved.

Recommendations

- In the next tranche of funding from any source, the remaining outfall drains may be taken up on first priority, followed by secondary (collector) drains.
- Interconnectivity of primary, secondary and tertiary drains may be given attention to ensure smooth flow of drainage and to prevent stagnation and resultant flooding.
- Entry of solid waste may be prevented by effective segregation of waste and

by removing obstructions like water supply mains, electrical and telephone cables etc.

- The storm water drains may be constructed beginning from the downstream end towards upstream duly maintaining a minimum clearance of 0.30 m above the MFL/MWL of the receiving water body below the MFL of the outfall drain at the confluence/outfall point to prevent backflows.
- Silt traps may be provided at the culverts, bridges and at sharp turnings to prevent deposition of waste and clogging of drains and to prevent flooding and inundation.
- The MWL of the outfall drains should be maintained above the MWL of the incoming side drains to prevent backflows.
- It is preferable to cover the drains with light weight RCC slab/stainless steel grill to prevent solids entering the drains and to prevent accidents.
- It is suggested to allow storm run-off on the pavements also up to 0.15 m so that the roads also act as drains and the load on the regular drainage network is also reduced leading to economy.
- Necessary regulatory and development measures may be planned meticulously to preserve the only existing major water body on the east of the city.
- Sustainable Urban Drainage design principles, sustainable pavement design and construction practices, sponge city concepts may be applied in the design of storm water drainage to make it environment friendly, economical and sustainable. Now that sewerage system is also being implemented, allowing recharge with drain/rain water may not pose noticeable ground water pollution.

In view of the impending necessity of conserving water for future generations in view of the drastically reduced per capita water availability to 1123 m³ from the 3000 m³ 50 years ago, and the predicted water scarcity in India by 2025 if business-as-usual situation prevails.

5. Solid waste management

The Performance Assessment report for the State of Telangana for 2015-16 showed that the existing household coverage of Solid Waste Management Services at 87% is deficient by 13% to the Service Level Benchmark for the parameter, of 100%. The City Sanitation Plan drafted by the Corporation shows a significantly improved status of nearly 99%. It is also interesting to note that the CSP pins the number of households that are covered at 77,941 households which is very high compared to census figures. The CSP also states that since no fee is being collected for D2D collection from households, the assessment of the actual number of households is difficult.

Notwithstanding the above as per the assessment made in the CSP, reiterated in the course of Field exploration of the team, it is estimated that Karimnagar Municipal Corporation produces about 157 MT of waste every day. The efficiency of collection of this waste is to the tune of nearly 97%. The balance 3%, accounting for 5 MT is scattered in drains and any vacant land. As far as the door to door collection is concerned, it is done to the extent of more than 98% and carried out on alternate days. While no fee is collected for door to door household collection of waste, an amount of Rs. 1000 is collected from function Halls, Rs.3 00 to Rs. 1000 for hotels and Rs. 120 to Rs. 600 from hospitals on monthly basis.

Figure 40: Performance against Benchmarks - Solid Waste Management



The city has a dump yard located in Autonagar, a little more than 3 Km away from the city in the Ramagundam Bypass road which is non-operational. There is also a defunct vermi-composting unit within the precincts of the dump yard. The site is located in a total of 7.5 acres of land and of this 3 acres has been leased to M/s Shalivahana MSW Green energy Ltd. which also set up the operation of a Refuse Derived Fuel (RDF) run Waste to Energy Plant that is set up at Sultanabad to use 30% of the MSW collected and processed. It is to be mentioned here that the plant which has been operational and processing the collected waste for more than 8 years prior to closing down, the same is not functioning currently.

While the factors responsible for the closure of both the WTE plant and the Solid Waste Processing unit are unclear, it is certainly a point for speculation that it is due to the management of both the units by the same agency. Delinking of the management of the WTE plant and the processing unit presents the possibility of at least the more imminent responsibility of segregation of waste and its treatment is resumed. It is clearly noticed that the threat that the ever increasing pile of assorted garbage from various sources poses to the environment and percolation of the same to contaminate groundwater quality increases the urgency for action to revive operations. Second, the

quantum of dead waste generated within the KKMC limits if inadequate to run the WTE plant, the planning of collection of waste across the neighboring ULBs could be a breakthrough in the implementation of the Municipal Solid Waste Management Guidelines subject to the working of a robust strategy for contributions and sharing of financials.

It might be mentioned that the city has a demonstration vermi-composting unit within the premises of the SRR Arts College Girls Hostel where activities have been in progress till 30 days back (the last batch of vermi-compost is not yet complete). The team has been informed that the Vermi-composting Officer from the office of the CDMA had visited the unit and pointed out some technical flaws in the construction of the beds (the floor of the bed being lower than the ground level thereby preventing the draining of leachate formed in the process of keeping the compostable mass wet) and suggested rectification of the same and the same was in the process of being carried out. Also fresh batch has not been initiated.

The District Collector of Karimnagar has handed over 10 acres of land at Maqdumpur to the KMC for the development of a Resource Park and Vermi-compost unit for the composting of the wet waste. As on date of the visit, plantations have been initiated and other activities are yet to take off.

All the above points substantiate the strong need for revving up the technology and management aspects related to the proper handling of Municipal Solid Waste with visionary decision-making to enable KMC bring back this important area on track.

Conclusions

Effective mechanisms like D2D collection covering most of the corporation area and the institutionalization of commercial waste collection from market-places in Karimnagar reflects the efforts taken up in order to build and stabilize these systems both with respect to the citizens as well as the workers over the past few years. However, the non-functioning of the Solid Waste treatment Plant and vermi-compost plant at Autonagar and the technological flaws identified in the construction of the vermi-compost unit at SR College have resulting in the glutting of the collected waste which is dumped at the rate of 160 tons every day. Further, the lack of proper system of O & M of garbage collection vehicles result in good number of vehicles being off-roads leading to less-than-optimum solid waste management in the corporation.

The lack of a specific system of treatment of waste generated pre-empts the scope of insisting for segregation of waste at the household level. While the distribution of twin bins is currently being taken up, in the absence of a proper

mechanism for the collection of waste in the segregated form at the household level this does not serve any purpose.

The Corporation is in the process of developing a Resource Park over an expanse of 7 acres of land located at Maqdumpuram. This land has been allotted to the corporation by the Collector under the Swachh Bharath Mission. Currently this land is vacant and some greenery is being developed with plans to initiate a vermi-compost yard.

Recommendations

3. There is an immediate need to revive the waste treatment plant that has been non-functional for the past more than 2 years. The cumulative piling up of garbage with some rudiments of churning the waste, the quantity of which is miniscule in comparison to the quantum of waste already existing in the dump-yard and the availability of a single JCB brings to light the need for procurement of more such machinery.
4. Further proper sorting of the material that is done when the waste treatment unit is functional would also result in the reduction of absolute waste that can go for land-filling, activation of the wind rows system of waste treatment and its ultimate processing into compost, in a regular cycle.
5. It is essential that the community should be made aware of the specific details of what constitutes dry and wet waste with proper demonstration of the same. Awareness generation on the advantages of keeping the different kinds of waste exclusive and uncontaminated to retain the value of the waste would empower the community to contribute pro-actively to the retrieval, recycling and reuse of the material. This will also justify the non-collection of garbage collection fee as the activity of segregation and secondary disposal would yield revenues.
6. The 7 acres of land allotted and earmarked for the development of a resource park can be innovatively utilized to develop a Dry Resource Collection Center (DRCC) as well as a vermi- composting yard using the right technology to generate vermi-compost that can be made available for Telangana Lo Haritha Haram and also for commercial sale and for popularizing the use of organic compost.

Community Involvement / Inclusion

Karimnagar has an impressive performance in the poverty alleviation initiatives taken up under the DAY- NULM. Since the advent of urban poverty alleviation initiatives through the implementation of the SJSRY, Karimnagar has done well in collectivization of the urban poor into need based groups and leveraging and gaining benefit from the provision under various components.

Karimnagar has a total of 3,932 operational SHGs with a corpus of 1,470.34

lakhs. These SHGs are further federated into 123 Slum level Federations which have a corpus of Rs. 166.36 lakhs. At the town level they are federated into 2 Town Level Federations with a corpus of Rs. 1.6 lakhs. Out of the SHGs 257 groups have availed bank linkages at various stages in different doses totaling to Rs. 1,050.81 Lakh rupees. Under the popular program of DAY-NULM, a total of 125 units were initiated under the Self- Employment Program (SEP) component with financial support to the tune of Rs. 106.6 lakh rupees. Under the Employment linked training Program component (Rajiv Yuva Kiranalu), a total of 49,084 candidates have registered for trainings for different categories of skill development programs. Of these, a total of 25,070 persons have been placed based on training accounting for a little above 51 % of those trained.

While the primary focus of the groups and federations initially was organizing need-based groups with self-generated savings for internal lending, later proliferating into other income generating activities which are predominantly financial in nature, the inclusion of issues relating to enhancing quality of life and use of the group strength to tackle social, nutritional and vulnerability related have resulted in the scale-up of the range of activities to include domestic violence, community health and community nutrition as well as building up information base for use by the youth and other categories of people.

Issues pertaining to sanitation, solid waste management and related issues have been properly presented to the community level structures as a result of which the strong internal and external resource of the community has not been properly harnessed to achieve SBM goals. If the inclusive approach with reference to the community level infrastructure is utilized, it could elicit the required public participation that is vital in achieving success of these initiatives.

Recommendations

1. With households being the source of domestic waste generation, the groups can be educated on the importance of sanitation and the management of waste for better health practices.
2. Groups can play an important role in the collection of waste in the segregated form and disposal of the same as an activity that can yield good financial returns for those involved. Examples of these initiatives haven't been seen at many ULBs.
3. Group members, further, can be educated on the advantages of taking up better sanitation and personal hygiene related practices.
4. Outreach to the community can be accelerated with the help of the group members on importance of sound practices related to waste segregation, disposal etc. so that these can become priority areas.

6. Sanitation Value Chain

a. Coverage with toilets

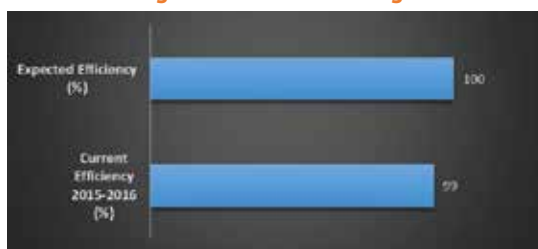
The 2011 Census Data on sanitation systems and their containment can be seen in the table below. This data does not include the toilets constructed under SMB, so especially the numbers concerning OD will have changed. Still this table gives a good overview over sanitation systems in the town and it can be assumed that the toilets constructed under SBM have septic tanks and pits.

Table 33: Sanitation Type

Type		Percentage
Households having latrine facility within the premises		92.9
Flush/pour flush latrine connected to	Piped sewer system	12.0
	Septic tank	74.4
	Other system	2.0
Pit latrine	With slab/ ventilated improved pit	1.0
	Without slab/ open pit	0.2
Night soil disposed into open drain		3.1
Service Latrine	Night soil removed by human	0.0
	Night soil serviced by animal	0.3
HHs not having latrine facility within the premises		7.1
Alternative source	Public latrine	0.2
	Open Defecation	6.8

Source: Census (2011)

Figure 41: Toilet Coverage



Karimnagar standson records as one of the 12 ULBs having completed 99% coverage with toilets as per the Telangana SLB data for 2016. On the landmark day of August 15, 2017, Karimnagar, along with all the Urban Local Bodies in the State joined to declare Telangana an Open Defecation- Free (ODF) State (Self declaration, to be certified after due verification by Third Party). Karimnagar MC on its part also rendered the last mile connectivity of taking up the construction of a total of 387 Individual Household Latrines (IHHLs) under the SBM. Under this about 50 IHHLs have been constructed with septic

tank provision, about 100 units are constructed with single pit and the balance of 237 toilets have been constructed with twin pits. Out of a total of 49650 households, all the households have been covered with individual toilets. In addition the corporation has taken up the construction of Community Toilets in 3 locations as follows:

Gidda Perumandla (to cater to the needs of a settlement colony with temporary non-owned huts of construction workers and also visitors to a nearby temple),

Gautam Nagar near water tank (catering to the needs of settlers who are there for temporary work and the operators of the tank) and,

Saptagiri Colony near vehicle shed (catering to the needs of the corporation related drivers, etc. who park their vehicles as well as visitors to the nearby temple).

KMC has proposed the construction of a total of 12 Public Pay and Use toilets and 3 SHE Toilets at various points to cater to the needs of the general public and visitors to various public institutions like Collectorate Office, Government offices, as well as bus stands, etc. However, till date, none of the structures has been constructed as the Council has raised objections on the location, etc. The Sanitation staff expects that the tenders will be cleared before 15th March 2018.

Table 34: Details Of Existing Pay & Use Toilets

S No	Location	Operating Organisation	Male				Female			Water provision	Users per day
			WCs	WBs	Urinals	Baths	WCs	WBs	Bath		
1	Collector Officer	Private Operator	5	1	3	1	3	1	1	Bore well	100
2	Opp. Municipal officer	Private Operator	7	1	2	1	2	0	0	Mpl Water Tank	700
3	Opp. Mpl Guest House	Private Operator	6	1	4	0	1	0	0	Bore well	75
4	Near state Bank Of Hyderabad	NGO	6	1	6	2	6	2	2	Bore well	300
5	Savaram street	NGO	5	1	5	2	2	1	1	Bore well	50
6	Telangana chowk	NGO	4	0	6	1	3	1	1	Bore well	175
7	Kashmir gadda Raithu bazar	Private Operator	6	1	6	1	6	1	1	Bore well	100
8	Govt. Hospital Mancherial	SHG	6	1	4	1	4	1	1	Mpl. Tank	100

S No	Location	Operating Organisation	Male				Female			Water provision	Users per day
			WCs	WBs	Urinals	Baths	WCs	WBs	Bath		
9	Fish Market	SHG	7	1	2	1	3	1	1	Mpl. Tank	175
10	Ramnagar Fish Market	SHG	4	1	2	1	4	1	1	Bore well	125
11	Near Forest Office	SHG	4	1	2	1	4	1	1	Bore well	100
12	Bus Stand Premises	Private Operator	9	2	10	2	9	2	1	Bore well	1000
13	Bus Stand Premises	Private Operator	1	0	0	0	1	0	0	Bore well	150
14	Bus Stand Premises	TSRTC	9	0	10	1	2	0	1	Bore well	500
15	Bus Stand Premises	TSRTC	0	0	0	0	2	1	1	Bore well	300
16	Bus Stand Premises	TSRTC	4	0	8	0	3	0	0	Bore well	150
17	Govt. Hospital Mancherial	NGO	3	1	2	1	2	1	1	Bore well	100

b. Septic tanks

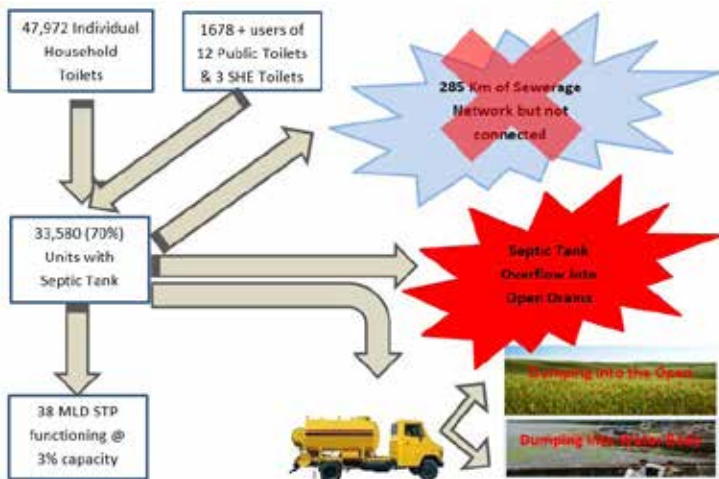
With reference to the status of toilets in the city it is to be noted that the Municipality has identified 2,980 toilets as insanitary. This translates in the City as toilets without soak pits and those where the outflow from the septic tanks opens directly into the storm water drain and the grey water which is very potent pathologically trickles into the SWD. There are also toilets in slum areas where the toilets do not have a septic tank and the faecal matter directly flows into the drains leading to insanitary conditions in the entire locality. In discussion with the research team, it was told that the household had applied for conversion of their toilet into a safe unit but their application was not considered as there is no provision for repair of existing structures.

Shaik Bee is one of the thirty odd members belonging to the Mushtafa Nagar near KKK Basthi in the heart of the Karimnagar city. All the families in this locality are involved in the business relating to sale of meat in slaughter house or retail meat and chicken outlets. Some of the other members also run Kalyani (beef) Biryani Hotels. All members of the community have joined together to form for themselves an SHG which they named KKK Basthi Mahila Sangham and regularly meet and save Rs. 100 every month. “ I have saved more than Rs. 40,000/- as a member of the SHG and have taken internal loan a number of times to meet a range of needs that include fees and uniforms for children, investment in the purchase of raw material for the meat shop....” She says. However, she never took any loans for her own personal use, anytime, like all the members of her locality.

Shaik Bee has her own house in the locality but is very distressed that the toilet is in a terrible state of dis-function. The commode was broken long back and she approached the Corporation for replacement but since it was denied, her family cemented the commode. However, due to the rough finish, this results in the commode never getting completely clean despite her using acid. Further, the whole locality has the problem of rodents which have dug up the earthwork surrounding the open drains which are running close to the houses and into the sub-soil structures like P traps and the pipes leading to the septic tank. With the choking of the pipes, a straight passage has been made from the outlet of the commode to the open drain. Now the faecal matter is directly flushed out through this opening into the open drain. At the time of the visit, residual faecal matter was found along the passageway to the drain. Shaik Bee's family has approached the Sanitary Inspector for sanction of the SBM subsidy and is promised the same for which they are still waiting.

As per the Swachh Bharath Mission provision, the cost of a single toilet unit is Rs. 15,000 of which Rs. 12,000 is given by way of Central and State releases, of Rs. 4,000 and Rs. 8,000 respectively and the balance of Rs. 3,000 is the share of the beneficiary. However most of the households opted for structures at a much higher cost even to the tune of Rs. 50,000. While this is indicative of the interest that the Mission has built among the people to possess a toilet unit, many individuals for multiple reasons did not yet complete the construction of the unit, much less, use it. Nearly 4 out of the 10 structures visited were found to be incomplete, contrary to the records and self-declaration of the corporation's ODF status (at the time of the field study in November 2017). The reason for non-completion was some family exigency (son's accident) or non-availability of the required finances leading to the non-completion of toilet units. A single positive incidence that was seen in the field was where a family had constructed a unit with a western commode due to the presence of a senior member in the family.

Figure 42: Sanitation Value Chain in Karimnagar Municipal Corporation



The above figure depicts the sanitation related value chain in a self-explanatory manner, already described in sections above. In a nutshell, the lack of inspection chambers and household connections in the case of underground sewerage has led to the multiple repercussion of under-utilization of the STP which has been built with projected use in mind, has resulted in the continuance of the practice of utilization of the services of 4 KL Vacuum Septic tank cleaning trucks operated by private individuals. Further the lack of optimal utilization of the STP coupled with the absence of silencers have resulted in the operation of the plant, an activity causing untold inconvenience and nuisance to the neighborhood. A third issue that has added to the situation is that while the corporation started insisting the septic tank cleaning truck operators to empty the sludge into the STP, the lack of provision for the neutralization of the material through chemical process both from the stench and the potential bacteriological load has resulted in adding to the woes of the residents.

It is expected that the sanction of the government of an amount of Rs. 25 lakhs for the completion of the underground sewerage work would hasten the process of completion of the construction of nearly 50,000 inspection chambers with requisite household connections to complete the UGD system and make it fully functional.

Conclusions

Karimnagar has joined all the other cities in the drive towards achievement of ODF status declared by the Hon'ble Minister for Municipal Administration and Urban Development on 15 August 2017. The last set of toilets under SBM were

also taken up to complete the requirement of total coverage of households with the units.

It is also learnt that the city has also applied for visit by the Quality Council of India for Third Party Evaluation has already been sent. Given the situation there are certain points of concern that need mention here which need address to be able to rise to the status of an ODF town in true sense.

For one, there are a lot of toilets still incomplete and therefore not in use. 3 toilets that were visited by the team supposed to have been constructed under the SBM drive were found in a row, to be incomplete. They also appeared to have been in that state for a long time.

The choice of the residents to construct units with septic tanks (either commode over tank or tank unit adjacent to the latrine) as against the SBM advocated model using the leach pits have proved very expensive to the families (costing more than Rs. 50,000) who had to temporarily stall the construction for lack of finances.

During Focused Group Discussions (FGD) with members of the Slum Level Federation (SLF) it was clear that though they were using sanitary napkins as part of their Menstrual Hygiene Management, they were randomly disposing the used material along with the household garbage or into the drain resulting in the clogging of the drains.

Recommendations

1. The residents should be properly educated on the concept that mere construction of toilets does not lead to safe sanitation practice but that they should consistently use toilets all the time.
2. Clarity on the technical details of the toilets is needed among the municipal sanitation staff as the construction of toilets with a single pit having double the depth of a twin pit and constructing septic tanks without soak pits and without provision for the emptying point to the lack of clarity on the details of the technology.
3. Introduction of facility for tracking the movement of septic tank cleaning trucks and log book maintenance by the truck owners would yield important information on the place where the faecal sludge is disposed as well as the requirement of maintenance of the septic tanks, vital in monitoring the same.
4. It is imperative to complete the installation of Inspection Chambers (ICs) connecting the presently un-utilized underground sewerage network to make the huge system functional. For this, the existing plan for installing 10,000 ICs with direct connection and 20,000 ICs with twin connections needs to be grounded and the work needs to be taken up on war footing.

7. Important points on sewerage system in city development plan/ CSP/ master plan/ any other plan

Underground Sewerage Network

Karimnagar has initiated a comprehensive underground sewerage system to cater to the needs of a projected population of 5,01,000 persons expected to be attained by 2036 for management of 55 MLD at the calculated rate of 80% of the bench mark LPCD of 135. This has been initiated with an estimated budget of Rs. 77 crores under the Urban Infrastructure Development Scheme for Small and Medium Towns (UIDSSMT). All the wastewater and sullage from a total of nearly 385 km of sewerage network has been designed for treatment in a Sewerage Treatment Plant of 38 MLD capacity which is sufficient to treat Sewerage pertaining to the population projected till 2026. The method of treatment is Moving Bed Bio Reactor. It might be mentioned that while the entire network has been laid, the corporation has faced paucity of funds for the installation of Inspection Chambers (ICs) and provide household connections.

In view of the inability of the corporation to raise the required financial resources to complete the sewerage network systems, the State Government has released an amount of Rs. 50 crores for completion of the work, viz, installation of Inspection Chambers, giving household connections including road cutting and restoration work using Reinforced Cement Concrete (RCC) and Steel Mesh Reinforced Concrete (SRC) as required. In view of the 48,000 odd households to be covered, plan has been made for the installation of 10,000 Inspection Chambers with direct (single) house connection and 20,000 ICs with twin household connections.

As of date only 3,500 ICs are installed along with household connections as against the sanction given for 2,000 ICs under the scheme.

Due to less-than-optimal inflows into the STP, treatment is being done at only 3% of the capacity where the plant is set to operate for 2 spells of 2 hours each, during the day. due to the grossly inadequate inflow load into the Plant, during the 2 hour period also, only 2 out of the 6 Blowers are operated.

The works related to the sewerage networking as well as the construction and operation of the STP has faced lot of setbacks in recent times mainly due to the length of time involved in execution. It is understood that both the contracts have been awarded to M/s Ramky Enviro Engineers Ltd in 2008 which are still operational. Due to the long time taken for the execution of the projects it is found that there are a few negative fallouts. For one, lack of understanding of the citizens on the implication of the presence of a treatment facility in the vicinity has resulted in an agglomeration of houses coming up in close proximity of the plant. In view of the functioning of the unit considerable

stench is created in the surrounding areas which are a major irritant to the residents. The second issue is related to the functioning of the blowers and the inflow valves which make a loud noise when functioning. Even when 2 of the optimal battery of 6 blowers are switched on, the noise is deafening. It might be mentioned that there is a provision to reduce the quantum of noise by fitting the blowers with silencers at a cost of Rs. 2,00,000. However, cost being a factor the plan to procure silencers has been deferred.

Recently, it is understood that the neighborhood has expressed resentment towards the stench that has started pervading and polluting the atmosphere. They have even resorted to the extreme measure of locking up the premises and preventing the operation of the unit. According to the Unit operators, there are multiple reasons cited by the residents: first that the smell is very polluting; second that the froth that is created from the tanks and channels is blowing into the vicinity of the houses. The most important reason, it is understood, is the emptying of the sludge collected from the septic tanks into the STP by the private parties involved in cleaning of septic tanks with the deployment of 4 KL vacuum trucks. This was following a decision taken by the KMC to persuade the private truck owners (there is no such facility available with the corporation) to refrain from letting out the septage into the outflow channel of the Lower Manair Dam or nearer into open fields.(Further explanation may be given regarding the location of the sewerage Treatment Plant in the Master Plan and absence of the buffer area surrounding the Plant as well as suggestions on alternatives like treatment of septage at point of letting into the STP to reduce the stench and associated bacteriological risks).

8. Slums Sanitation and SWM issues

There are 58 poor settlements with a population of 31,250 constituting 11% of total population of town. Of the 58 poor settlements, 42 are notified slums. There is a lack of adequate water supply, roads, drainage, health and livelihoods in the slums. The BPL survey (from municipal records) indicates the unemployment ratio is high at one-third of the population. The following table shows the details of the slums in Karimnagar.

The situation of dearth of basic amenities in the slums is typical of most of the slums that lace all urban local bodies. Lack of planned approach roads and arterial lanes, hap-hazard location of the dwellings and choked open drains, were found existent in KMC poor areas of Gautamnagar, Sultanpur, etc. The open drains in these areas present a disconcerting feature that there are defunct septic tanks for few individual latrines, and broken commodes and sub-surface pipes in few other dwellings leading to direct issue of faecal matter into drains. In a meeting with the Area Level Federation (ALF/SLF) of Sultanabad, it was found

that request has been made number of times for the upgradation of the latrine units under SBM support but that their applications were not considered.

Table 35: Slums Population

Total Slums	Notified Slums				Non-Notified Slums			
	No.	Total House-holds	Total Population		No.	Total House-holds	Total Population	
			Male	Female			Male	Female
58	42	21,956	46,746	46,071	16	4,176	8,891	8,762

There is no D2D collection of garbage from Sultanpur area and the residents resort to scattering the household garbage randomly on the streets.

Other major characteristics of slums in Karimnagar can be summarized as the follows:

- Waste (both solid and liquid) are discharged directly into the storm water drainage system.
- There is a general lack of awareness about health and hygiene among the slum dwellers.
- Urban poverty alleviation initiatives have been given great emphasis in Karimnagar. The urban poor women are associated with Community Based Organizations (CBOs) like Self Help Groups (SHG), Slum Level Federations (SLF) and Town Level Federations (TLF) with a good self-generated corpus amount.
- Further, the members have availed bank linkages in many cycles, as they were in existence for the past more than 6-8 years.
- As far as the economic activity pertaining to the families is concerned, it was found that most of the residents involve in retailing of meat and related activities like running of hotels, predominantly selling Biryani, etc. Many of the women said that they used the loan amount procured from the banks and group savings to enhance their business.
- Issues pertaining to sanitation and solid waste management have not yet assumed priority with the groups as evident from the fact that there has been no instance of the members using amount for construction/upgradation of latrine units.

Conclusions and Recommendations

Community Involvement

- Engage the city councilors, RWAs and TLF/SLF/SHG members and inform them about the proposed works, appropriateness of the design and pipe size, execution schedule of the work etc. so that they are well informed and do not spread any unnecessary apprehensions about the work and their cooperation during the execution and subsequently is assured.
- Toll free number to respond to any public queries and posting the basic

information in the website of the Municipality would also be helpful in keeping the public informed of the execution details of the project.

- Plan for developing IEC strategy to ensure that users have appropriate behavioural practices required for sustainable use and maintenance of the sewerage network, eliminating the malpractice of pushing solid waste and silt into the sewer lines.
- MEPMA Team and the Women leaders from TFs, SLFs and SHGs need to be engaged to ensure participation of poorer neighborhoods and slums in planning, execution and sustainable use and maintenance of the UGD infrastructure.
- Area based committees to be formed for ensuring good public cooperation in sustainable use and maintenance of the UGD network.
- The labour component of the earth work in UGD projects is normally about 15-20%. This must be utilized to the optimal extent to benefit the local labor and also enhance their income to the extent required so as to facilitate that the project investment contributes to improving livelihoods of the local labor.
- Proactive efforts to ensure that the contractors fulfill the conditions of contract related to fair wages, safe working conditions and facilities for the human labor engaged for the execution of various works.

Operation and Maintenance

- Evolve an institutional mechanism like a O&M Monitoring Committee at the Council level with the Chairperson, the Commissioner, City Engineer, interested Councilors, local expert / academia and one TLF/SLF office bearer as members to oversee the Operation and Maintenance of the sewerage facilities, for trouble shooting to accomplish prompt maintenance activities and to make the O&M really effective and sustainable both environmentally, financially and for ensuring better quality of life for the people. They can also act as a pressure group in the Council in approving the funding required for effective O&M of Sanitation related services.
- Identify the potential candidates from the sanitation wing of the Municipality and engage them from execution phase so as to thoroughly familiarize them with the sewerage system and extend the employment opportunity in STPs and O &M to the local poor.
- A reasonable overlapping period between PHED and Municipality is required after completion and handing over of the project.
- Build the capacity of the decision makers in the Municipality to realistically estimate the cost of O&M of the sewerage system and accordingly initiate the process for resolutions, obtaining Council approvals for collection of user charges and O&M budget for meeting the operational costs, including measures for augmentation of ULB's income from other sources like Property Tax etc. in view of the huge O&M cost burden of more than Rs. 2 Cr. per annum.
- Right from the day 1, the user charges must be collected and the defect

liability period of maintenance by the contractor must be used as cushion period to build own reserves of the Municipality for the maintenance.

- Field diary /memoirs to be prepared for guiding the future staff who are going to handle the O&M responsibility of the sewerage system.
- In view of the need and demand for expanding the sewerage facilities to various other cities in the state, it is important that learning and best practices from the execution of the project are properly documented for future usage in other cities of the state.
- Prepare a O&M Plan for the water and sanitation sectors aiming at environmental sustainability including water and energy conservation and their use efficiencies.
- Special focus needs to be laid on NRW reduction, universal metering, migration to 24x7 water supply and development of climate resilient water and sanitation infrastructure, Smart Water and Sewerage System Management practices and service level improvement in the Smart City Programme.

Water Sample Analysis

I. Raw Water Sources results and analysis

Total coliform bacteria results shows “nil”, although the parameter tested was for “total” which includes wide varieties of gram-negative bacteria available in the environment wherever life exists and Manair reservoir/river are not exceptional from anthropogenic activities and cattle access. Therefore, this sample need to be tested and duplicate samples also to be tested in other labs.

Residual Chlorine concentration from the households/consumer end showing 1.0 mg/L which is 5 times higher than the desirable limit as per BIS standards. However, “result’ column shows ‘satisfactory’.

Moreover, residual chlorine value at reservoir and at house hold level are same (1.0 mg/L), which may not occur as chlorine is a very strong oxidizing agent and escapes rapidly from both closed and open storages.

II. Piped Water Supply Samples

No parameter of any sample exceeded the prescribed limit, except a bore well sample shows elevated levels of Hardness. A water softner can be used to reduce hardness.

III. Wastewater Analysis Report (Inlet & Outlet of STP)

Inlet: Concentration of Total Dissolved Solids, Chlorides, COD and BOD are found to be very lower than a representative sewerage water. Usually sewerage water contains substantial loads of chlorides as it contains excreta, which is organic therefore BOD should be very high, varies from 300-500 but the report

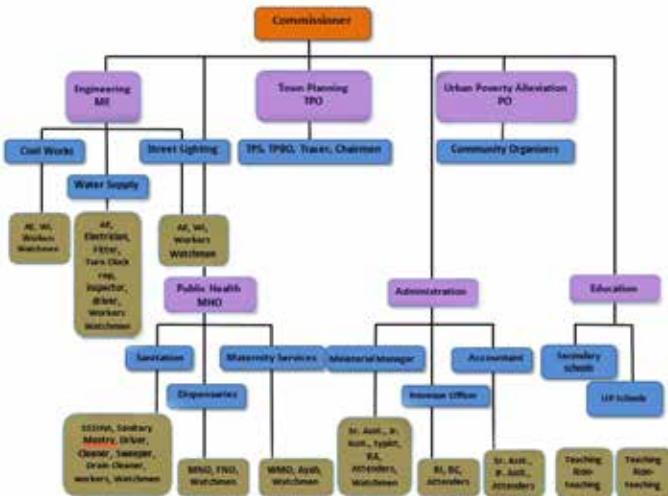
shows only 11. (by referring to chloride values, 148 mg/L, of Lab ref, no: 8433 of bore well sample, one can understand that a safe bore well chloride level is almost equal to that of Sewerage!!)

Outlet: As per the CPCB revised “Standards for STPs” the effluent discharge standard for Total Suspended Solids is 20 mg/L, however the STP treated water contains 66 mg/L which is 3 times higher than the prescribed standard. Faecal Coliform count reported as “present” however, as per the standards the count should be less than 100 MPN/100mL (most probable number) , but the report shows only “present”, count is not available.

9. ULB Organization Structure and Governance

Karimnagar Municipal Corporation is headed by the Municipal Commissioner from the Indian Administrative Services (IAS) with all functions broadly classified under 6 Sections Namely, Engineering, Public Health, Town Planning, Administration, Urban Poverty Alleviation and Education Wings. These 6 sections are further sub-divided into 13 sub-sections that deal with different aspects of Municipal Functioning as shown in the Organogram below:

Figure 43: Organogram of Karimnagar Municipal Corporation



There are a total of 495 sanctioned positions in the corporation of which the number of persons in harness is 288, accounting for a little above half, i.e. 58% in the permanent roles. In terms of the department-wise vacancy, the highest vacancy is with the Public Health Wing, with 44% vacancy (118 out of a total of 270). However, many positions from this section appear to have been filled as outsourced positions as shown in the two tables:

Figure 44: Position of Permanent Staff of all Departments

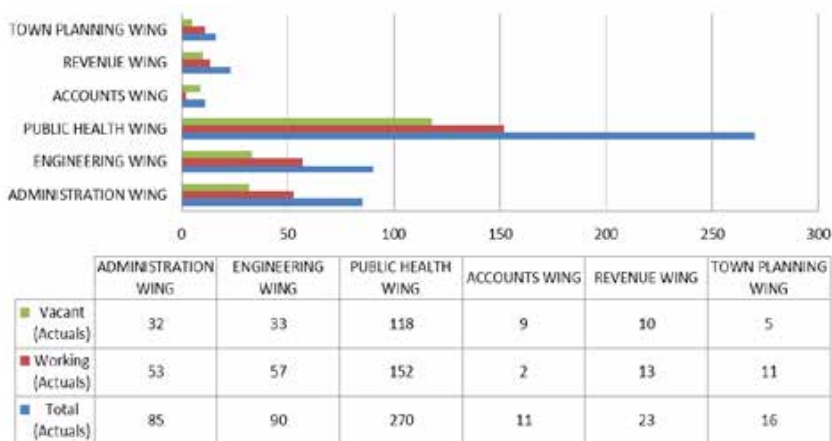
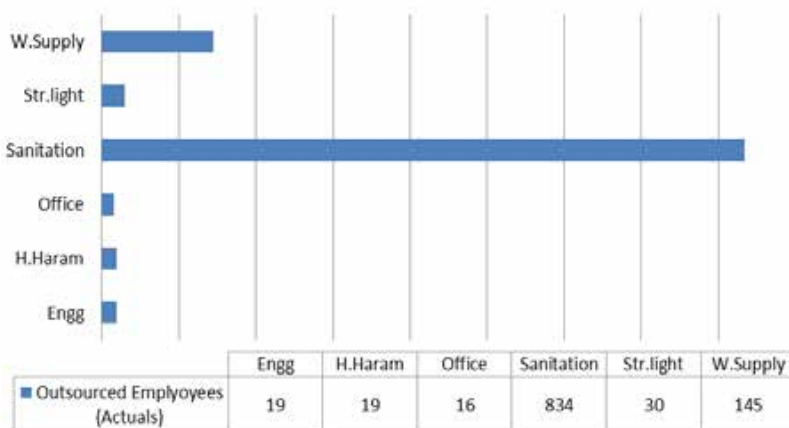


Figure 45: Position of Outsourced Employees all Sections



It is however to be noted that the key positions within the Public Health wing like Municipal Health Officer and Sanitary Inspectors are still vacant and not filled either in the permanent or outsourced positions. The total number of functionaries assigned for sanitation and SWM functions is given in the following table:

Table 36: Staff Position of Permanent Staff all departments

S No	Category	As per GO Ms 151	Existing positions	Total	Working	Vacant
1	Municipal Medical Officer	0	1	1	0	1
2	Municipal Health Officer	1	0	1	0	1
3	Sanitary Supervisor	1	4	5	1	4
4	Assistant Statistical Officer	0	1	1	1	0
5	Sanitary Inspector	1	0	1	0	1
6	Drivers	0	5	5	4	1
7	Health Assistant	0	2	2	2	0
8	Axiliary Nursing Made	0	1	1	0	1
9	Male Nursing Orderly	0	1	1	0	1
10	Sanitary Maistry / Sanitary Jawan	15	0	15	0	15
11	Public Health Workers	0	235	235	144	91
12	Tractor Cleaners	0	2	2	0	2
	TOTAL	18	252	270	152	118

10. Finance

Karimnagar Municipal Corporation has been selected under both AMRUT and Smart city programs. Karimnagar registers a surplus of about 10% in 2014-15, 40% in 2015-16 and 42.6% in 2016-17. The maximum revenue generators are taxes and fees.

It is observed that the major income source for water supply and drainage has been fees from tap water supply, road cutting charges (2014-15), maintenance of internal roads and drains plan grant (2014-15 and 2015-16) and water tax (2016-17).

The major expenditure head has been in HT water supply electric bills (2014-15 and 2015-16), construction and maintenance of roads and drains (2015-16) and drain construction (2016-17). Presently, there is no specific budget head to record water supply and sanitation based expenditure. The major income head for sewerage and sanitation has been scavenging tax (2014-15 and 2015-16) and Swachh Bharat Swachh Telangana (2016-17).

The major expenditure head has been privatization of sanitation work and silt removal (2014-15 and 2015-16) and outsourced sanitary worker and inspector salaries. (As stated in CSP 2016)

While some indicative tables are presented below, more detailed analysis is needed and will be fed into this section in discussion with the key stakeholders and the ULB as well as the State Level.

Figure 46: Budget Details all Heads



Figure 47: Non Tax Resources

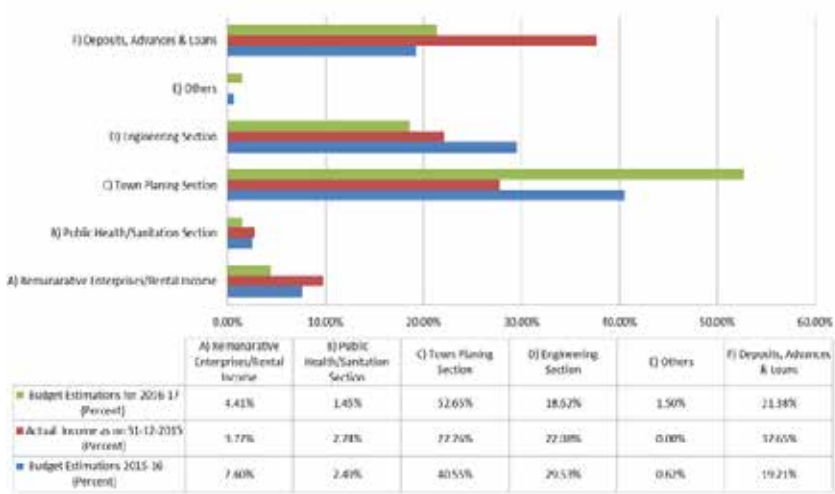


Figure 48: Capital Project Fund

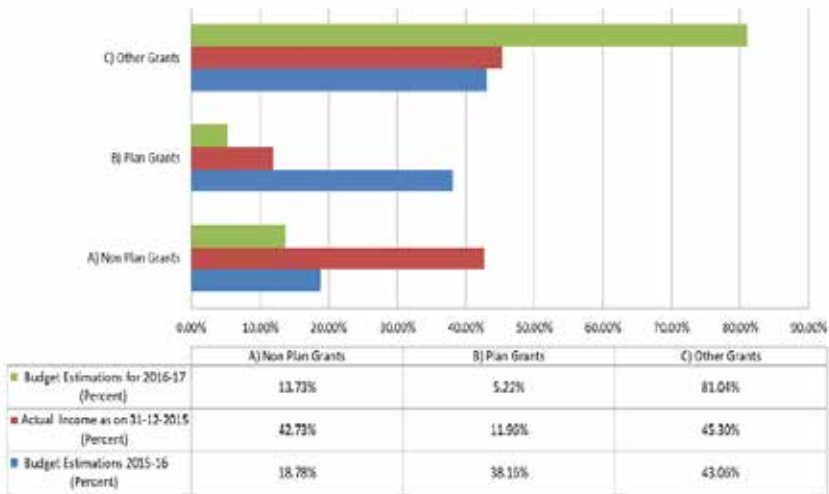


Table 37: Public Health/Sanitation Expenditure

Public Health/ Sanitation Expenditure	Budget Estimations 2015-16	Actual Expenditure 30-09-2015	Revised Budget Estimations 2015-16	Budget Estimations for 2016-17
Wages to workers through Placement Agencies (Wages to Out Sourcing-Sanitation, Park Workers)	950.00	505.08	677.35	1400.00
Rates and Taxes (Road Tax)	20.50.	1.55.	9.10.	5.00.
Insurance to vehicles				10.00.
Fuel /Diesel for Heavy Vehicles	200.00.	135.12.	182.00.	200.00.
Fuel/Diesel for Light Vehicles				50.00.
Purchases Sanitation Conservancy material	14.00.	1.82.	5.09.	10.00.
Purchase of Medicines (Lime, Chemicals & Bleaching Powder)	20.00.	1.25.	5.31.	15.00.
Fogging/ Anti- malaria (Diesel/ Petrol- Maintenance)	1.50.	0.44.	0.45.	1.00.
Livery for PH Staff (Cheppals & Oil, Soaps Uniforms to PHW)	21.00.	-	10.41.	30.00.
Hire Charges to Machinery Rent (JCB, Tractors & Tools & Plants)	-	-	-	1.00.
Repairs & Maintenance of Compost Yard	-	-	-	10.00.
Maintanance of Compost Yards / Transfer Stations	-	-	-	5.00.
Repairs to Heavy Vehicles	5.00.	2.85.	4.90.	5.00.
Repairs to Light Vehicles				5.00.
Expenses on Unclaimed Dead Bodies	1.00.	0.40.	0.40.	1.00.
Control of Stray Animals (Dogs, Pigs & Monkeys)	10.00.	1.00.	1.00.	10.00.
Special Sanitation For Fairs & Festivals	-	-	-	5.00.
TDS from Contractors/Suppliers (Out sourcing Sanitation, Parks Workers)	-	8.16.	16.50.	35.00.
EPF (Out sourcing Sanitation, Parks Workers)	-	204.52.	250.00.	450.00.
ESI (Out sourcing Sanitation, Parks Workes)	-	-	-	150.00.

Public Health/ Sanitation Expenditure	Budget Estimations 2015-16	Actual Expenditure 30-09-2015	Revised Budget Estimations 2015-16	Budget Estimations for 2016-17
Service Tax	-	-	-	1.00.
Collection and Testing of Food Samples	2.00.	-	-	-
Maintanance of Market & Sloughter house	-	-	-	-
Others (Sanitation Expenses)	2.00.	8.49.	10.00.	15.00.
Organization expenses (Pulse polio etc.	2.00.	-	1.56.	2.00.
Diumper bin purchase & repair	2.00.	1.50.	1.50.	2.00.
Funeral charges (private workers)	2.00.	0.40.	0.40.	1.00.
Food adulteration act	2.00.	-	-	-
Vehcile tracking	15.00.	-	-	-
Total	1270.00.	872.58.	1175.97.	2419.00.

11. Conclusions and Recommendations

Karimnagar Municipal Corporation at this juncture in development presents a situation where a number of initiatives have been launched but which have not been put to use for want of last mile connectivity or strategic problem-solving. At the same time non-alignment of the vast human resource developed in the ULB to the priorities of sanitation and solid waste management have resulted in multiple fall-outs.

The dynamic leadership available within the corporation in the form of the Corporation functionaries as well as the elected representatives have not only been part of planning and consultation in the form of the formation of the CSTF and consequent preparation of the CSP and the orientation on AMRUT and exposure to best practice areas within and outside the state but have championed many town level initiatives like distribution of twin-bins, procuring of participation of multi-level stakeholders in the town's initiatives.

The study of Sanitation, Wastewater and Sewerage Management have brought to the fore many insights that are responsible for the situation existing today. It has also identified key performance areas and opportunities that can be leveraged to help improve the existing infrastructure and manpower and bring them to optimal utilization and make decisive strides in moving towards the next generation of initiatives aimed at equitable and sustainable systems.

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Urban Wastewater Management in Telangana

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SANITATION CAPACITY BUILDING PLATFORM