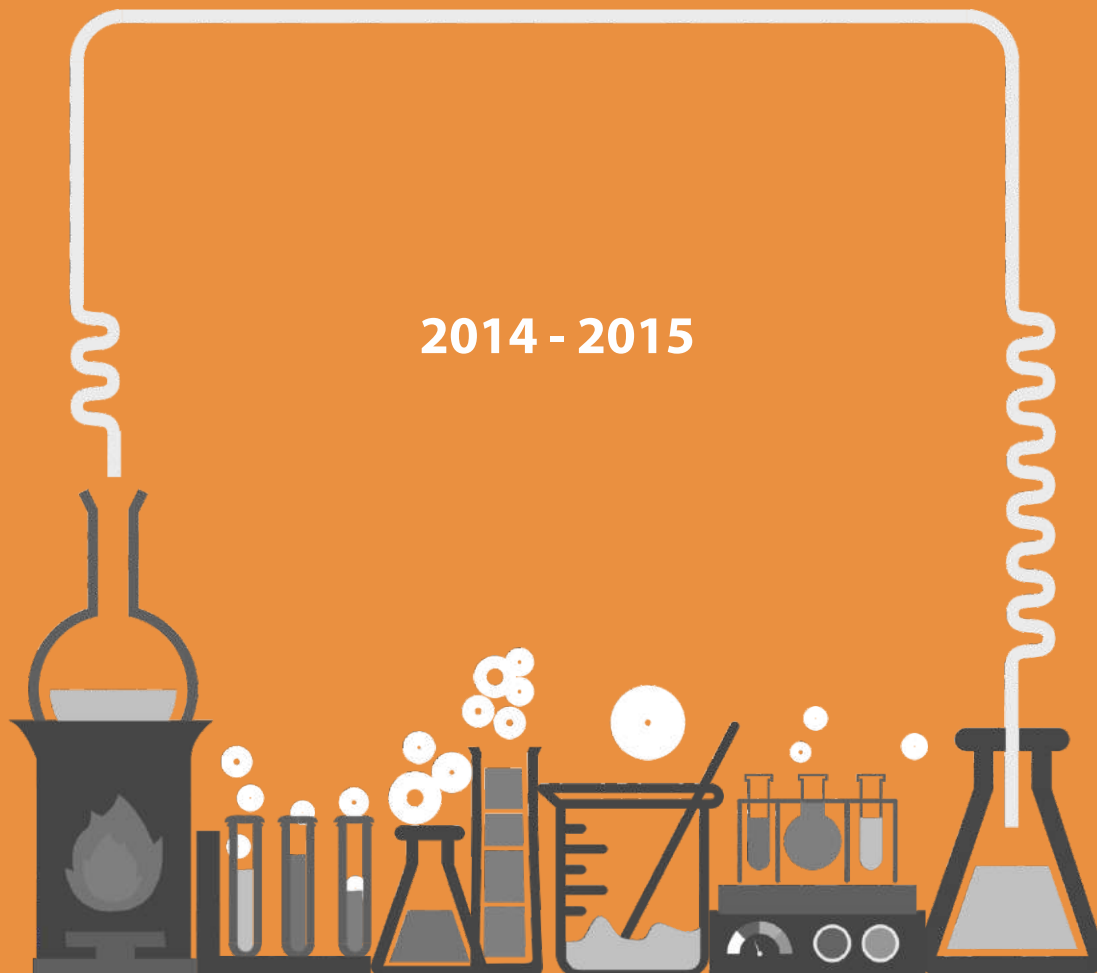




# Status of Water Quality Testing Laboratories In Telangana

2014 - 2015



## IN PARTNERSHIP

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## DISCLAIMER

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## FOREWORD

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India, with a population of 1.2 billion, has made substantial progress in ensuring access to safe water supply. However, 76 million Indians still lack access to improved water sources and about 9 per cent of the habitations face water quality issues due to chemical contamination. Indian government gives more priority to providing access to drinking water, than on improving the quality of water.

Lack of access to safe drinking water is often related to economic, political and social power imbalances, and discrimination against certain groups or communities. The time and energy required to fetch water along with the negative health impacts of using dirty water, also has a huge impact on people's ability to work or get education. Poor and marginalised communities often cannot access sufficient quantities of safe water locally, due to lack of infrastructure and bad management of services or lack of political will to prioritise the right to safe water. WaterAid India works with local partners to help achieve access to potable water and to ensure that local governments take up water quality testing and the community is trained to track information and take actions on the issue.

Few of the critical issues in dealing with water quality are related to weak legislation, enforcement of water quality standards and testing protocols and lack of awareness amongst local communities about the importance of safe water and the cost of poor environmental and domestic hygiene.

In this context, to achieve the mission of safe delivery of drinking water across rural Telangana, WaterAid India carried out a comprehensive assessment to understand the condition of water quality testing laboratories in the state, in partnership with SaciWATERS and Rural Water Supply & Sanitation (RWS&S) Department, Government of Telangana.

With a vision to increase the awareness on the importance of safe water, sanitation and hygiene and build the capacity of frontline workers and government officials, the study was aimed at understanding the implementation gaps and challenges for service delivery of safe drinking water.

Water testing labs play a major role in assessment of results and in identifying common water quality problems such as pH values, presence of chemicals like arsenic, fluorine and iron. I hope the study benefits governments, water testing laboratories and all concerned citizens to recommend water quality surveillance and undertake required changes in rolling out programmes to ensure safe water for everyone, everywhere.

Hyderabad  
22<sup>nd</sup> March 2016



**Neeraj Jain**  
Chief Executive, WaterAid India

## PREFACE

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In February 2013, the Ministry of Drinking Water and Sanitation, Government of India developed a separate Protocol to focus on drinking water. The Uniform Water Quality Monitoring Protocol suggested setting up of more laboratories and to improve the quality of existing laboratories to ensure safe drinking water in all villages. In this regard, the State Government of Telangana (before State bifurcation – 2<sup>nd</sup> June 2014) established several Sub-Divisional Labs with advanced water quality testing infrastructure and initiated capacity building of human resources at different levels.

Today, in Telangana there are a total of 75 Water Quality Testing laboratories (District, Division and Sub Division) working effectively to guarantee clean and safe drinking water to a population of 35.19 million covering 24,437 habitations, 8,705 Gram Panchayats, and 438 Mandals in nine districts. To enhance the functioning of State Laboratories, and to suggest measures for improvement, SaciWATERs in partnership with the State Water and Sanitation Mission (SWSM), Government of Telanagana and WaterAid India conducted the lab assessment in 2014-2015. Such an effort is first of its kind where civil society and government have come together to acknowledge the existing gaps in implementing the National Rural Drinking Water Program.

I hope the findings of this report which emphasises to build capacity of human resources with the required technical and social skills will assist the State Lab and the Rural Water Supply and Sanitation Department (RWS&S) to improve drinking water quality in the State. It is important that the knowledge disseminated from the laboratories on the status of drinking water quality are shared with the rural communities to spread the message of safe drinking water. The current attempt made through this exercise will be immensely useful to engineers, chemists, microbiologists, and decision-makers working in the drinking water sector both in rural and urban areas.

Hyderabad  
22<sup>nd</sup> March 2016



**Dr. Anamika Barua**  
Executive Director, SaciWATERs



## ACKNOWLEDGEMENT

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The State Government of Telangana has taken up drinking water supply project as one of the most prestigious project connecting every household in Telangana with piped drinking water supply in the next three years. In addition to the Government's initiative to provide safe drinking water to rural households, I hope this report will contribute and assist Laboratories in the State to support the RWS&S Department and the Lab officials to ensure quality of drinking water.

The study will support in developing Annual Implementation Plans (AIPs) on aspects like capacity building trainings, infrastructure support, department coordination and community participation for lab operation and maintenance.

On behalf of SaciWATERS, I would like to profoundly thank Mr. Ramulu Naik, Project Director, State Water & Sanitation Mission (SWSM), Mr. J. Viswanath (Director, SWSM) and Mr. Surender Reddy (Engineer-in-Chief, RWS&S). I am specially obliged to Mr. A. Sateesh, Consultant and Mr. R. Parthasarathy, Chief Chemist, RWS&S for showing keen interest in this study and spending their valuable time going through and offering suggestions. I am also thankful to WaterAid India, particularly Ms. Hema Lata Patel (Regional Manager – Southern Region), Mr. Sudhakar Nukala (Program Coordinator – Southern Region) who have been very supportive in all our endeavours to advocate and promote safe drinking water in Telangana.

I am deeply indebted to all the lab officials and their District Coordinators who trusted the team and participated actively in sharing the issues at lab and field level. Without them this study wouldn't have been possible.

I would also like to extend my gratitude to the team at SaciWATERS particularly Mr. Byjesh Kattakandi, Ms. Parepally Sahithi, Dr. Gangadri Gondipalli and Ms. Rithika Fernandes, Mr. Arjun Surendra and Dr. S. N. Reddy (for the preliminary report). Lastly but not the least I would like to thank Mr. Nani Babu (for the GIS support) and Mr. Jyotirmay Das and Ms. Judith Christiana (SaciWATERS) and Ms. Pragya Gupta (WaterAid India, New Delhi) for the edit and Mr. Raju Kakkerla for the overall design of this report.

Hyderabad  
22<sup>nd</sup> March 2016



**Dr. Aditya Bastola**  
Senior Fellow, SaciWATERS

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- V Medak
- VI Nalgonda
- VII Nizamabad
- VIII Rangareddy
- IX Warangal

## **ABBREVIATIONS**

<b>ARWSP</b>	Accelerated Rural Water Supply Programme
<b>AE</b>	Assistant Engineers
<b>BOD</b>	Biological Oxygen Demand
<b>B.Sc</b>	Bachelor of Science
<b>DDWS</b>	Department of Drinking Water supply
<b>Dy. EE</b>	Deputy Executive Engineer
<b>DWSM</b>	District Water and Sanitation Mission
<b>EC</b>	Electrical Conductivity
<b>E. coli</b>	Escherichia coli
<b>GP</b>	Gram Panchayat
<b>H<sub>2</sub>S</b>	Hydrogen Sulfide
<b>IMIS</b>	Integrated Management Information System
<b>Lpcd</b>	Litres per Capita per Day
<b>MPN</b>	Most Probable Number
<b>M.Sc</b>	Master of Science
<b>NRDWP</b>	National Rural Drinking Water Programme
<b>O&amp;M</b>	Operation and Maintenance
<b>pH</b>	Potential of Hydrogen
<b>PHED</b>	Public Health Engineering Department
<b>RWS&amp;S</b>	Rural Water supply and Sanitation
<b>SaciWATERs</b>	South Asia Consortium for Interdisciplinary Water Resources Studies
<b>SWSM</b>	State Water and Sanitation Mission
<b>TDS</b>	Total Dissolved Solids
<b>UNICEF</b>	United Nations Children's Emergency Fund
<b>VWSC</b>	Village Water and Sanitation Committee

## 1. EXECUTIVE SUMMARY

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SaciWATERs in partnership with State Water and Sanitation Mission (SWSM), Government of Telangana, and WaterAid India carried out a comprehensive study to understand the status of Water Quality Testing Laboratories in the State of Telangana. The objective of the study was to ensure the compliance of Uniform Drinking Water Quality Monitoring Protocol across the State laboratories, to maintain quality assurance of testing, supervision of water quality surveillance and monitoring of the status of drinking water in the State of Telangana.

Information regarding the current status of laboratories i.e., its infrastructure, equipment, human resources, and the processes and protocols in record keeping, adherence to testing protocols and reporting system were gathered and analysed. The results observed that most labs have good quality instruments, adequate testing chemicals and other accessories directed under the Uniform Drinking Water Quality Monitoring Protocol. But, the staff's knowledge and skills, working condition of analytical instruments, their maintenance and coordination varied widely across the labs. The district and divisional labs are found relatively better equipped compared to Sub - Divisional Labs in terms of its physical infrastructure.

To avoid such disparities and malfunctioning in labs, it is necessary that the state authority monitor and streamline the provisions sanctioned for the laboratory buildings, equipment, repair mechanisms, chemical supply, recruitment of personnel, administration and coordination among laboratories. Regular refresher courses and capacity enhancement programs would support the staff to equip them with newer techniques and technologies of testing drinking water, lab maintenance, book keeping, collection and preservation of water samples and among others. Communication and technical skills of lab technicians and assistants can be capacitated through capacity building training programs. These training would also help them to disseminate technical information and knowledge on safe drinking water at grassroots level.

The Laboratory Officials had resentment over the recruitment process. The general preference was to formalise the Government recruitment process rather than the current third-party recruitment process. This has raised issues of transparency and accountability among senior engineers appointed at district level. The high attrition rate in State Laboratories are likely to reduce efficiency in delivery of safe drinking water and increase cost on capacity building activities.

For effective delivery of safe drinking water services at grassroots, the National Drinking Water Mission emphasise on participatory approach (Gol, 2013a). It is important that the lab assistants responsible for collection of water samples and dissemination of test results be trained in participatory methods. This ensures sharing the water quality results on a wide scale and is acknowledged at community level, thereby supporting the efforts to spread awareness on water quality and the efficient management of drinking water.

Although the Protocol directs environment, health and safety management of labs, there is a need to focus on human safety measures and waste management within laboratories. In turn lab performances depend on the quality of skilled personnel, the infrastructure, the chemicals provided and the administrative support received. Coordination between the District Coordinator and local RWS&S staff's play a key role for smooth operation of these labs. Hence, sensitization on the importance of safe drinking water, waste management, health and community participation among the key stakeholders particularly from the RWS&S, State labs, and the District labs are vital in order to achieve the goals of National Rural Drinking Water Mission.



## 2. INTRODUCTION

The Indian Constitution has set special provision to ensure safe drinking water as a basic right. Article 47 confers the duty of provisioning clean drinking water and improved public health standards of the State. Ensuring community participation in implementation of safe drinking water supply schemes through sector reforms have been given highest priority in the National Water Policy. But in factual terms only 81 per cent of urban population and 54 per cent of rural population have access to safe drinking water (WHO/UNICEF, 2012), where 69 per cent of country's population still reside in rural India. Drinking water supply in rural India is localized and depends on surface water sources such as lakes, streams, open wells and ground water source.

Keeping in view the ground reality and to address this basic necessity central government provides technical and financial support to state governments through various schemes such as Accelerated Rural Water Supply Programme (ARWSP) (now renamed as National Rural Drinking Water Programme or NRDWP) and Rajiv Gandhi National Drinking Water Mission. The five-year plans allocate a substantial amount for large investments in order to provide sustained drinking water for villages under various programmes. Though water is provided to communities through various schemes, ensuring its quality still remains a major challenge across the country. An unprecedented demand created by an ever increasing population and intensive farming in addition to unreliable rainfall has changed the nature of drinking water supply. Reliance on surface water sources and ever decreasing groundwater levels bring challenges in terms of the quality of drinking water being supplied to the communities. Thus, in recent years, monitoring the quality of water has gained major focus and the need for a robust water supply system which is reliable and safe is being recognized at all levels.

The Twelfth Five Year Plan focused on piped water supply, increasing household tap connections and raising drinking water supply norms from 40 lpcd to 55 lpcd. Coverage of water quality affected habitations was earmarked by funding for areas affected by chemical contamination, Japanese Encephalitis and Acute Encephalitis Syndrome (JE/AES) by the Ministry of Drinking Water and Sanitation, Government of India (GoI, 2013a). Chemical contamination like presence of Iron, fluoride, nitrate, arsenic, salts etc. are prevalent in the country especially in regions with relatively low rainfall. Hence, long term planning is necessary considering sustainability in water availability and supply, poor water quality, centralized vs. decentralized approaches and financing of Operation and Maintenance (O&M) cost while ensuring equity with regard to gender, socially and economically weaker sections of the society and socially vulnerable groups such as pregnant and lactating mothers, differently abled population, senior citizens, and other marginalized sections of the society. With all these issues and challenges emerging in the water sector, laboratories were established to test the entire country's water sources. NRDWP emphasises on providing safe and adequate drinking water facilities to all the habitations. It is one of the six components of Bharat Nirman Yojana launched in 2005, and one of its priority areas being monitoring and amelioration of arsenic and fluoride contaminated sources. It also envisages to test all drinking water sources (both public and private) for the presence of chemical and bacteriological contaminants using field test kits. Sanitary inspection is also a part of this programme. Under this programme a total of 2,161 laboratories were set up across the country to carry out water quality tests. Continuous monitoring and analysis of water sources is being carried out. The findings are published in the public domain.

At the state level, PHED/RWS&S Departments are the primary executing agencies for commissioning rural water supply schemes. District Water and Sanitation Mission (DWSM) carry out the district level functions under the supervision, control and guidance of Zilla Panchayat/Parishad. Village Water and Sanitation Committee (VWSC) at each Gram Panchayat plans, monitors, implements, operates and maintains its Water Supply Scheme. Water Quality Testing Labs play a major role in the analysis of water and identifying common determinants like pH level, presence of chemical contaminants such as arsenic, fluoride, and iron, etc. Consequently they help to recommend studies for further water quality surveillance. These studies collate the learning and the research that is carried out and help in formulating national level strategies for improvement and also recommend remedial measures based on the findings.

### 2.1. The field test program

To decentralize the process of Water Quality Monitoring & Surveillance, field test kits were first provided at Gram Panchayat (GP) level in the year 2005-2006. GPs were given the responsibility to test all the drinking

water sources (both public and private). They then refer the samples which result positive to district and divisional water testing laboratories for confirmation (Gol, 2006). Due to lack of awareness, proper payments and training at GP level, field testing kits at village level were not accepted. Nevertheless, from the field results it was observed that field test kits have their own problems which indeed reiterates the need for government supported laboratories. Thus in Telangana, over 75 Water Quality Testing laboratories has been established to guarantee clean and safe drinking water to all. The labs are mandated to:

- Carry out chemical tests (once in a year) and biological tests (twice in a year) for drinking water in rural areas,
- Report and coordinate with the Administrative staff of the RWS&S department for fixing the cases and solving the issues where sources are found to be contaminated,
- Carry out regular follow up in terms of testing water sources which were found contaminated and are under threat,
- Train the grassroots workers on testing water sources, and
- Enhance capacity of local communities to identify water quality issues.

This exercise is aimed at examining the status of the water quality testing laboratories in the State and if they have been able to fulfil their mandates. The objectives of the assessment include:

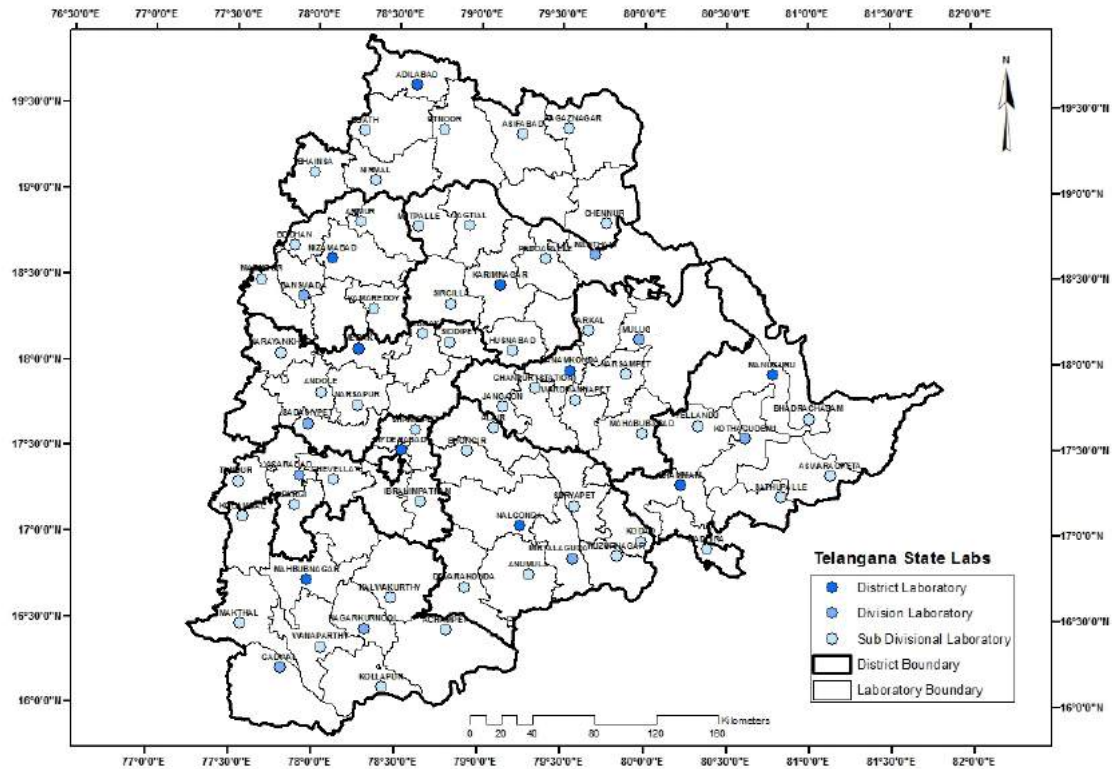
- Analyse the functioning of the water quality testing labs at various levels,
- Identify and analyse the gaps and challenges in implementation, and
- Make multi-level suggestions to fix the identified gaps and thereby improving the effective functioning of laboratories.

## 2.2. The Methodology

The assessment was carried out by SaciWATERs along with representatives from the State Lab. The lab staffs were administered a pre-prepared questionnaire designed as per the Uniform Drinking Water Quality Monitoring Protocol, 2013 (Gol, 2013b) detailing on functioning of lab, extent of coverage of instruments and equipment, chemicals present in the labs and their infrastructure facilities, staff capacity and their knowledge and experience in record keeping, safety measures, coordination and communication with the communities. In addition, the staffs were also subjected to informal interviews, where questions were asked on functioning and issues related to employees, physical infrastructure, instruments, equipment and chemicals, coordination etc. The primary data was collected through questionnaires, informal interviews and group discussions along with information gathered from NRDWP and State water quality labs (Rural Water Supply and Sanitation Department). Data was comprehensively analysed and compared with the minimum required benchmark on drinking water quality testing laboratories in the State of Telangana.

### 3. TELANGANA STATE OVERVIEW

Map 1 Telangana State Water Quality Laboratories



Source: Rural Water and Sanitation Department, Telangana

Under the National Rural Drinking Water Programme, water quality monitoring labs were established all over India, including in the State of Telangana. The State had set up 75 labs and they were given the jurisdiction of 8,705 Gram Panchayats and 24,437 habitations covering 438 Mandals. Presently, the system monitors 1, 17,643 sources. Out of these sources Iron contamination was found to be prevalent in 10.9 per cent (approx. 12,876 sources) followed by Fluoride in 10.8 per cent, Nitrate in 4.9 per cent and TDS in 3.6 per cent. In addition, 9,003 of the sources were found to be bacterially contaminated.

Table 1 Description of Districts

Sl.No.	District	No. of Mandals	No. of GP	No. of Habitations	No. of Sources	No. of Habitations Affected
1	Adilabad	52	866	3,621	25,276	695
2	Karimnagar	57	1,207	2,248	24,247	764
3	Khammam	41	673	2,678	21,397	1,501
4	Mahabubnagar	64	1,325	3,417	19,252	1,846
5	Medak	46	1,071	2,419	18,908	1,293
6	Nalgonda	59	1,179	3,327	25,150	1,640
7	Nizamabad	36	718	1,645	14,685	441
8	Rangareddy	33	704	1,664	10,674	1,014
9	Warangal	50	962	3,418	20,690	2,036
	<b>Total</b>	<b>438</b>	<b>8,705</b>	<b>24,437</b>	<b>1,80,279</b>	<b>11,230</b>

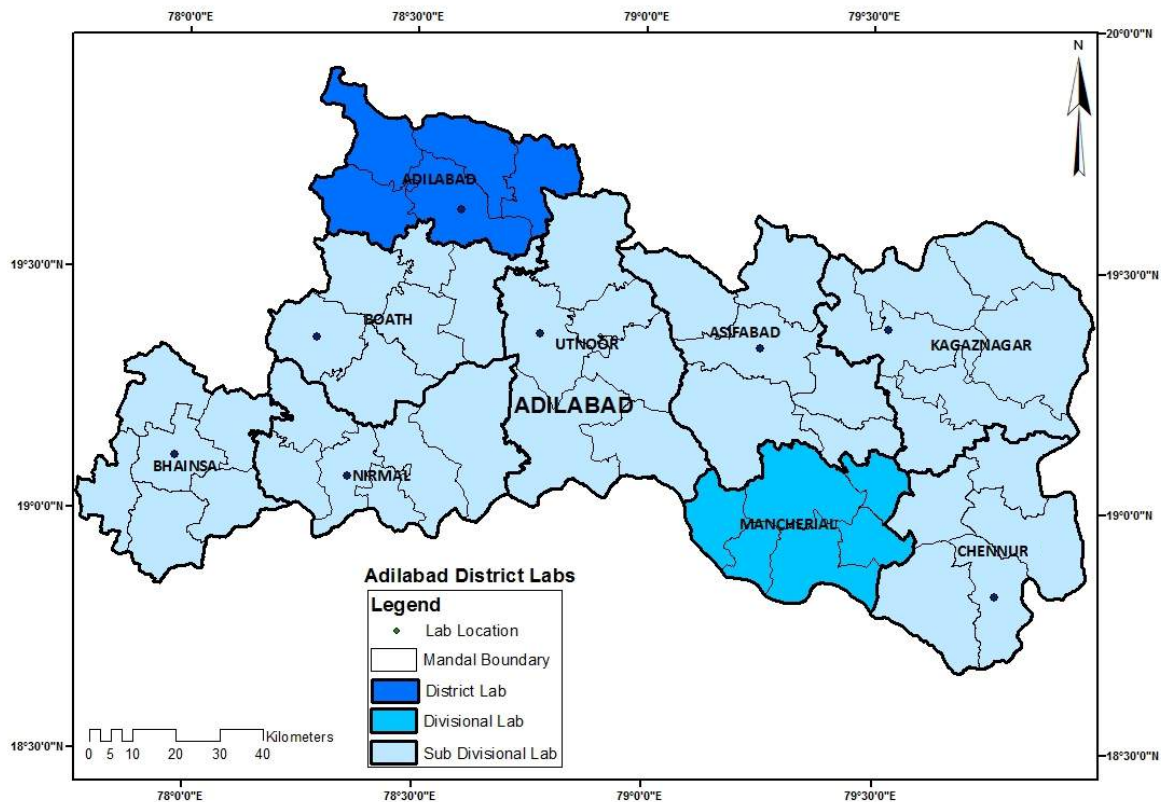
Source: Rural Water and Sanitation Department, Telangana

It has been noted that the labs were provided with good quality instruments, equipment and chemicals in a manner that minimizes operational error. However, in practice, it was seen that the quality of the labs varies by a large margin, even within the same district. The District and Divisional labs were consistently found better than Sub - Divisional Labs, except in the case of Nalgonda district. Quality of personnel and access to chemicals also varies, as the appointment of staff is often in the hands of the local Rural Water Supply and Sanitation department staff. It was seen that the functioning of a lab depends on the amount of involvement of RWS&S staff. Similar is the case of the quality of the lab's physical infrastructure. The district and divisional labs seem by and large (with a few exception) better equipped, both in terms of availability and possibly because of the fact that the "spotlight" often fell on these labs in times of health issues, such as gastrointestinal epidemics. There are some issues that could be improved such as streamlining of chemicals, equipment, repair mechanism and consumables. Besides this, though in most labs the record keeping is done satisfactorily, some labs require additional building spaces. On the whole, the labs in the State of Telangana can be said to be functioning well, with some minor issues.



## 4. ADILABAD DISTRICT LABS

Map 2 Adilabad Water Quality Labs and their jurisdiction



Source: Rural Water and Sanitation Department, Telangana

### Box 1 Adilabad District Overview

#### Situation of the District

Total Population - 27,41,239  
 Rural Population - 72.27 %  
 Urban Population - 27.73 %  
 Male Population - 1,369,597  
 Female Population - 1,371,642  
 Density of Population (per Sq. Km.) - 170  
 Sex Ratio (per 1000) - 1001  
 Child sex ratio - 934  
 Households with Tap Water 2001 - 16.5 %  
 Household with Tap Water 2011 - 31.3 %  
 Source : Census 2001, 2011

In Adilabad district, the drinking water coverage has increased by 47.2 per cent in the last decade (2001-2011). The SWSM established four sub-division labs in 2012, and later in 2014 two more sub-division labs were added. At present, the district has nine labs covering 30 Mandals of 866 Gram Panchayats (GPs) and 3,681 habitations. In 2014 - 15, water samples from 14,857 sources were tested in the district. The chemical status of drinking water result indicated the presence of Iron in 724 sources, Nitrate in 722 sources and Fluoride in 389 drinking water sources.

### 4.1. History and Jurisdiction

Adilabad District Lab was the first water quality testing lab out of the nine existing labs. It was established in 1999. The others labs came into operation after 2000. In a year the labs of Adilabad district tested water samples from 14,857 sources. The labs have a workforce of 40 staffs which includes Technicians, Field and Lab Assistants. They are engaged in continuous monitoring of sample collection from drinking water sources, analysing and reporting the findings to the concerned GPs. The labs currently cover only 59 per cent of the total drinking water sources in the district.

Table 2 Description of Adilabad Laboratories

Lab Name	Year of Establishment	No. of Mandals	No. of GP	No. of Habitations	No. of Staffs	Total Sources	Sources Tested 2014-15	Coverage (percentage)
Adilabad District Lab	1999	5	112	359	5	2,137	1,834	86
Mancherial Division Lab	1999	6	81	275	6	2,806	2,374	85
Boath Sub-Division Lab	2012	6	91	512	4	2,481	1,629	66
Utnoor Sub-Division Lab	2005	6	106	704	4	3,377	2,111	63
Bhainsa Sub-Division Lab	2014	6	110	247	5	2,630	NA*	NA*
Chennur Sub-Division Lab	2014	5	86	276	4	2,608	399	15
Asifabad Sub-Division Lab	2012	6	69	582	4	3,363	1,887	56
Kagaznagar Sub-Division Lab	2012	6	105	409	4	3,043	1,890	62
Nirmal Sub-Division Lab	2012	6	106	317	4	2,831	2,733	97
<b>Total</b>		<b>52</b>	<b>866</b>	<b>3,681</b>	<b>40</b>	<b>25,276</b>	<b>14,857</b>	<b>59</b>

\*(Data Not Available) New Lab established in April-May 2014

Source: Rural Water and Sanitation Department, Telangana

## 4.2. Drinking Water Contamination Status

Table 3 Adilabad drinking water contamination status

Lab Name	Sources tested	Alkalinity	Fluoride	Iron	Nitrate	TDS	pH
Adilabad District Lab	1,834	5	8	42	98	3	0
Mancherial Division Lab	2,374	1	124	367	1	4	0
Asifabad Sub - Division Lab	1,887	2	5	14	8	0	0
Boath Sub - Division Lab	1,629	1	147	274	567	23	4
Chennur Sub - Division Lab	399	0	3	2	0	0	0
Kagaznagar Sub - Division Lab	1,890	1	10	16	17	0	0
Nirmal Sub - Division Lab	2,733	0	32	9	31	0	0
Utnoor Sub - Division Lab	2,111	1	60	0	0	0	0

Source: NRDWP 2014-15 data



In 2014-15, the labs in the district tested 14,857 sources. Out of these, 1,633 sources (11 per cent) were found to be chemically contaminated and Coliform was found in 1.02 per cent of the total sources tested.

The lab-wise contamination status highlights that Boath Sub-Division Lab had the highest rate of contamination with 50.03 per cent of the total sources tested, followed by Mancherial (19.97 per cent), Adilabad (7.69 per cent) and Utnoor (2.89 per cent). Mancherial Division Lab (74 per cent), Asifabad Sub-Division Lab (48 per cent) and Chennur Sub-Division Lab (40 per cent).

The labs in Adilabad district have followed up and re-tested the same drinking water sources more than five times in a year. Kagaznagar Sub-Division Lab, in particular has re-tested the same source for 16 times in a year to understand the contamination pattern. Almost half of the total contaminated sources were regularly followed up by Kagaznagar Sub-Division Lab, Utnoor Sub-Division Lab and Adilabad District Lab. At Kagaznagar Sub-Division Lab the retesting of drinking water sources in different periods were carried out in order to understand the variations in chemical contamination of the same sources that were caused due to increasing intensity of water usage and the ever changing environment.

### 4.3. Infrastructure and Facilities

The quality of lab equipment are of high standard but their operation and maintenance differ within the labs. For instance, Bhainsa and Chennur Sub-Division Labs established recently, in April-May 2014 have received all necessary lab equipment. The labs were provided with computers for daily reporting of the water quality reports but they are also being used for non-lab purposes especially by the Assistant Engineers (Aes).

Each lab in the district has its own shortcomings. All labs have separate rooms for chemical and microbiological tests except Bhainsa Sub-Division Lab. Apart from the Boath Sub-Divisional Lab, all the other labs are housed within government premises under the supervision of Assistant Engineer/Executive Engineer (EE). At Mancherial Sub-Division Lab there is space constraints for both chemical and biological experiments and for administrative purposes. The lab officials use the RWS/RWS&S office to document the analysed data and upload the monthly IMIS report.

Due to acute power supply and the lack of building wiring, the equipment have not been utilized optimally. During our assessment some of the important instruments such as UV Laminar Air Flow Chamber for bacteriological analysis, incubators, and hot air oven were not functioning and most labs didn't have adequate water supply. It was noticed that in all the Sub-Division Labs, the building wiring system was in poor state, and the employees were not fully aware about safety measures. Staffs often did not use footwear while handling electrical lab equipment. They are exposed to conductive parts making them vulnerable to electric shocks. Except in Adilabad District Lab, Mancherial Sub-Division Lab, and Nirmal Sub-Division Lab, there was no practice of using closed footwear or hand gloves to prevent bacterial or chemical substances from outside hampering the experiments. The State Lab regularly conducts trainings on Lab Safety Measures, the protocol explicitly mention safety measures to be followed, but eventually most of the the labs do not practice these. Similarly, the protocol highly regards safe disposal of laboratory wastewater but the labs in question here often let out the wastewater in the open ground. These labs are not connected to any sewage system. Across all the labs in the district there is no drainage system for safe disposal of solid and liquid wastes.

### 4.4. Human Resources

Labs in the district have adequate and well-qualified teams. But some of these teams lack skills to use new technology, some require skill upgradation for assessing emerging chemical and microbiological contaminants. The reasons for existence of such incapacities, though State Lab conducts annual capacity building trainings, is due to higher attrition rate amongst the lab staffs. This is a common issue felt across all staffs in the State Labs due to lack of timely release of salary by the third-party contractor.

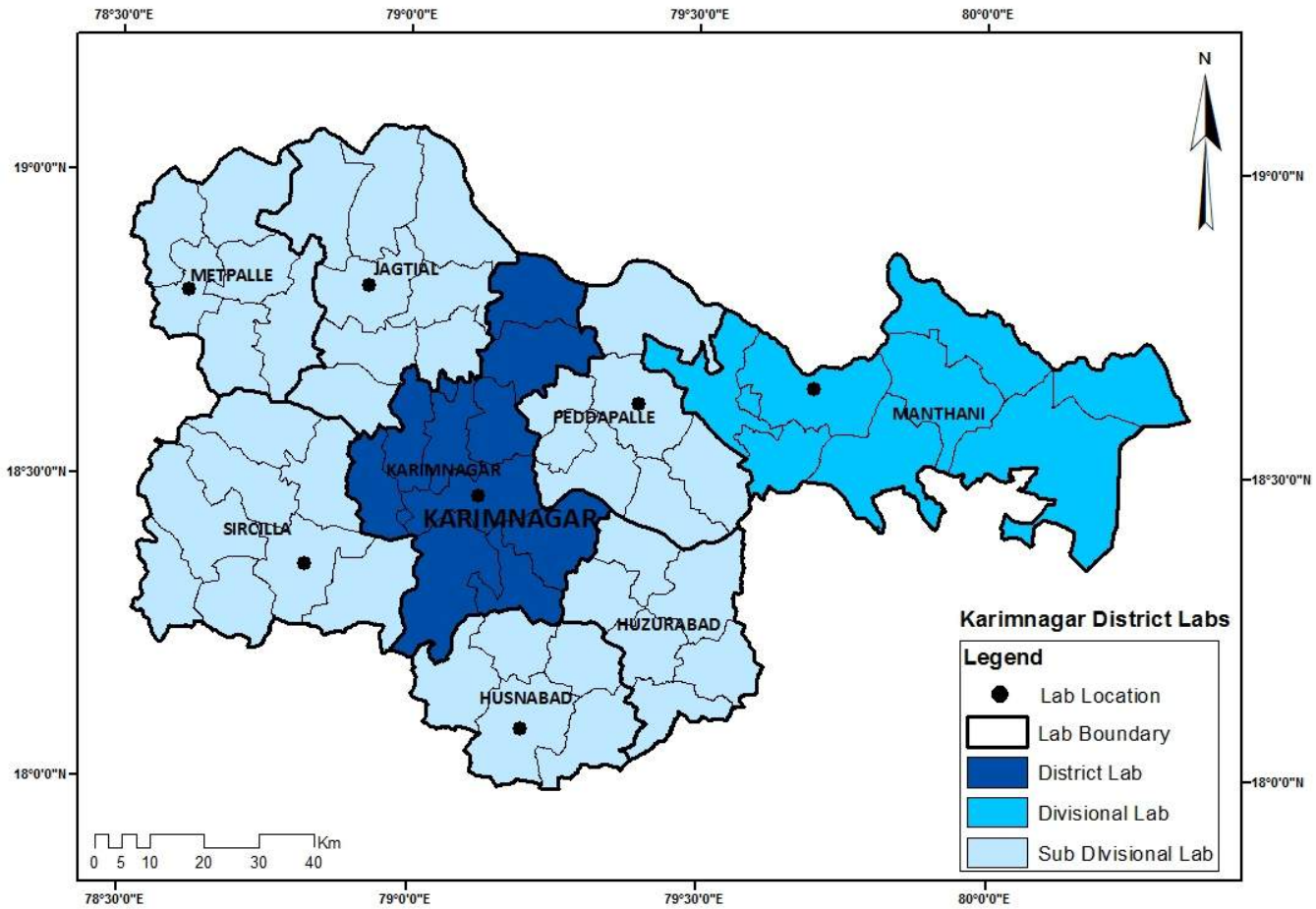
The Field Assistants are responsible for communicating the water source quality report to the Gram Panchayat. The water quality reports are maintained at the lab level, but report dissemination acknowledgement from the community is not recorded at the labs. There is a need to build capacities of

these Field Assistants on the methods of knowledge dissemination for effective communication with the end-users at community level. It is essential that Field Assistants are familiar with social mobilisation processes for building community awareness on safe drinking water.



## 5. KARIMNAGAR DISTRICT LABS

Map 3 Karimnagar Water Quality Labs and their jurisdiction



Source: Rural Water and Sanitation Department, Telangana

### Box 2 Karimnagar District Overview

#### Situation of the District

Karimnagar Total Population – 3,776,269  
 Rural Population – 74.81 %  
 Urban Population – 25.19 %  
 Male Population - 1,880,800  
 Female Population - 1,895,469  
 Density of Population (per Sq. Km.) - 319  
 Sex Ratio (per 1000) - 1008  
 Child sex ratio - 935  
 Households with Tap Water 2001 – 36.6 %  
 Household with Tap Water 2011 – 66.9 %  
 Source: Census 2001,2011

The Census 2011 indicates that coverage has increased of by 45.3 per cent when compared to Census 2001. To cater to the need for testing drinking water, four Sub-Divisional Labs were established in 2012 in addition to the existing eight labs that cover 1,197 Gram Panchayats and 2,249 habitations. District wide, only 62 per cent of the water sources were tested in the laboratories during 2014-2015. Fluoride (1,886 sources) was found to be prevalent in the tested sources followed by Iron (545 sources) and Nitrate (237 drinking water sources).

### 5.1. History and Jurisdiction

Karimnagar District Lab and Manthani Divisional Lab was established in the late 1990's and other labs became functional in 2012. These labs cover 57 Mandals, 1197 Gram Panchayats and 2249 habitations. In terms of number of sources tested last year, Karimnagar District Lab had tested 2454 sources. Sircilla and Manthani Sub - Divisional Labs and other Sub - Divisional Labs that tested sources that are in the range of 1700-1900. The district-wide coverage of these labs are approximately 62 per cent of the total sources.

Table 4 Description of Karimnagar Laboratories

Lab Name	Year of Establishment	No. of Mandals	Gram Panchayats	Habitations covered	No. of Staffs	Total Sources	Sources Tested 2014-15	Coverage (percentage)
Karimnagar District Lab	1997	10	238	429	6	5,422	2,454	45
Manthani Division Lab	1998	7	112	347	7	3,320	1,958	59
Sircilla Sub-Division Lab	2012	8	187	312	4	3,044	1,964	65
Jagital Sub-Division Lab	2010	8	193	306	4	3,248	1,921	59
Huzarabad Sub-Division Lab	2012	6	127	195	4	2,163	1,384	64
Husnabad Sub-Division Lab	2012	5	107	268	4	2,597	1,760	68
Metapally Sub-Division Lab	2012	6	111	143	4	2,013	1,621	81
Peddapally Sub-Division Lab	2011	7	122	249	4	2,440	1,923	79
<b>Total</b>		<b>57</b>	<b>1,197</b>	<b>2,249</b>	<b>37</b>	<b>24,247</b>	<b>14,985</b>	<b>62</b>

Source: Rural Water and Sanitation Department, Telangana

## 5.2. Drinking Water Contamination Status

In 2014-2015, the labs in the district tested 14,985 sources. Out of the total drinking water sources tested, 2,817 (18.79 per cent) were found chemically and microbiologically contaminated. The common chemical contaminations as per the results included Fluoride (66.95 per cent), Magnesium (33.47 per cent), Calcium (23.03 per cent), Iron (19.34 per cent) and Nitrate (8.41 per cent). Presence of Calcium, Magnesium and Alkalinity are the new emerging water contamination issues in the district. The microbiological contamination in the form of Coliform bacteria in the total sources tested was found to be 5.78 per cent.

At Lab level - out of 14,985 samples tested, 16.35 per cent (2,450 sources) were chemically contaminated in which Fluoride was present to be in 13 per cent, Magnesium in 6.29 per cent, Calcium in 4.3 per cent, and Iron in 3.6 per cent. Husnabad Sub - Divisional Lab has the highest level of chemical contamination (72 per cent) followed by Karimnagar District Lab (30 per cent) and Huzurabad Sub - Divisional Lab (19 per cent) of the total sources tested. The lab records show, repeated testing of the contaminated sources to monitor contamination status of the sources in different seasons i.e., monsoon and post monsoon seasons. This practice is followed across all labs in the State.



Table 5 Karimnagar drinking water contamination status

Lab Name	Sources tested	Alkalinity	Fluoride	Iron	Nitrate	TDS	pH
Karimnagar District Lab	2,454	69	399	180	8	69	0
Manthani Division Lab	1,958	0	104	0	1	0	1
Husnabad Sub - Division Lab	1,760	5	888	166	207	3	0
Huzurabad Sub - Division Lab	1,384	0	68	189	6	0	0
Jagtial Sub - Division Lab	1,921	0	45	3	1	0	0
Metpalle Sub - Division Lab	1,621	0	19	0	3	2	0
Peddapalle Sub - Division Lab	1,923	0	30	2	4	0	0
Sircilla Sub - Division Lab	1,964	0	333	5	7	0	0

Source: NRDWP 2014-15 data

### 5.3. Infrastructure and Facilities

The Sub - Divisional Labs in Karimnagar district were mostly functioning within the premises of Assistant Engineer, Deputy Engineer or Executive Engineer's Offices. The offices were in need of renovation and separate spaces for conducting both chemical and biological tests. Labs in the district often report of space constraint as the major irritant to conduct regular water testing. For instance, since 1958 the Manthani Sub - Divisional Lab functions in a single room. The laboratory building is poorly maintained. Similarly, Peddapalle Sub - Division Lab has very limited space to conduct microbiological tests. The Huzurabad Sub - Division Lab on the other hand cannot operate heavy instruments due to poor electric wiring.

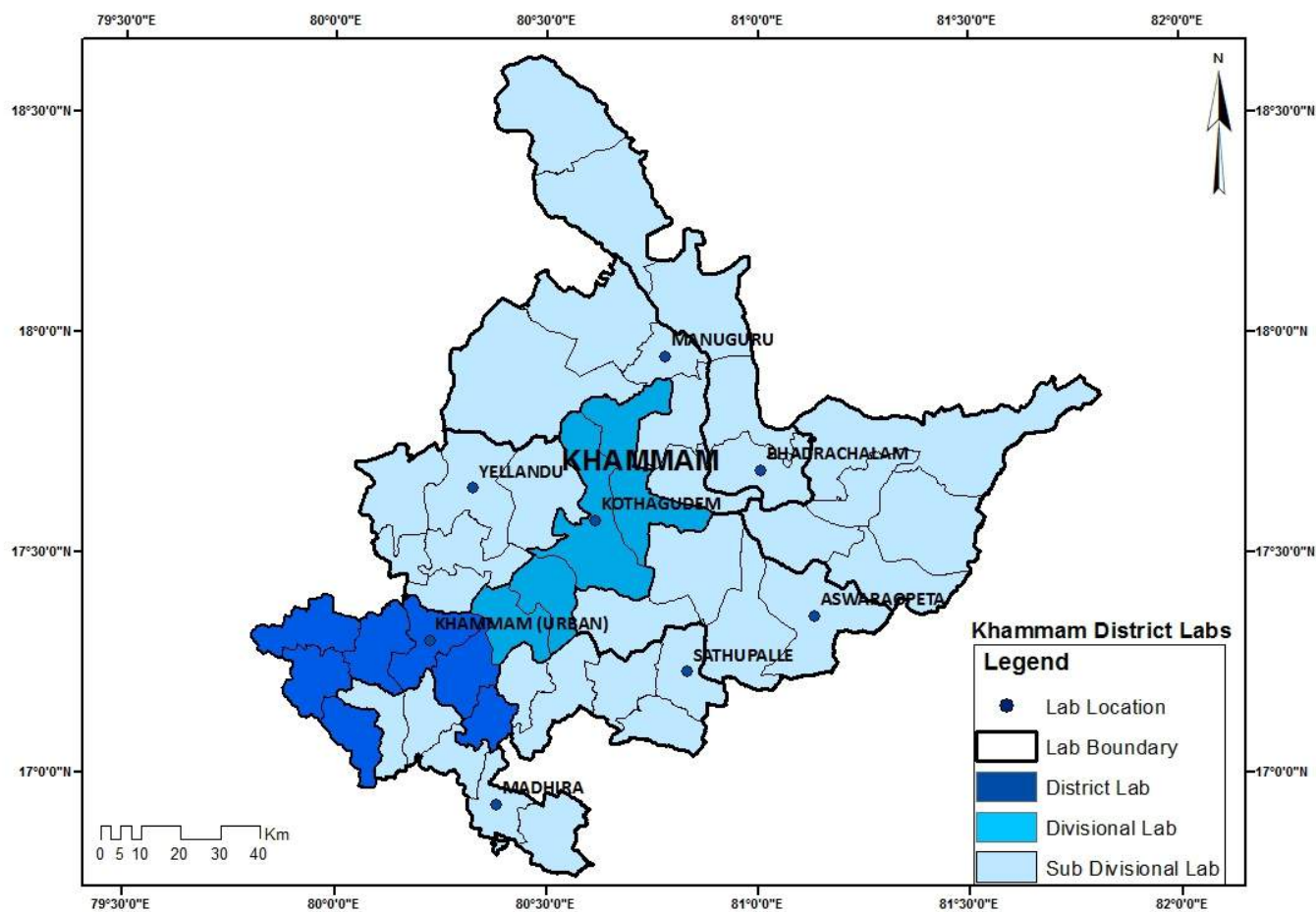
Most of labs have provisions for continuous electricity and water supply, except for Husnabad Sub - Division Lab. The voltage fluctuations has caused burning of electric wires and damaged lab instruments. Often laboratories prepared their own distilled water. At Husnabad Sub - Division Lab, distilled water is purchased since they have no piped water supply.

### 5.4. Human Resources

The technical staffs across the labs are well-qualified and have a minimum of B.Sc. and M.Sc. degrees. The shortcomings are they lack avenues for skill upgradation and knowledge on emerging water quality issues and new technologies. Husnabad Sub - Division Lab staffs stated that they require training on lab analysis, reporting and record keeping. Some lab staffs expressed dissatisfaction over their job portfolios, as the Assistant Engineers assign them with non-lab related personnel work. The lab officials also expressed strong resentment over irregular release of salaries. Yet with several shortcomings, some lab officials particularly from Jagtial and Sircilla Sub - Division Labs were keen to conduct sanitary surveys and are highly motivated.

## 6. KHAMMAM DISTRICT LABS

Map 4 Khammam water quality labs and their jurisdiction



Source: Rural Water and Sanitation Department, Telangana

### Box 3 Khammam District Overview

#### Situation of the District

Khammam Total Population – 2,607,066  
 Rural Population – 74.90 %  
 Urban Population – 25.10 %  
 Male Population – 49.80 %  
 Female Population – 50.20 %  
 Density of Population (per Sq. Km.) - 174  
 Sex Ratio (per 1000) - 1011  
 Child sex ratio - 958  
 Households with Tap Water 2001 - 25.1 %  
 Source: Census 2001, 2011

Census 2011 indicates that drinking water coverage had an increase of 56.7 percent in the district compared to Census 2001.

### 6.1. History and Jurisdiction

Khammam district has eight water quality testing laboratories among which two are divisional and six are sub-divisional level. The labs of Khammam district were

set up later compared to the labs of other districts. These eight labs have a jurisdiction of 673 GPs and 2,678 habitations covering 41 Mandals, which cover 72 per cent of total district water sources.



Table 6 Description of Khammam Laboratories

Lab Name	Year of Establishment	No. of Mandals	No. of GP	Habitations covered	No. of Staffs	Total Sources	Sources Tested 2014-15	Coverage (percentage)
Khammam District Lab	1998	7	177	387	6	4,082	2,949	72
Kothagudam Division Lab	2000	4	57	314	6	2,343	1,530	65
Madhira Sub - Division Lab	2012	5	108	153	4	2,643	1,657	63
Manuguru Sub - Division Lab	2012	5	49	347	4	1,823	1,227	67
Sathupally Sub - Division Lab	2012	5	97	222	4	3,161	1,650	52
Yellandu Sub - Division Lab	2012	6	77	569	4	3,093	2,437	79
Aswaraopeta Sub - Division Lab	2010	4	54	339	3	1,979	1,979	100
Bhadrachalam Sub - Division Lab	2010	5	54	347	4	2,490	1,927	77
<b>Total</b>		<b>41</b>	<b>673</b>	<b>2,678</b>	<b>35</b>	<b>21,397</b>	<b>15,359</b>	<b>72</b>

Source: Rural Water and Sanitation Department, Telangana

## 6.2. Drinking Water Contamination Status

Table 7 Khammam drinking water contamination status

Lab Name	Sources tested	Alkalinity	Fluoride	Iron	Nitrate	TDS	pH
Khammam District Lab	2,949	2	203	54	1	118	5
Kothagudem Division Lab	1,530	0	3	869	36	2	0
Bhadrachalam Sub - Division Lab	1,927	2	9	191	80	0	0
Madhira Sub - Division Lab	1,657	91	594	263	409	265	4
Manuguru Sub - Division Lab	1,227	81	55	237	389	118	2
Sathupalle Sub - Division Lab	1,650	176	124	588	2	164	4
Yellandu Sub - Division Lab	2,437	3	30	166	182	3	0
Kallur Sub - Division Lab	1,979	7	19	50	1	6	0

Source: NRDWP 2014-15 data

The eight labs in the district monitors over 15,000 sources where Magnesium (36.2 per cent); Iron (15.7 per cent); nitrate (7.2 per cent); Fluoride (6.8 per cent) were found as the major chemical contaminants. Biological contaminant as Coliform bacteria were tested and founded positive in 7.1 per cent of the total sources in the district. Turbidity and hardness were also major concerns in the district. Kothagudem,

Madhira, Manuguru and Sathepalle Labs test results indicate higher concerns about the contamination of drinking water sources compared to other labs in the district.

### 6.3. Infrastructure and Facilities

All labs are equipped with advanced digital machines and lab equipment. But many labs reported that the computers and printers were not working and hence data uploading was not being done efficiently. Furthermore, 60 per cent of the labs do not prepare distilled water due to non-functional distillation apparatus (Kothagudem, Sathupally, Bhadrachalam, Madhira). Distilled water is often purchased for test preparation, while some labs (Yellandu Sub- Division Lab) do not have continuous water supply.

As per the Protocol for reliable analysis of microbiological test a separate room is allocated to all laboratories. Sathupally and Yellandu Sub – Division Labs lack separate room to conduct microbiological tests. Interestingly laboratories require electricity supply with dedicated meter to operate the lab instruments. Madhira Sub - Division Lab though has electricity supply but it has no electric meter connection. Khammam District Lab, Kothagudem Division Lab, Manuguru and Yellandu Sub - Division Labs operate with a shared electric meter connection.

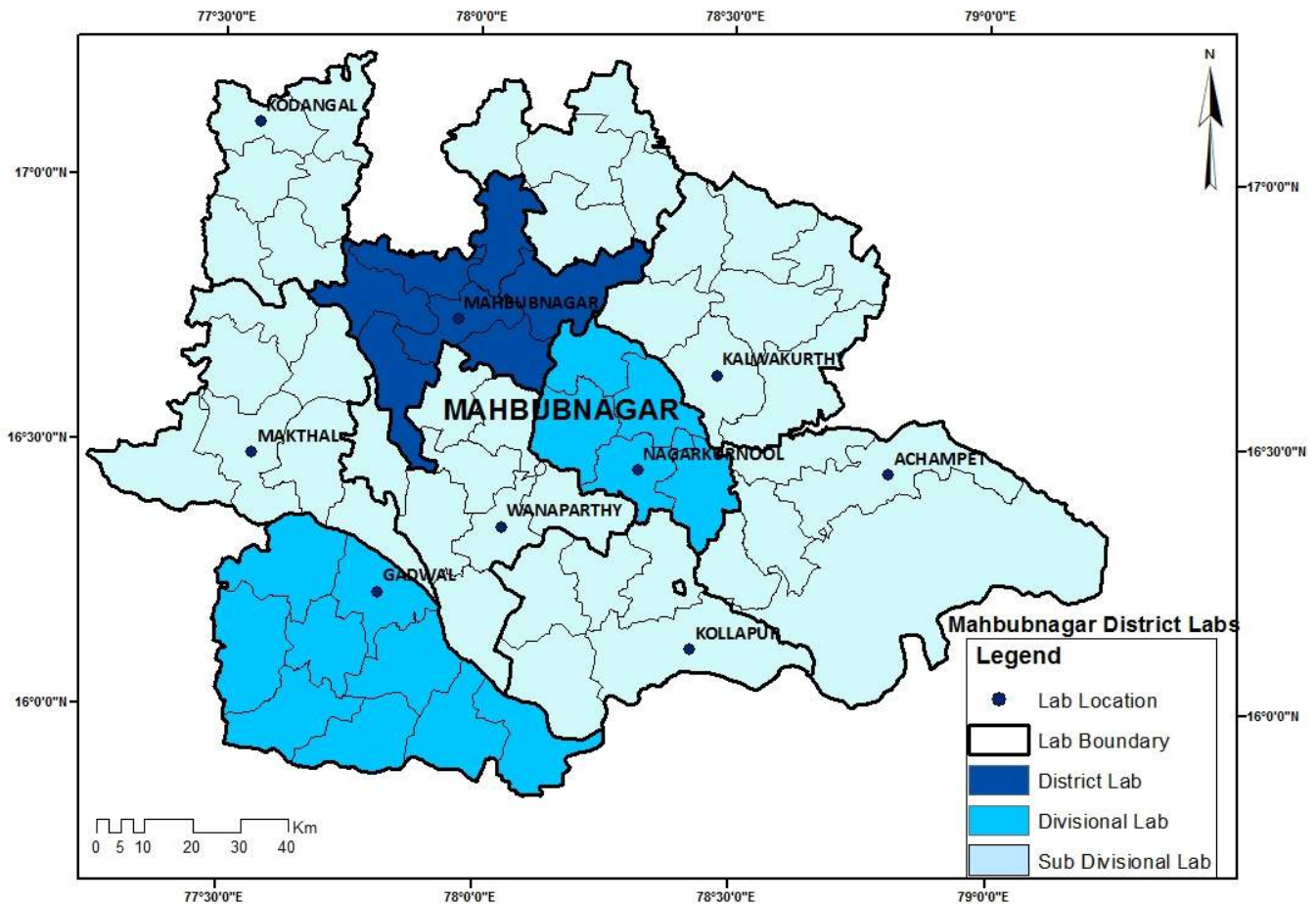
### 6.4. Human Resources

Often the laboratories in the district have educationally qualified professionals directed under the Protocol. However, at Khammam and Kothagudem labs there is no Microbiologist. In Aswaraopeta Sub - Division Lab due to lack of Field Assistants (who are responsible for collecting water samples and disseminating test results to community), this responsibility is shared by the Lab Chemist and Microbiologist. Due to naxalite activities in Khamman district, the lab assistants find difficulty in collecting samples at village level.

The staffs across the laboratories have raised concerns over the increasing pressure from the Engineers to carry out non-lab related roles and responsibilities and sheer lack of cooperation. The staffs in the district have reported over the discontent on timely release of salary and added burden of responsibility towards the State Laboratory for the Assistant Engineers and the Deputy Executive Engineers.

## 7. MAHBUBNAGAR DISTRICT LABS

Map 5 Mahabubnagar water quality labs and their jurisdiction



Source: Rural Water and Sanitation Department, Telangana

### Box 4 Mahabubnagar District Overview

#### Situation of the District

Total Population – 4,053,028  
 Rural Population – 85.01 %  
 Urban Population – 14.99 %  
 Male Population – 2,050,386  
 Female Population – 2,002,642  
 Density of Population (per Sq. Km.) - 220  
 Sex Ratio (per 1000) - 977  
 Child sex ratio - 925  
 Households with Tap Water 2001 - 50.6 %  
 Household with Tap Water 2011 – 76.2 %  
 Source: Census 2001, 2011

According to the Census Data of 2011 coverage in terms of drinking water sources in the district has increased at the rate of 23.9 per cent compared to 2001 Census. In 2014-2015, the labs in the district tested 12,059 to 13,183 water sources. Out of the total drinking water sources tested 3,168 (26.27 per cent) were found to be chemically contaminated.

### 7.1. History and Jurisdiction

Mahabubnagar district has ten labs for monitoring and testing drinking water sources. One District Lab is situated in Mahabubnagar, two Divisional Labs are in Nagarkurnool and Gadwal, and seven Sub-Divisional labs in Achampet, Kalwakurthy, Kodangal, Kollapur, Makhthal, Shadnagar and Wanaparthy respectively. These labs test the water quality sources covering 64 mandals with 1,329 GPs and 3,152 habitations testing around 13,183 water sources in the district. These ten labs cover 68 per cent of the total drinking water sources in the district. District Lab and the two Divisional Labs have six staffs each and the Sub-Divisional Labs have 4 staffs each (a Chemist, Microbiologist, Field Assistant and a Lab Assistant).

Table 8 Description of Mahabubnagar Laboratories

Lab Name	Year of Establishment	No. Of Mandals	Gram Panchayats	Habitations covered	No. of Staffs	Total Sources	Sources Tested 2014-15	Coverage (percentage)
<b>Mahabubnagar District Lab</b>	NA	7	154	513	6	2,168	1,494	69
<b>Nagarkurnool Division Lab</b>	1998	5	99	210	6	1,404	1,404	100
<b>Gadwal Division Lab</b>	1999	9	196	320	6	2,265	1,222	54
<b>Achampet Sub Division Lab</b>	2012	5	83	231	4	1,748	958	55
<b>Kalwakurthy Sub Division Lab</b>	2012	7	146	463	4	2,742	1,730	63
<b>Kodangal Sub Division Lab</b>	2012	6	140	388	4	1,722	1,031	60
<b>Kollapur Sub Division Lab</b>	2012	5	90	91	4	1,579	1,099	70
<b>Makthal Sub Division Lab</b>	2012	7	144	288	4	1,896	1,536	81
<b>Shadnagar Sub Division Lab</b>	2012	5	124	468	4	1,431	1,272	89
<b>Wanaparthy Sub Division Lab</b>	2012	8	153	180	4	2,332	1,437	62
		<b>64</b>	<b>1,329</b>	<b>3,152</b>	<b>46</b>	<b>19,252</b>	<b>13,183</b>	<b>68</b>

Source: Rural Water and Sanitation Department, Telangana

## 7.2. Drinking Water Contamination Status

The 2014-2015 Mahabubnagar drinking water status data revealed the presence of Iron (21.7 per cent), Fluoride (8.6 per cent) and Nitrate (7.3 per cent) as the major chemical contaminants. As in the case with other districts in the state, hardness of water is a problem in Mahabubnagar district as well.

Table 9 Mahabubnagar drinking water contamination status

Lab Name	Sources tested	Alkalinity	Fluoride	Iron	Nitrate	TDS	pH
Mahabubnagar District Lab	1,494	132	223	424	710	85	0
Gadwal Division Lab	1,404	21	100	939	22	126	1
Nagarkurnool Division Lab	1,222	34	504	47	8	70	1
Achampet Sub Divisional Lab	958	73	38	483	11	94	1
Kalwakurthy Sub Divisional Lab	1,730	0	10	9	2	0	0
Kodangal Sub Divisional Lab	1,031	1	128	15	7	1	0
Kollapur Sub Divisional Lab	1,099	1	16	347	61	0	0
Makthal Sub Divisional Lab	1,536	85	59	6	6	186	0
Shadnagar Sub Divisional Lab	1,272	31	14	195	39	48	0
Wanaparthy Sub Divisional Lab	1,437	58	36	394	91	60	2

Source: NRDWP 2014-15 data

### 7.3. Infrastructure and Facilities

In most labs, instruments are provided and most are in working condition except for a few which needed usual maintenance. They don't have spare battery supply and usually it is the staff or the District Consultant who replaces it spending their own money. It was also noted that computers are not functioning in some of the labs, and in Kodangal lab, the computer system is placed at the Assistant Engineer's office, and used by the regular RWS&S staff.

Generally most labs in Mahabubnagar district are well equipped with good infrastructure, except Kalwakurthy Sub - Division Lab that is poorly spaced and even lack basic furniture. The lab lacks basic drainage and sanitation facilities, the lab liquid waste is drained into the open ground. The Achampet and Gadwal Sub -Division Labs are in a dire need of renovation since it is located in an old government building. While some Sub -Division Labs like Wanaparthy and Kollapur have already initiated to renovate the laboratories. The Kollapur Sub -Division Lab is still under construction for a separate bacteriological room.

### 7.4. Human Resources

Across all the labs in Mahabubnagar, the available lab officials were educationally qualified as per the Protocol, and were well trained and knowledgeable. However the newly appointed staffs lacked training in lab management and related experiences. Interestingly in some sub-divisional labs, the Deputy Executive Engineer took keen interest in smoothening operation and managing the laboratories. Unlike the Achampet Sub -Division Lab, the lab space was occupied with the RWS&S field materials, leaving little



space for the lab to function. In some labs, the lab officials were carrying out RWS&S work. At Gadwal and Makhthal sub divisional lab, the lab assistants and lab helper were frequently asked to support RWS&S in the day-to-day activities.

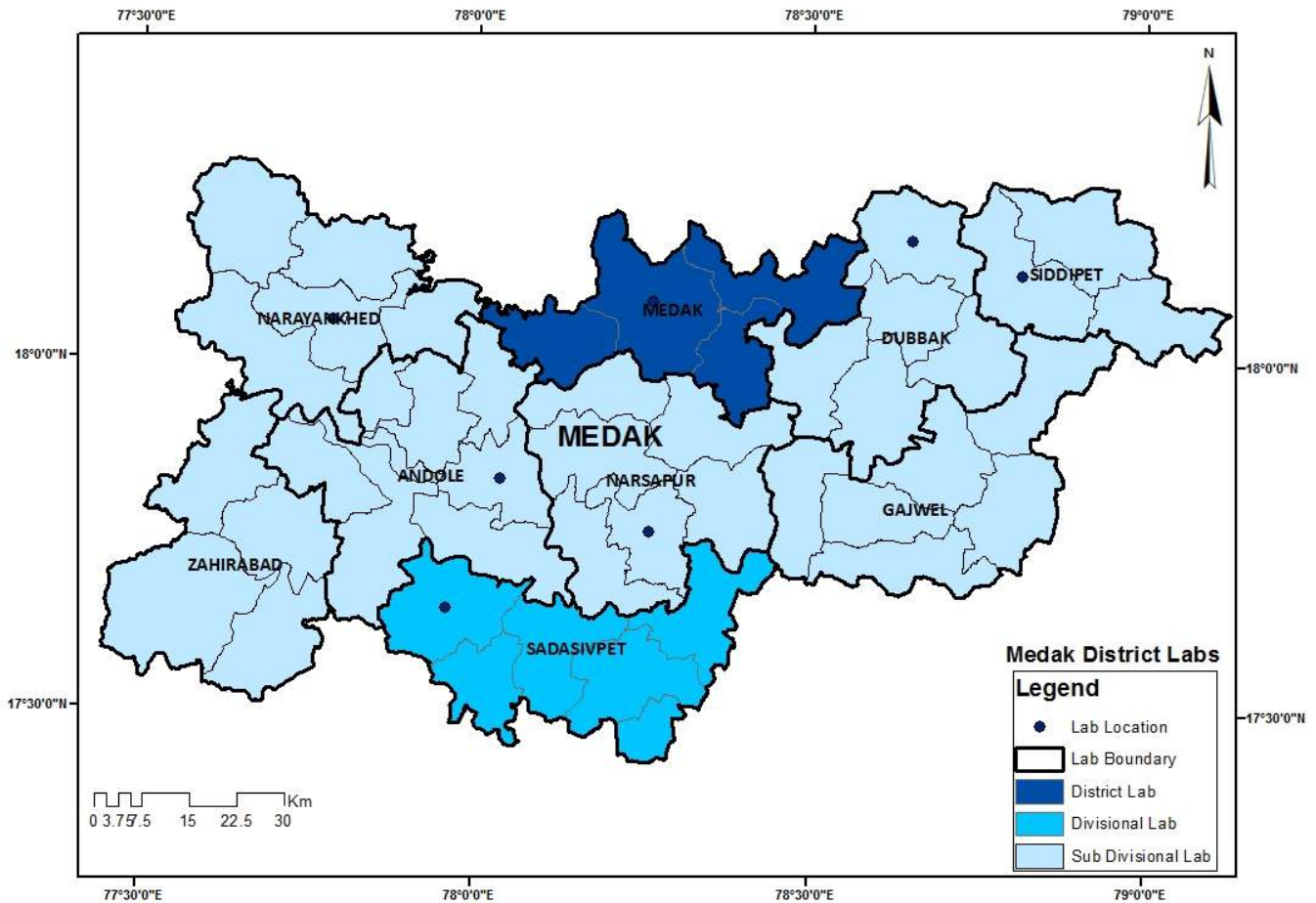
The district consultant visits each lab at least once a month, and examines the registers. The drinking water sources documented in the lab registered are not coded properly. From the labs in Mahabubnagar, it was also suggested for recruiting an Assistant District Coordinator.





## 8. MEDAK DISTRICT LABS

Map 6 Medak water quality labs and their jurisdiction



Source: Rural Water and Sanitation Department, Telangana

### Box 5 Medak District Overview

#### Situation of the District

Total Population – 3,033,288  
 Rural Population – 76 %  
 Urban Population – 24 %  
 Male Population – 1,523,030  
 Female Population – 1,510,258  
 Density of Population (per Sq. Km.) – 313  
 Sex Ratio (per 1000) – 992  
 Child sex ratio – 952  
 Households with Tap Water 2001 – 54.3 %  
 Household with Tap Water 2011 – 71.3 %  
 Source : Census 2001, 2011

The Census Data of 2011 indicates an increased rate of 23.9 per cent in covering the entire population with drinking water within the district compared to Census of 2001. In 2014-2015, the labs in the district altogether tested 12,059 sources. From these 3,168 (26.27 per cent) drinking water sources were found to be chemically contaminated. The common chemical contaminations include: Fluoride (36.30 per cent), Iron (34.15 per cent), Alkalinity (13.51 per cent) and Nitrate (10.76 per cent). At Medak there was a growing concern about the Hardness

of water. 8.33 per cent of the total sources contained hard water. 16.56 per cent of total sources tested found to be microbiologically contaminated. They contained Coliform bacteria.

### 8.1. History and Jurisdiction

To cater to the increasing demand to ensure for safe drinking water, nine labs function in the district. There are four additional Sub - Divisional Labs which were established in 2012, two labs in 2014 and one Sub - Divisional Lab was established in 2014. These nine labs have the jurisdiction of testing the water quality of sources in 46 Mandals with 1,081 Gram Panchayats and 2,443 habitations which covers only 64 per cent of total sources. There are 40 staffs including one District Consultant from these nine labs. They monitor 12,059 drinking water sources. The District Consultant is expected to coordinate all the labs within the district along with the State Lab and RWS&S.

Table 10 Description of Medak Laboratories

Lab Name	Year of Establishment	No. of Mandals	Gram Panchayats	Habitations covered	No. of Staffs	Total Sources	Sources 2014-15	Coverage (percentage)
<b>Medak District Lab</b>	1999	4	100	281	6	2,741	1,550	57
<b>Sadashivapet Division Lab</b>	1999	6	126	213	6	2,315	1,841	80
<b>Zaheerabad Sub-Division Lab</b>	2012	4	112	182	4	823	738	90
<b>Siddipet Sub-Division Lab</b>	2012	3	78	153	5	2,241	1,634	73
<b>Narsapur Sub-Division Lab</b>	2012	6	131	458	4	2,421	1,748	72
<b>Gajwel Sub-Division Lab</b>	2012	6	128	246	4	2,038	1,482	73
<b>Narayankhed Sub-Division Lab</b>	2010	5	116	372	3	1,869	1,273	68
<b>Dubbak Sub-Division Lab</b>	2014	5	134	249	4	1,897	942	50
<b>Jagipet Sub-Division Lab</b>	2014	7	156	289	4	2,563	851	33
<b>Total</b>		<b>46</b>	<b>1,081</b>	<b>2,443</b>	<b>40</b>	<b>18,908</b>	<b>12,059</b>	<b>64</b>

Source: Rural Water and Sanitation Department, Telangana

## 8.2. Drinking Water Contamination Status

From the total sources tested in the District 26 per cent was found to be chemically contaminated. The above table depicts the intensity of chemical contamination in the sources tested by District Lab, Division Lab and the various Sub - Division Labs. Gajwel Sub - Division Lab has the highest intensity of chemical contamination which is 40.01 per cent, followed by Narsapur (38.73 per cent), Zahirabad (35.5 per cent), Siddipet (21.73 per cent), Medak (20.77 per cent), Andole (17.51 per cent), Sadasivpet (11.08 per cent), Dubbak (4.14 per cent) and Narayankhed (3.93 per cent) of the total water sources tested. Sixteen per cent of the sources tested were identified to be contaminated with Coliform bacteria and E.Coli was detected in only one source out of the total sources tested. Alkalinity and hardness in water were found to be 14 per cent and eight per cent respectively across the sources.

Table 11 Medak drinking water contamination status

Lab Name	Sources tested	Alkalinity	Fluoride	Iron	Nitrate	TDS	pH
Medak District Lab	1,550	54	125	89	120	44	0
Sadasivpet Division Lab	1,841	30	106	32	1	66	0
Andole Sub Division Lab	851	8	29	116	2	1	1
Dubbak Sub Division Lab	942	0	4	33	3	0	0
Gajwel Sub Division Lab	1,482	25	436	19	168	50	0
Narayankhed Sub Division Lab	1,273	0	8	37	6	0	0
Narsapur Sub Division Lab	1,748	309	246	287	34	4	0
Siddipet Sub Division Lab	1,634	2	191	211	7	1	0
Zahirabad Sub Division Lab	738	0	5	258	0	0	0

Source: NRDWP 2014-15 data

### 8.3. Infrastructure and Facilities

District lab has cutting edge instruments to carry out sophisticated tests but some of them were not working. The instruments should be regularly checked for maintenance. Only then we can ensure accurate test results. For instance, bacterial analysis requires incubation at different temperatures and if the instrument is not functioning properly, the accuracy of the test result becomes doubtful. There is shortage of glass ware in Narsapur Sub – Division Lab. Some glass-wares were broken by rodents. During the assessment it was also noticed that the new lab in Dubbak initially borrowed glass-wares, burettes from nearby government institutions for experiments. Distillation equipment were not working in some labs due to various reasons such as power fluctuation and hardness of the water.

The lab buildings (Gajwel, Narsapur and Narayankhed) are in a dilapidated condition, the ceilings are broken and leaking. The Gajwel Sub - Division Lab is operating in an old government building with a leaking roof. The lab does not have access to a proper sewer system and the wastewater from the lab is released into the open ground. Most Sub - Divisional Labs are functioning in just one room with no separate space for chemical and biological testing. In Narsapur Sub - Division Lab, there is not even enough space to place the refrigerator and the computer. In addition to that the building premises is not clean and is used as dump yard by the locals in the area. In Narayankhed Sub - Division Lab the situation is very dismal. The roofs were leaking. There is no provision for continuous water supply. There was no separate room for microbial analysis. Also, the lab was too congested with all the lab materials due to lack of space. In almost all the labs water and electricity supply was found to be very erratic. Some of the instruments need stable electric flow but due to fluctuations in the electric voltage which is very common in the region the instruments cannot be operated. In Narayankhed Sub -Division Lab, packaged mineral water is purchased for lab purposes as there is no piped water connection.

#### 8.4. Human Resources

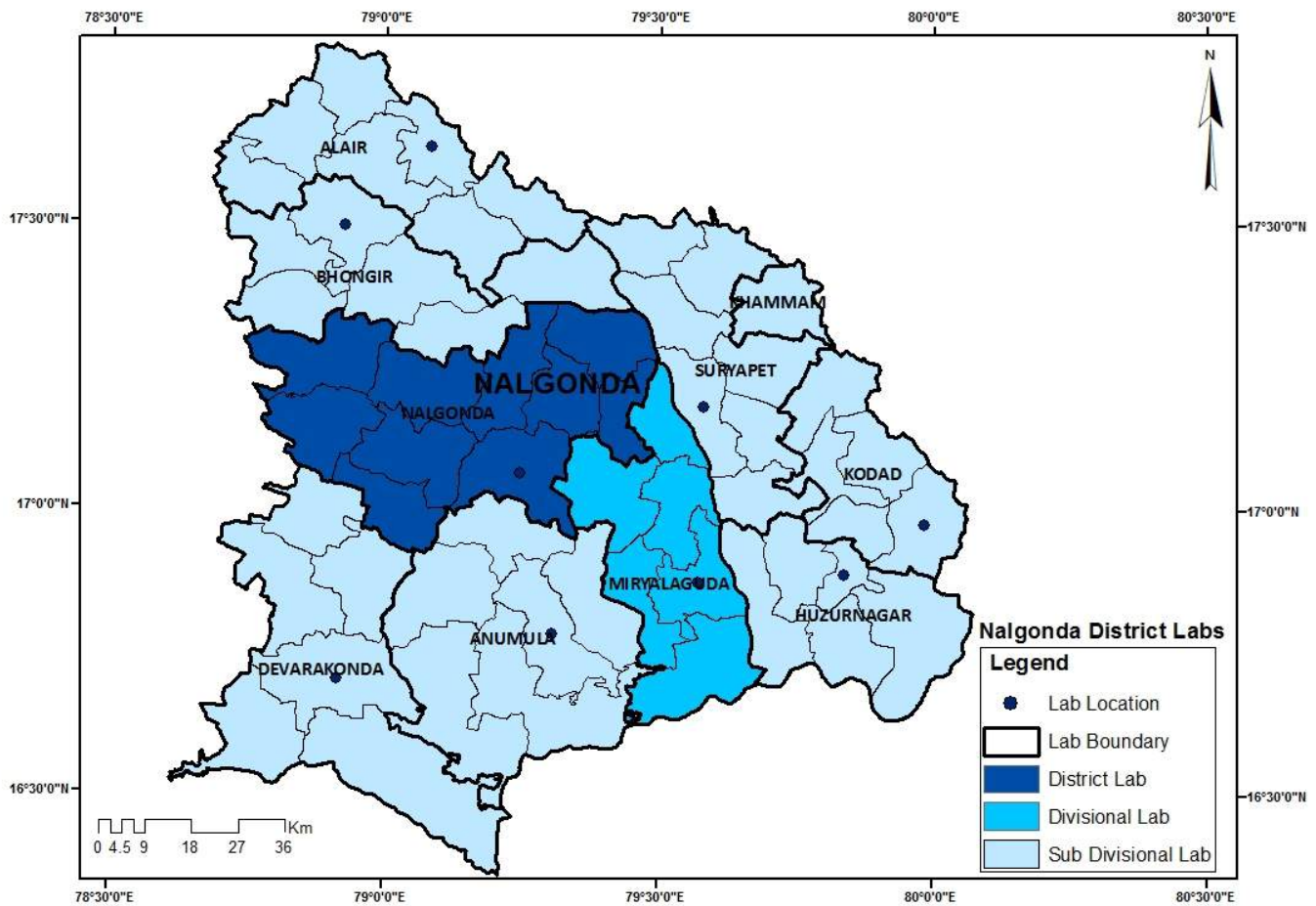
All the staffs are qualified and satisfy the minimum requirement needed for their respective positions. But there is a lot of scope for improvement. In Zaheerabad Sub -Division Lab, staffs are not skilled enough to use computer or maintaining registers containing water quality data. Some technical staffs were not able to communicate properly about the experiments they do and the procedures they follow. Their computer and communication skills need to be upgraded.





## 9. NALGONDA DISTRICT LABS

Map 7 Nalgonda water quality labs and their jurisdiction



Source: Rural Water and Sanitation Department, Telangana

### Box 6 Nalgonda District Overview

#### Situation of the District

Nalgonda Total Population – 3,488,809  
 Rural Population – 81.01 %  
 Urban Population – 18.99 %  
 Male Population - 1,759,772  
 Female Population - 1,729,037  
 Density of Population (per Sq. Km.) - 245  
 Sex Ratio (per 1000) - 983  
 Child sex ratio - 923  
 Households with Tap Water 2001 – 54.9 %  
 Household with Tap Water 2011 – 65.7 %  
 Source: Census 2001, 2011

According to the 2014-2015 data (NRDWP), there are 12,213 drinking water sources in the districts. Decadal (2001-2011) increase in drinking water coverage was 16.4 per cent in the district. The State Water and Sanitation Mission established labs to cater to the growing demand of safe drinking water. There are a total of nine labs where one is the District, one Divisional and seven Sub-Divisional labs.

### 9.1. History and Jurisdiction

The District Lab and Divisional Lab have been functioning since 1995 and 2001 respectively. The other labs have been established recently in the last three years. These nine labs cater the needs of 53 Mandals which covers 1,057 Gram Panchayats and 2,890 habitations. They test over 12,000 drinking water sources. This district has the lowest coverage in terms of total source tested (48 per cent).



Table 12 Description of Nalgonda Laboratories

Lab Name	Year of Establishment	No. of Mandals	GP	Habitations covered	No. of Staffs	Total Sources	Sources Tested in 2014-15	Coverage (percentage)
Nalgonda District Lab	1995	10	183	492	6	3,889	2,300	59
Miryalaguda Division Lab	2001	6	124	397	6	3,691	1,426	39
Kodad Sub-Division Lab	2012	5	95	160	4	1,900	1,471	77
Huzurnagar Sub Division Lab	2014	5	89	227	4	2,216	1,115	50
Suryapet Sub-Division Lab	2012	8	139	465	4	3,130	1,304	42
Devarakonda Sub-Division Lab	2010	6	114	475	4	2,720	1,050	39
Bhongir Sub- Division Lab	2013	6	160	346	4	2,658	1,044	39
Alair Sub-Division Lab	2012	7	153	328	4	1,994	1,041	52
<b>Total</b>		<b>53</b>	<b>1,057</b>	<b>2,890</b>	<b>36</b>	<b>22,198</b>	<b>10,751</b>	<b>48</b>

Source: Rural Water and Sanitation Department, Telangana

## 9.2. Drinking Water Contamination Status

Table 13 Nalgonda drinking water contamination status

Lab Name	Sources tested	Alkalinity	Fluoride	Iron	Nitrate	TDS	P H
Nalgonda District Lab	2,300	565	574	6	31	243	0
Miryalaguda Division Lab	1,426	5	16	78	54	53	2
Alair Sub Division Lab	1,471	241	707	87	24	94	3
Anumula Sub Division Lab	1,115	33	210	402	61	47	4
Bhongir Sub Division Lab	1,304	3	259	1	1	44	1
Devarakonda Sub Division Lab	1,050	59	330	3	16	58	12
Huzurnagar Sub Division Lab	1,044	66	17	2	132	56	2
Kodad Sub Division Lab	1,041	57	264	487	206	2	0
Suryapet Sub Division Lab	1,462	124	205	67	16	85	2

Source: NRDWP 2014-15 data

Fluoride was found to be a major contaminant in the water sources that were tested in the district. 21.1 per cent of the total tested sources were contaminated due to Fluoride. The other water sources were contaminated due to alkalinity (9.4 per cent), Iron (9.3 per cent) and other dissolved solids which totals to about 5.6 per cent. Hardness of water (20.4 per cent) was found to be a major issue in the district. Among all the drinking water sources tested 7 per cent and 2.1 per cent respectively were found to be contaminated due to the presence of Coliform and E.coli.

### 9.3. Infrastructure and Facilities

All the labs in the district have the required equipment and chemicals, but they are not maintained properly which in turn affects the performance and accuracy of the tests. Instruments were found to be in working condition in most of the labs, except in Aliar Sub - Division Lab. In Aliar the reason for this could be that officials are not trained on how to use the machines properly.

Few labs have excellent infrastructure but not all. All the lab buildings are well maintained except a few like the Alair Sub - Division Lab. The furniture in Alair Sub -Division Lab needs to be upgraded. Some staffs also complained that their furniture and computers are sometimes used by Deputy Executive Engineer's office and RWS&S staff for their official work like site supervision. Alair Sub - Division Lab does not get power supply as it was disconnected after the Deputy Executive Engineer's office failed to pay the electricity bills. It has had serious implication on the functioning of the lab.

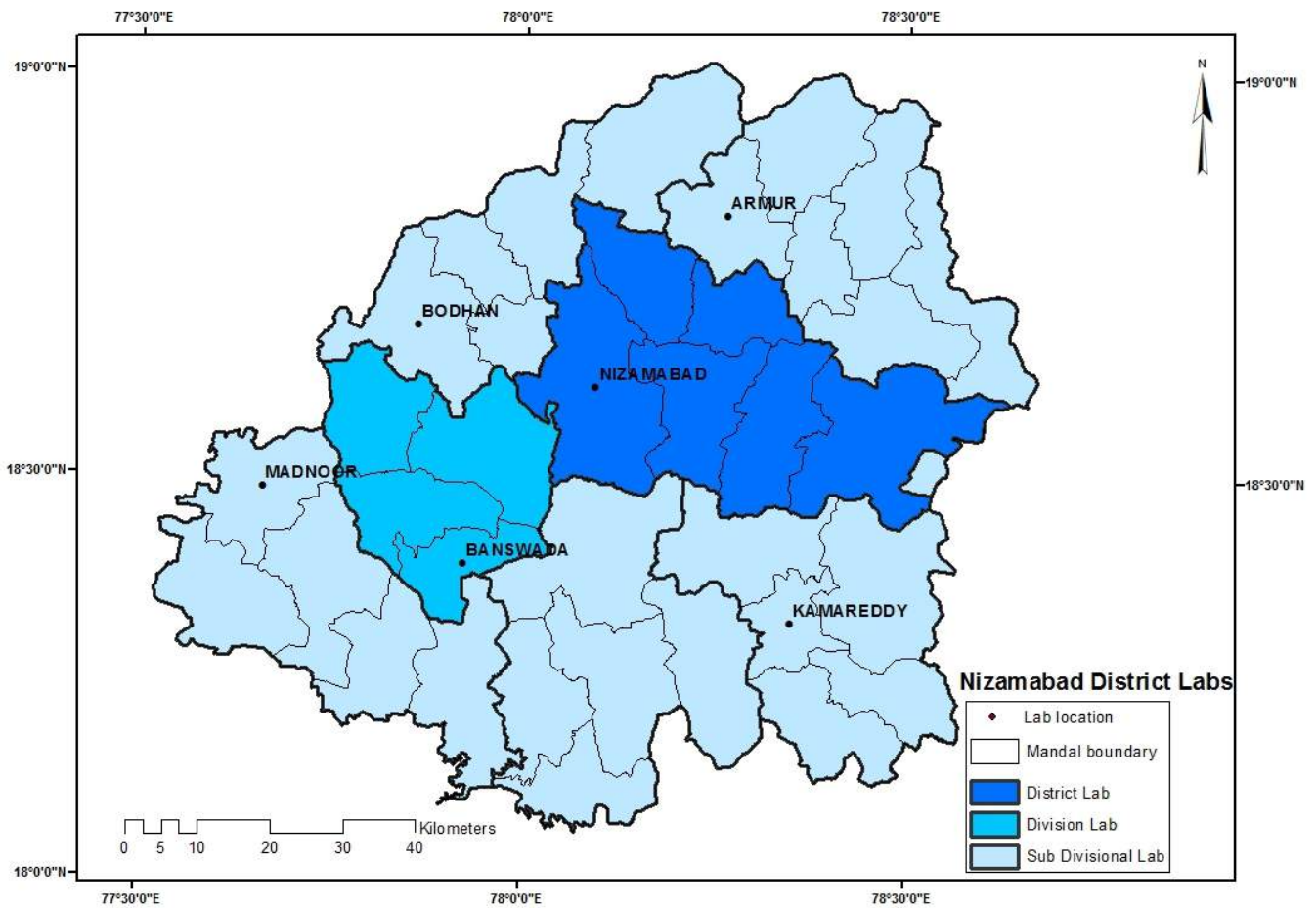
The other labs in the district too have a multitude of electrical issues. In Devarkonda, for instance, there was electrical problems with the Autoclave which restricted the proper functioning of laminar air flow. The refrigerator at Miryalguda Sub - Division Lab has malfunctioned and has not been repaired.

### 9.4. Human Resources

In Nalgonda district, the lab staffs showed competencies not only in testing the samples but also in entering data and statistically analyzing them to identify the pattern over a period. However, it was noticed that the staffs were not maintaining the instruments properly. It was further noticed that there were anomalies in the register used for keeping microbiological data. The staff seemed least bothered to carry out confirmatory tests for E. coli, in case of high MPN. Kodad Sub - Division Lab is a prime example where E. coli confirmatory tests were also not conducted. Interestingly in Bongir Sub -Division Lab, the staff had to postpone the experiments as the EC meter was not working, but they still went on to report TDS and conductance value by using crude/traditional methodology through averaging. The registers maintained at Suryapet Sub - Division Lab were not updated. In Aliar and Miryalguda, the staff has to be encouraged to maintain and update their registers. Regular supervision and monitoring by District Coordinators can resolve most of the issues.

## 10. NIZAMABAD DISTRICT LABS

Map 8 Nizamabad water quality labs and their jurisdiction



Source: Rural Water and Sanitation Department, Telangana

### Box 7 Nizamabad District Overview

#### Situation of the District

Nizamabad total Population - 2,551,335  
 Rural Population - 76.94 %  
 Urban Population - 23.06 %  
 Male Population - 1,250,641  
 Female Population - 1,300,694  
 Density of Population (per Sq. Km.) - 321  
 Sex Ratio (per 1000) - 1040  
 Child sex ratio - 948  
 Households with Tap Water 2001 - 58.85 %  
 Household with Tap Water 2011 - 77.2 %  
 Source: Census 2001, 2011

The 2011 Census indicates an increase in rate for about 23.7 per cent of drinking water coverage in the district compared to the 2001 census. To cater the needs for safe drinking water quality in 2012, four additional sub-division labs were established by the RWS&S. Nizamabad district has seven labs in total that cover 718 Gram Panchayats and 1,645 habitations covering 66 per cent of total drinking water sources under quality testing.

### 10.1. History and Jurisdiction

Out of the seven labs, Nizamabad District Lab was the first water quality testing lab in the district. It became functional in 1989. The other labs started functioning only after 2000. These seven labs cover 30 Mandals in the district with 718 Gram Panchayats and 1,645 habitations. The total sources tested by these labs in the year 2014-2015 were 9,664. Currently 36 staffs including Technicians, Field and Lab assistants engage in continuous monitoring of water sample collection, analysing and reporting them to the concerned GPs.

Table 14 Description of Nizamabad Laboratories

Lab Name	Year of Establishment	No. of Mandals	Gram Panchayats	Habitations covered	No. of Staffs	Total no. Of sources	Source tested 2014-15	Coverage (percentage)
<b>Nizamabad District Lab</b>	1989	5	132	370	6	2,886	2,111	73
<b>Banswada Division Lab</b>	2000	5	76	214	4	1,858	1,225	66
<b>Armur Sub-Division Lab</b>	2012	4	108	141	5	1,858	627	34
<b>Bodhan Sub Division Lab</b>	2012	4	109	177	6	2,323	1,834	79
<b>Kamareddy Sub Division Lab</b>	2012	4	100	175	5	2,281	1,569	69
<b>Madnoor Sub Division Lab</b>	2012	4	102	244	5	1,740	978	56
<b>Yellareddy Sub Division Lab</b>	2012	4	91	324	5	1,739	1,320	76
<b>Total</b>		<b>30</b>	<b>718</b>	<b>1,645</b>	<b>36</b>	<b>14,685</b>	<b>9,664</b>	<b>66</b>

Source: Rural Water and Sanitation Department, Telangana

## 10.2. Drinking Water Contamination Status

In 2014-2015, the labs in the district tested 9,664 sources and found that the rate of chemical contamination of drinking water sources is 13.2 per cent (1,276), and of bacterial contamination, which primarily includes Coliform (1.91 per cent).

Table 15 Nizamabad drinking water contamination status

Lab Name	Sources tested	Alkalinity	Fluoride	Iron	Nitrate	TDS	pH
<b>Nizamabad District Lab</b>	2,111	22	98	3	6	39	0
<b>Banswada Division Lab</b>	1,225	0	0	121	17	11	0
<b>Armur Sub Division Lab</b>	627	4	32	120	102	9	0
<b>Bodhan Sub Division Lab</b>	1,834	0	2	6	3	2	0
<b>Kamareddy Sub Division Lab</b>	1,569	0	16	1	0	0	0
<b>Madnoor Sub Division Lab</b>	978	25	28	269	7	192	6
<b>Yellareddy Sub Division Lab</b>	1,320	0	54	15	66	0	0

Source: NRDWP 2014-15 data

The lab-wise analysis shows that out of the total tested sources, Madnoor Sub - Division Lab found the highest chemical contamination (39.65 per cent). It was followed by Armur (36.68 per cent), Banswada (11.72 per cent), Yellareddy (9.71 per cent), Nizamabad (7.27 per cent) and Bodhan and Kamareddy (about 1 per cent each). If sources were found contaminated, lab staffs would re-test water samples from the same source for several times. For e.g., Bodhan Sub - Division Lab has tested one single source 15 times in a year. Almost 50 per cent of the contaminated sources are retested in different intervals, especially during pre and post monsoon season across all the labs.

### 10.3. Infrastructure and Facilities

Most of the labs in Nizamabad district are not well equipped with advanced testing equipment. They often do not have the mandatory instruments/equipment. Filtration Assembly, Heating Mantle, Flame Photometer, Ion Meter and BOD Incubator are only available at Nizamabad District lab. The BOD Incubator at Nizamabad District Lab was not in working condition

Except Nizamabad District Lab and Bodhan Sub -Division Lab, other labs operate within a single room without distinct rooms for chemical and bacteriological analysis. There is not enough furniture and sitting arrangement for the staff. The lab premises are functioning in Government buildings that lack regular maintenance and are in a dismal state. The Banswada Division Lab building is on the verge of collapse.

The computers provided for regular online updation of water quality reports are not placed within the labs but are kept at the Assistant Engineer's room and are also being used for non-lab related works. This is because of lack of space in the office building.

Due to poor electrical wiring and erratic electricity supply, lab equipment are not being optimally utilized. The water supply is irregular and some (Banswada Division and Bodhan Sub division lab) do not even have piped water connection and they solely depend on paid bottled water in order to prepare distilled water.

### 10.4. Human Resources

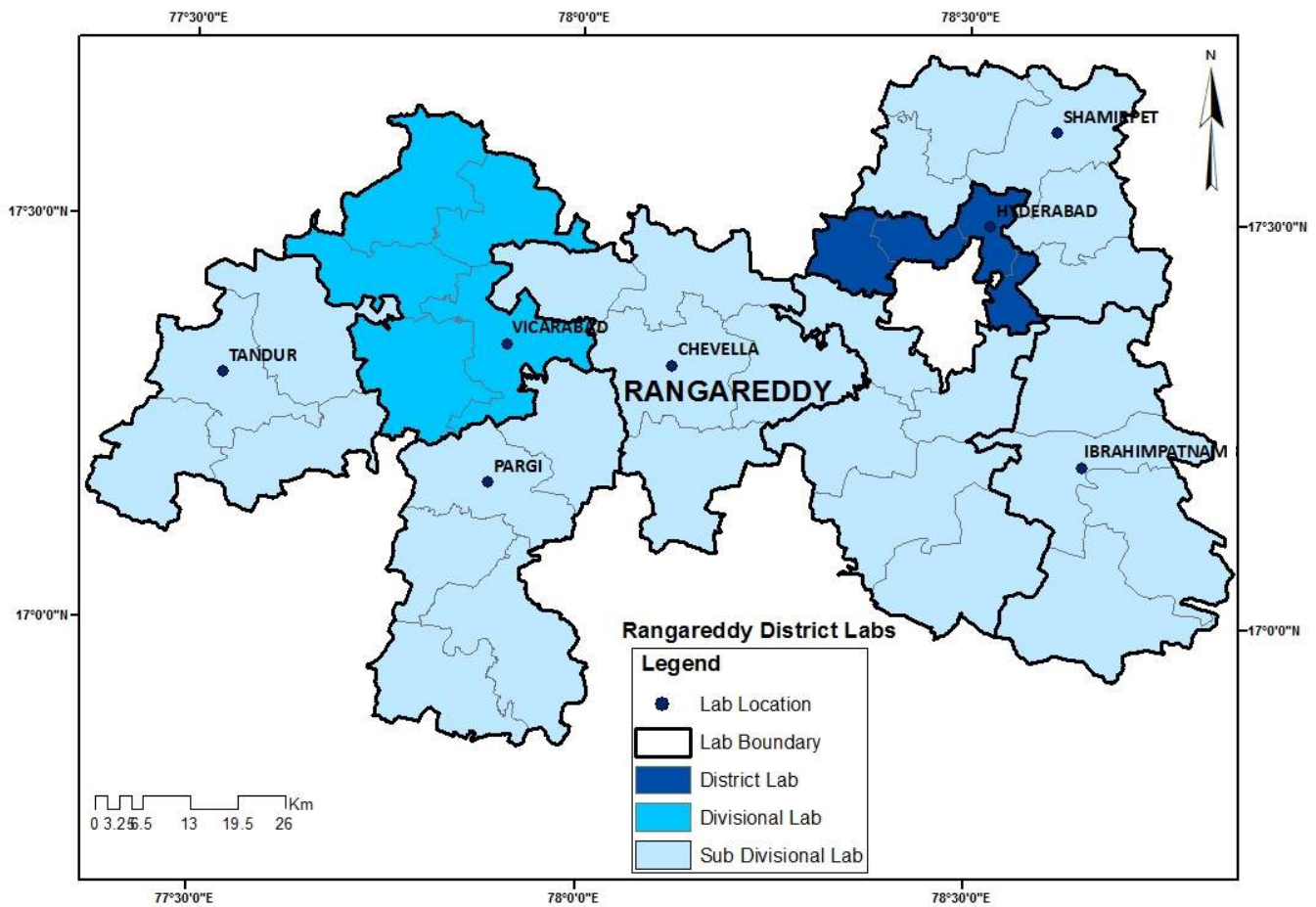
The staffs have the capacity to test the standard chemical parameters. Microbiologists across the labs in Nizamabad have a maximum education qualification of Bachelors in Chemistry or Microbiology. The Lab Helpers and Field Assistants are Intermediate (12<sup>th</sup> Standard) pass and had been working more the three years. The Technical staffs in Nizamabad District lab are regular government employees and had been working for the last 26 years, while the rest of the staffs across the district are employed on contractual basis for short periods. The contractual staffs are recruited through a third-party payment system. They often do not receive their salaries for several months. Since labs function under the administrative role of RWS&S, release of monthly payment depends upon Assistant Engineer/Deputy Executive Engineer's approval. There is no clear policy on how to coordinate and report to RWS&S on the lab performances. This has contributed to increase higher attrition rate amidst these lab staffs.

There is a strong need to build capacities of the lab staff on disseminating water quality reports at the grassroots/village level. Due to higher attrition rates amidst the staffs, the capacity building trainings have to be provided round the year. The capacity building training programs should focus on issues of knowledge mobilization, enhancing scientific knowledge, communication skills, record keeping, safety compliance and protective measures, and the importance of water quality in human development and poverty alleviation.



# 11. RANGAREDDY DISTRICT LABS

Map 9 Rangareddy water quality labs and their jurisdiction



Source: Rural Water and Sanitation Department, Telangana

## Box 8 Rangareddy District Overview

### Situation of the District

Rangareddy Total Population – 5,296,741  
 Rural Population – 30 %  
 Urban Population – 70 %  
 Male Population – 2,701,008  
 Female Population – 2,595,733  
 Density of Population (per Sq. Km.) - 870  
 Sex Ratio (per 1000) – 961  
 Child sex ratio - 933  
 Households with Tap Water 2001 – 56.1 %  
 Household with Tap Water 2011 – 76.5 %  
 Source : Census 2011

The district census Data of 2011 showed an increase rate of 26.7 per cent of drinking water coverage in the district than 2001 census.

## 11.1. History and Jurisdiction

Rangareddy district has a total of seven water quality testing labs that cover 705 Gram Panchayats and 1,564 habitations. Out of the seven labs, four sub-divisional lab were established recently in 2012 to cater to the increasing need of drinking water quality testing. There are seven water quality labs in the district with one district lab at Uppal, one division lab at Vikarabad and five Sub - Division Labs.

Table 16 Description of Rangareddy Laboratories

Lab Name	Year of Establishment	No. of Mandals	Gram Panchayats	Habitations covered	No. of Staffs	Total Sources	Sources Tested 2014-15	Coverage (percentage)
<b>Uppal District Lab</b>	1983	5	96	240	6	1,293	1,156	89
<b>Vikarabad Division Lab</b>	1999	5	103	188	6	1,264	1,187	94
<b>Shamirpet Sub-Division Lab</b>	2012	5	84	176	4	1,870	1,068	57
<b>Chevella Sub-Division Lab</b>	2012	5	126	250	4	1,486	1,486	100
<b>Ibrahimpatnam Sub-Division Lab</b>	2012	4	87	176	4	1,652	867	52
<b>Pargi Sub-Division Lab</b>	2012	5	118	442	4	1,884	1,643	87
<b>Tandur Sub-Division Lab</b>	2010	4	90	192	4	1,247	1,142	92
<b>Total</b>		<b>33</b>	<b>704</b>	<b>1,664</b>	<b>32</b>	<b>10,674</b>	<b>8,549</b>	<b>80</b>

Source: Rural Water and Sanitation Department, Telangana

## 11.2. Drinking Water Contamination Status

In 2014-2015, a total of 8,549 drinking water sources were identified and tested for providing safe water. Chemical contaminants like Fluoride (14 per cent), Iron (9 per cent) and Nitrate (3.1 per cent) have been found in the tested sources. The other important issue with the water is its hardness, which was found in 12.3 per cent of the tested sources. Coliform was detected in 19 per cent of the total tested sources. The total coverage of sources is one of the highest among the districts in Telangana which is 80 per cent.

Analysis of lab-wise chemical contamination in Rangareddy district found that iron and fluoride are the main contaminants in the drinking water sources that were tested. The other issues were that of nitrate and alkalinity. In Chevella and Shamirpet Sub - Division Labs, 95 per cent of the sources were contaminated due to the presence of fluoride and in Vikarabad and Paragi Sub - Division Labs more than 70 per cent of the sources were contaminated due to Nitrate. Coliform was detected in 19 per cent of the sources in the Microbiological tests. No E.coli was noticed in the district. The intensity of chemical contamination is high in Ibrahimpatanam with 57.65 percent, followed by Vikarabad (29.06 per cent), Pargi (26.84 per cent), Shamirpet (26.4 per cent), Tandur (13.92 per cent), Chevella (13.12 per cent), and Hyderabad (Uppal) (11.51 per cent). In Rangareddy district, on an average 400 sources were retested twice, 218 sources were retested thrice, and 98 sources, 38 sources and 19 sources were retested four, five, and six times respectively. About 31 sources were retested more than six times. As per the Protocol, all drinking water sources must be tested before and after monsoon season and the contaminated sources should be monitored throughout the year.

Table 17 Rangareddy drinking water contamination status

Lab Name	Sources tested	Alkalinity	Fluoride	Iron	Nitrate	TDS	pH
Uppal District Lab	1,156	2	18	45	64	9	0
Vikarabad Division Lab	1,187	3	81	278	4	9	1
Chevella Sub Division Lab	1,486	4	187	3	1	2	0
Ibrahimpattam Sub Division Lab	867	85	393	80	173	98	1
Pargi Sub Division Lab	1,643	1	107	347	11	5	3
Shameerpet Sub Division Lab	1,068	2	278	2	5	2	1
Tandur Sub Division Lab	1,142	15	106	11	4	37	0

Source: NRDWP 2014-15 data

### 11.3. Infrastructure and Facilities

Labs have been provided with high quality instruments and most labs have maintained them well. The staff at Vikarabad communicated that sometimes they have to spend their own money to buy batteries and repair the instruments. Some labs very ingeniously have started using packaged drinking water instead of distilled water, thereby reducing the scale formation and the frequency of de-scaling.

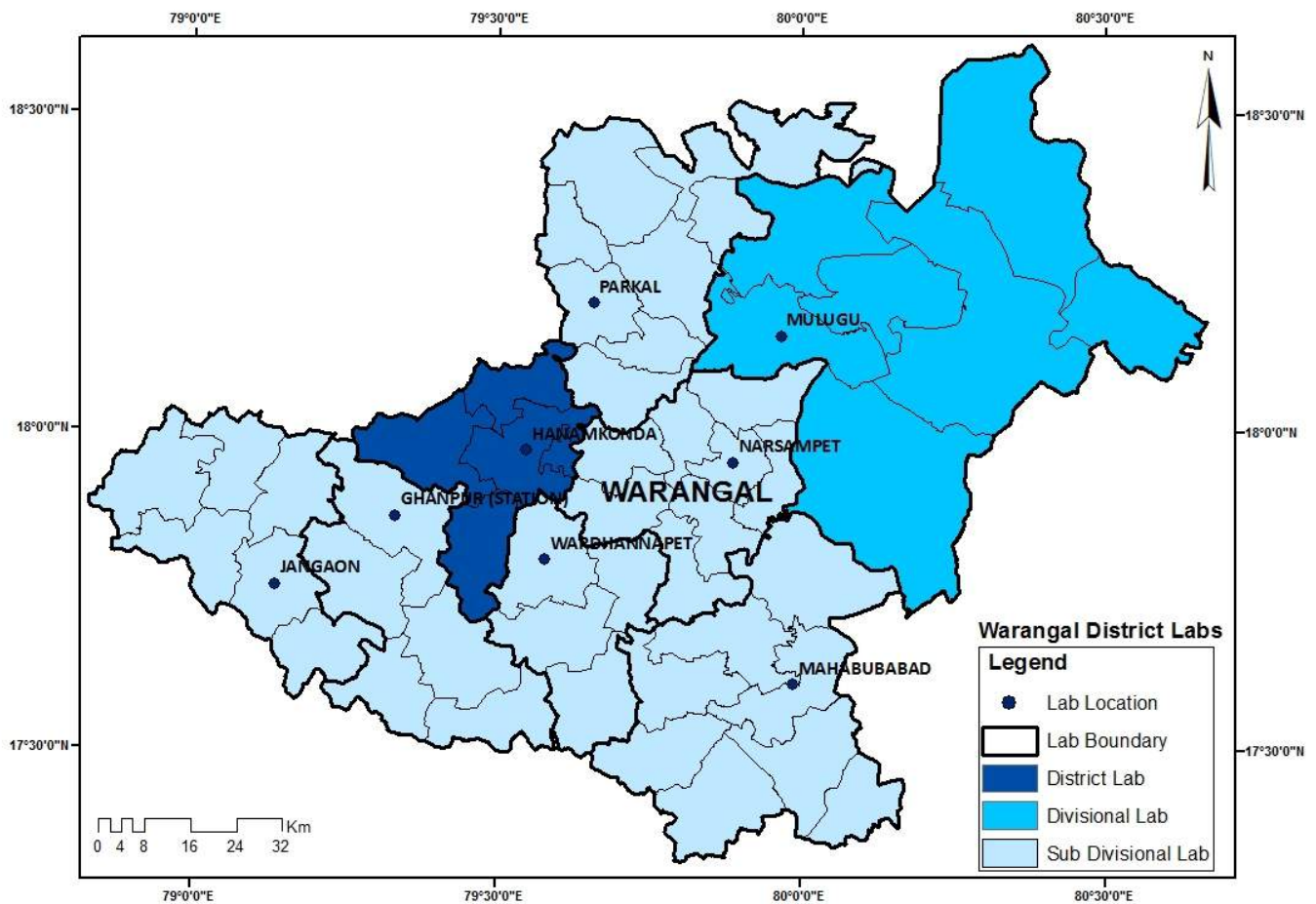
Computers are provided to all labs and are found in working condition, except in Pargi Sub - Division Lab. There the computer is not in working conditions since many months. Some labs use groundwater for analysis and scaling of distillation unit. The physical infrastructure in Tandur, Chevella and Shamirpet Labs need to be upgraded. Power supply fluctuations in Tandur and Chevella has resulted in equipment malfunctions. The hot air oven is not functioning in Chevella. A couple of labs also do not get regular water supply. Together with the above scope for improvement there are also some positive aspects about some of the labs in the district, for instance, District Lab situated at Uppal maintained everything in order. Vikarabad Divisional Lab was well renovated.

### 11.4. Human Resources

Most staffs across the Rangareddy district labs are government officials and have several years of experience. The staff in Ibrahimpattam and Vikarabad had have more than 15- 20 years of experience in the field. The new staff members in Ibrahimpattam had not received official training. This emphasises the need for a training to the new inductees. These training must be done in coordination with both RWS&S staff and the State Lab. The District Consultant should regularly visits the labs. It was shared during the field investigation, the district coordinator visit the labs once in two months. Most of the labs maintain registers on a regular basis. In addition, the dissemination of water quality test results to the communities should be a regular practice.

## 12. WARANGAL DISTRICT LABS

Map 10 Warangal water quality laboratories and their jurisdiction



Source: Rural Water and Sanitation Department, Telangana

### Box 9 Warangal District Overview

#### Situation of the District

Warangal Total Population – 3,512,576  
 Rural Population – 71.75 %  
 Urban Population – 28.25 %  
 Male Population - 1,759,281  
 Female Population - 1,753,295  
 Density of Population (per Sq. Km.) - 273  
 Sex Ratio (per 1000) - 997  
 Child sex ratio - 923  
 Households with Tap Water 2001 – 45.2 %  
 Household with Tap Water 2011 – 64.7 %  
 Source : Census 2011

The 2011 Census Data indicates an increase rate of 30.1 percent of drinking water coverage in the district than the last census in 2001.

### 12.1. History and Jurisdiction

To cater to the need of safe drinking water, eight water quality testing labs were established in Warangal. The district has one district lab at Hanamkonda, one divisional lab at Mulugu and six Sub - Divisional Labs at Ghanpur, Jangoan, Wardhannampet, Parkal, Narsampet and Mahabubabad. These eight labs test the water quality of 16,777 sources spread around 50 Mandals that includes 962 GPs and 3,418 habitations.



Table 18 Description of Warangal Laboratories

Lab Name	Year of Establishment	No. of Mandals	Gram Panchayats	Habitations covered	No. of Staffs	Total Sources	Sources 2014-15	Coverage (percentage)
Hanamkonda District Lab	1989	4	58	124	6	1,634	2,697	165
Mulugu Division Lab	2000	7	107	417	6	3,258	2,133	65
Station Ghanpur Sub-Division Lab	2014	5	109	392	4	2,472	684	28
Jangaon Sub-Division Lab	2005	6	120	312	4	2,322	1,933	83
Wardhannapet Sub-Division Lab	2010	4	87	336	4	1,756	1,756	100
Parkal Sub-Division Lab	2012	8	172	312	6	3,153	2,650	84
Narsampet Sub-Division Lab	2012	8	143	477	4	2,695	2,365	88
Mahabubabad Sub - Division Lab	2012	8	166	1,048	4	3,435	2,559	74
<b>Total</b>		<b>50</b>	<b>962</b>	<b>3,418</b>	<b>38</b>	<b>18,368</b>	<b>16,777</b>	<b>91</b>

Source: Rural Water and Sanitation Department, Telangana

## 12.2. Drinking Water Contamination Status

Fluoride (24.8 per cent), Iron (16.77 per cent) and Calcium (14.67 per cent) were the major chemical contaminants present in the drinking water sources in the district that were tested. E. Coli and Coliform were present in approximately 5 per cent of the sources tested. Hardness of water was also one of the major concerns which accounted to 24.8 per cent of the total sources. Large numbers of fluoride contamination was reported from Mahabubabad, Narasampet and Wardhannapet Sub - Divisional Labs. In Janagoan Sub - Divisional Lab, Coliform has been reported in 24.5 per cent of all the sources tested.

Table 19 Warangal drinking water contamination status

Lab Name	Sources tested	Alkalinity	Fluoride	Iron	Nitrate	TDS	pH
Hanamkonda District Lab	2,697	0	53	38	5	1	0
Mulug Division Lab	2,133	4	165	45	10	286	0
Ghanpur (Station) Sub Division Lab	684	0	209	264	3	8	0
Jangaon Sub Division Lab	1,933	1	45	8	85	1	0
Mahabubabad Sub Division Lab	2,559	28	716	889	668	251	1
Narsampet Sub Division Lab	2,365	469	970	1329	495	389	2
Parkal Sub Division Lab	2,650	338	309	89	173	218	0
Wardhannapet Sub Division Lab	1,756	4	604	152	27	281	0

Source: NRDWP 2014-15 data

## 12.3. Infrastructure and Facilities

All labs in the district were equipped with advanced instruments that were easy to operate and handle. The staff had undergone training to use the equipment. Though the labs had enough instruments and equipment but some of them were not in working condition. The instruments including autoclave, refrigerator, colony counter, water bath, flame photometer, etc. required repairing and servicing. Even though computers were present, some labs didn't have internet facility to upload the data in Water Soft<sup>1</sup>.

<sup>1</sup> WaterSoft: Official website of the Rural water supply & Sanitation of Government of Telangana.



The labs in Warangal districts do not have adequate space for conducting biological and chemical tests separately, except in Hanamkonda lab. Some labs manage in one small room with aluminium fabrication enclosure and some without any separation. Lack of separate space for stationing computers, for having food, storing chemicals, autoclave machines, etc., was also observed in these labs. Erratic electricity and water supply were major problems throughout the district. Electric fluctuations are common particularly during the official hours. Due to intermittent power supply in Parakal lab it often remains a challenge to conduct tests. Like its peer districts, Warangal also have problem for providing continuous water supply.

#### 12.4. Human Resources

The lab staffs were employed on contract basis and it was observed that the procedures followed the standard protocol prescribed by the SWSM (State Water and Sanitation Mission). The salaries of the staffs are not paid on a monthly basis and depended solely upon the state funding. During the assessment of the lab in June 2015, they got all the salary that was due, however the staffs desire to receive their salary on time, credited directly to their bank accounts. The staffs don't have the sense of ownership as they feel they can lose their jobs any time. They feel that their job should be made permanent considering the experience they have in the field.

Unlike other districts, Warangal district labs had good coordination with the RWS staffs; the Assistant and Deputy Engineer are cooperative in sanctioning request for release of fund for renovations. The District Coordinator is supposed to visit every lab at least once in a month. The frequency of visit of coordinator is relatively less resulting in information gaps between the state lab and the staffs. There is annual maintenance fund for each lab but it often remains unutilized. The district coordinator and the staffs don't even know about the existence of the fund and the processes to get it sanctioned.

## 13. OBSERVATIONS AND SUGGESTIONS

Groundwater is a source for about one-third of the global water withdrawals (Kundzewicz and Doell, 2009; Rao, 2009). In India, 80 per cent of the domestic needs across rural areas are met through groundwater (Mall et al., 2006). Keeping in view with the increasing demand for safe drinking water, increased groundwater extraction and land use pattern for agriculture and the adverse impacts of changing environment, it is likely to add stress to the existing safe drinking water in terms of quality and quantity (Kundzewicz and Doell, 2009; Rao, 2009; Mall et al., 2006). These will be manifested with reduced groundwater tables, increase in salinity and increase in natural pollutants especially in areas with high arsenic and fluoride concentration (Kundzewicz and Doell, 2009; Krishna et al., 2009; Sujatha and Reddy, 2003).

In view of the increasing incidences of arsenic and fluoride contamination of groundwater in the State of Telangana and the impacts of climate change, SaciWATERs team along with RWS&S, ably supported by WaterAid India carried out an assessment of all the Water Quality Testing Laboratories in the State. The observations and suggestions are grouped under different heads:

- Capacity building of Lab personnel
- Enhancing laboratory infrastructure and synergy among enabling agencies
- Proper record keeping, dissemination and monitoring of contaminated sources
- Employment arrangement of laboratory staff
- Environment, health & safety
- Infrastructure & maintenance of equipment

Coordination of State Lab, District Consultants and the Labs under their jurisdiction.

### 13.1. Capacity building of lab personnel

All personnel are qualified rightly for the positions they were recruited as per the NDRWP norms. Though the State Lab conducts capacity building training programs for the lab officials every year, still their knowledge levels seem to vary widely. Since there is high attrition among the lab personnel in a number of labs across the state, some staffs are not clear about the procedures involved in analysis and the parameters that are tested in their labs. This was true in case of both chemical and biological analysis. For instance, in bacteriological analysis, some staff carry out indicative tests, using H<sub>2</sub>S vials and report it as Most Probable Number (MPN) tests. There is no proper accommodation of Micro-biological analysis which is also hampered due to lack of power supply. Sometimes, the lab officials report results for particular parameter where they did not have working instruments in the first place. Thus, one of the major hindrances that affect the performance of the labs is the limited knowledge and capacity of the personnel.

- From the analysis it is concluded that there is a need to capacitate the human resource on the use and maintenance of latest lab equipment. Trainings could include on emerging pollutants, data management, lab maintenance, conducting sanitary survey<sup>2</sup>, laboratory and chemical maintenance and storage.
- Field Assistants who collect samples and disseminate results to the end-users are not trained. It is necessary to train them in field sampling, sanitary survey, sample preservation, storage and transportation to the lab, and dissemination of water quality test results to all stakeholders including Sarpanch and VWSC.
- Lab Staff need to understand the importance of proper data maintenance – online IMIS/Water Soft and updating the records regularly. The staffs also need to be orientated regularly on effective record keeping and register maintenance.

<sup>2</sup>Sanitary surveys are conducted by the laboratory staffs before collecting water samples for analysis

- Hands on training should be imparted to lab officials on a regular basis (due to high attrition) on matters related to operation of instruments, chemical handling and maintenance and its storage, including basic first aid techniques. Through field interview it was highlighted a ready reckon on Lab Management that talks about how to maintain, testing procedure, maintenance of infrastructures, chemical handling, computer use including disease pattern to be developed and shared widely.

### 13.2. Laboratory infrastructure and synergy among enabling agencies

RWS&S department is the nodal agency for smooth operation of the laboratories in the State. When RWS&S engineering staff (who generally are in-charge of laboratories) takes an interest in the functioning of the labs, the labs improve in performance. In many places where RWS&S staffs regularly inspect the labs and the registers, such registers were found to be well maintained and the copies of reports shared with the Gram Panchayats are well documented. But situation is not the same across the State, there is a need to generate the importance of water quality laboratories to secure safe drinking water and encourage inter-departmental cooperation among the RWS&S staffs.

Sometimes the RWS&S staffs (In-charge of Labs) were also reported (by the Lab staffs) to be non cooperative. For instance, sometimes the in-charge would use the lab personnel for non-lab related jobs. The lab computer allotted for documentation and printing of reports would be used by RWS&S staffs. Such behaviour often affect timely reporting (online reporting) as well as printing of water quality report. These equipment were poorly maintained.

As the water quality laboratory comes under the RWS&S department, entire sanctions and decisions are made through Assistant Engineers and Deputy Engineers. Therefore;

- It is necessary to improve the coordination between lab staff and enabling agencies (RWS&S). There are exemplars among the other labs wherein better synergy have improved efficiency, infrastructure maintenance and delivery, etc. (Example Mahabubabad).
- In the case of procurements, smaller lab necessities could be handled by the Staffs at the Lab level rather than channelling through the RWS&S. This can be allocated to the District Coordinator in consultation with the State.
- Capacity building and monitoring of RWS&S staff is also suggested as functioning of labs depends on their cooperation.

### 13.3. Record keeping, dissemination and monitoring of contaminated sources

Though in many labs, record keeping is well maintained but some labs are not efficient. Record of analysis reports shared with GPs is not available with all labs. Some districts such as Nizamabad and Karimnagar have developed a format for maintaining records of analysis reports. Perhaps a similar format could be developed state-wide. Many labs do not have records of results disseminated to Gram Panchayats.

The District Coordinator should seriously monitor the registers and verify them on a regular basis. In a couple of cases, it was seen that staff have reported conductance values despite not having a functioning EC meter. They reported using some approximation methods, which is not supposed to be done. However, in some districts, records are maintained neatly through the efforts of the District Consultant and local RWS&S officials. Although Deputy Executive Engineer in-charge is responsible for recruitment, but it is not reported to the State Lab and decisions at district and sub-division levels are solely handled by District RWS&S. There is no consensus on recruitment process between State and District.

Currently there exist no formal mechanism to understand if the information has been further disseminated to the community members. Maintaining register is a concern particularly in Sub - Divisional Labs. For instance, source numbers were missing from all registers and other labs sources are

described in an informal manner. The suggestions are as follows:

- Monitoring and documentation ensuring dissemination of analysis results to the community need to be formalized and monitored.
- As mentioned above, training is required in maintenance of stock registers, result dissemination and reporting. It would also be beneficial for the labs to update stock registers, when borrowing or lending of chemicals or equipment to other labs is carried out.
- Monitoring of contaminated sources should be performed efficiently through sufficient monitoring mechanism such as registers updated regularly where information pertaining to only contaminated sources, with details of contaminating chemicals such as Fluoride or even bacteriological contamination is kept in order to study changes, if any, through the years.
- Every lab across GPs should at least test three sources in both pre and post monsoon seasons. This should be monitored through a software with Lat- Long positions of the water sources being noted down.

### 13.4. Employment arrangement of laboratory staff

Due to lack of timely release of payments, the contractual staffs have strong resentment. They demand monthly payment of their salary. This delay in payment generates lack of interest and reduce their compliance. Their motive becomes only to somehow achieve the desired target for testing water sources. The lab staff state that they receive salaries once in six months and sometimes it even takes long. This is because the government releases funds only once in 6 months, and after due verification the funds are released to the contractor, the third party on contract basis releases the funds to the lab staff. Completion of all these process causes a further delay. This should be made transparent and uniform across the State.

- A centralised uniform salary as well as its disbursement system should be developed.
- Recruitment of Staff should be more transparent and should be made in consultation with District and State Chief. A few cases of nepotism have come to light, in which those who know the local RWS&S staff seem to be employed in the labs.
- The payment of staff need to channelise through state government official procedure than to wait for release of funds.
- Clarity, uniformity and transparency in manner of payment to lab staff is important as some staff are unaware on what basis they are being paid and how many working days are calculated per month.
- Lab vacancy position should be announced and before recruiting a committee should be formed at District in consultation with the State Lab to bring about greater transparency.
- Field staff should be provided with identity cards to avoid harassment from locals or police when they collect samples. Lab staffs also requested a budget for recurring expenditures, which is planned to be provided in the next financial year by the RWS&S department.

### 13.5. Environment, health & safety

There is no set policy for disposal of used chemicals, glassware and field kits. Generally they are kept inside the labs or are dumped outside. In some labs there is no sewage connection, so the wastewater from the lab is released directly into the environment. In many Labs it was seen that lab personnel perform experiments without proper footwear. The lab coats and safety glasses help in protecting the physical body against serious injury that can occur accidentally during the sample testing procedure.

- Sufficient measures need to be taken for health and safety reasons in the lab. Strict laws should be implemented to avoid carrying out experiments with bare feet, or without gloves and face masks.



Government should adopt standard safety measures for the water quality testing laboratories. There should be fire extinguishers and first aid safety box in all laboratories.

- Ensure supplies of shoe cover, masks, gloves, fire extinguisher and other material to confirm health and safety measures and should reduce the contamination of samples.
- Provision should be made for safe disposal of wastewater, and other chemical and hazardous wastes, as the chemicals used may be harmful to the environment as well as human health.

### 13.6. Infrastructure & maintenance of equipment

The newly established water quality labs in many districts are yet to receive full complement of instruments, chemicals and other equipment. It is also seen that many labs run out of essential chemicals towards the end of the financial year. For such instances, there should be some system of emergency supply, to tackle the shortage of chemicals. Old dilapidated buildings and physical infrastructure could be renovated and lit properly. The labs could be also cleaned.

For proper maintenance of instruments an expert should be commissioned. The expert could be authorized for repairing the instruments and overall maintenance of the Labs. An Assistant Service Engineer could be recruited for maintaining the infrastructure of the Labs. This is because faulty instruments are repaired through third party, which is time consuming and a cumbersome process. The Lab Engineer/Technician could be placed with the State Laboratory.

- The lab building should be spacious with separate rooms for chemical and bacterial analysis and should strictly adhere to the Protocol.
- A functional contingency fund should be constituted to cater to the expenses incurred in continuous maintenance of lab equipment. Even though all the labs are equipped with the best equipment but they are poorly maintained, and as a result there are several non- functioning equipment.

### 13.7. Coordination of State Lab, District Consultants and the Labs under their jurisdiction

- District Consultants in-charge of all the district labs are to be encouraged to pay more regular visits (than merely monthly visits) to all the labs. If the district is large such as Mahbubnagar, appointment of more consultants will improve monitoring of labs.
- There should be a monthly appreciation of Labs by the State on the basis of reporting, maintenance, testing and coverage – at sub-division, division and district level with monetary gains.

The performance assessment of Water Quality Laboratories in Telangana shows that District and Divisional Labs are well placed and out perform than the Sub- Divisional Labs. There is a strong need to build staff capacity to bridge the knowledge gap through engaging community in the form of awareness programs, capacity building training programs and the involvement of decision-makers. The training could be on the methods of community participation, the impacts of climate change and the evolving methods and technologies of testing water sources.

The water source test results indicate several districts in Telangana are vulnerable to chemical (Fluoride Arsenic and Nitrate) contaminations with an increasing impact of climate change and demand for agriculture produce. Laboratories should be incentivised to undertake repeated water source testing to understand contamination patterns across all seasons. They should also widely communicate the findings at community level. Alternate sources of drinking water and smart water technologies should be promoted in coordination with RWS&S. Unless these factors are not considered, the risk of water insecurity will threaten economic development, human health and citizens' well-being across the State.



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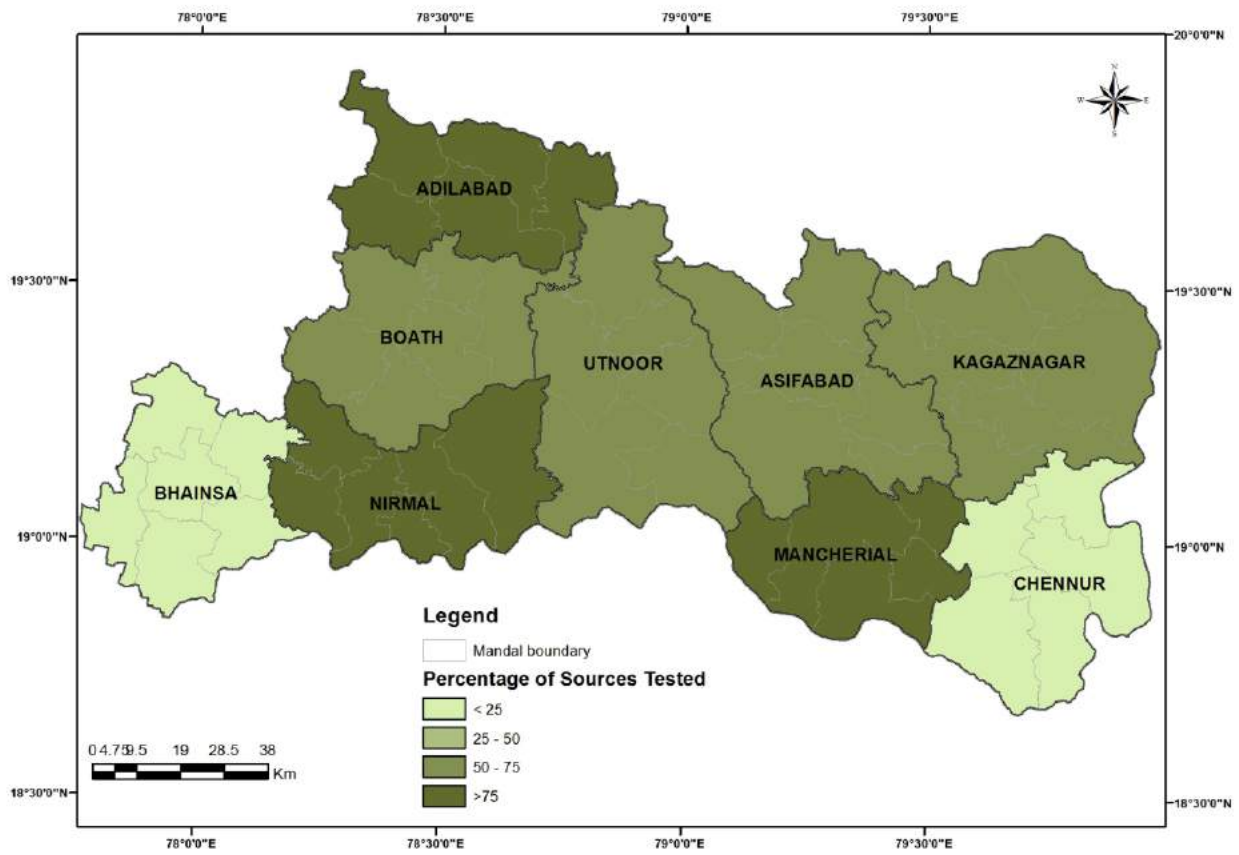
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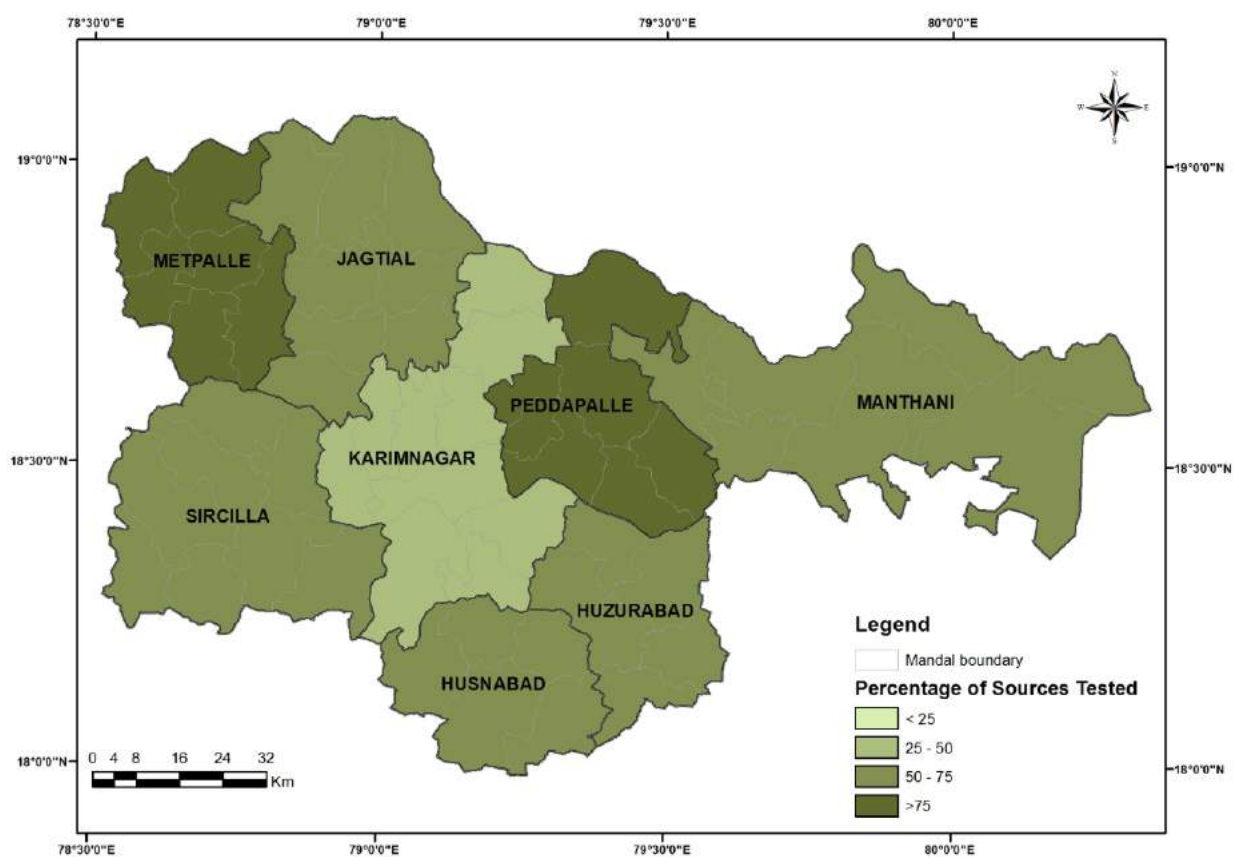
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# Annexure - District wise Coverage Map of Water Sources

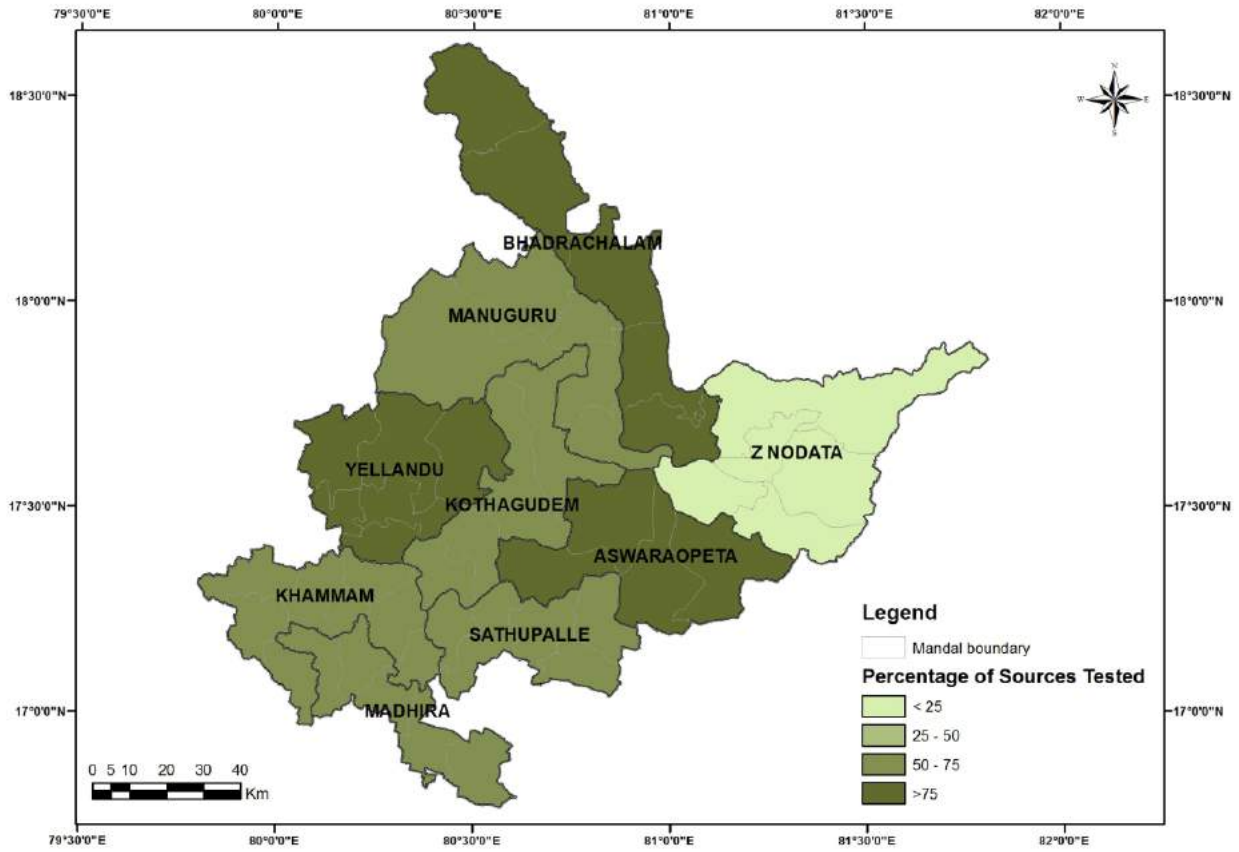
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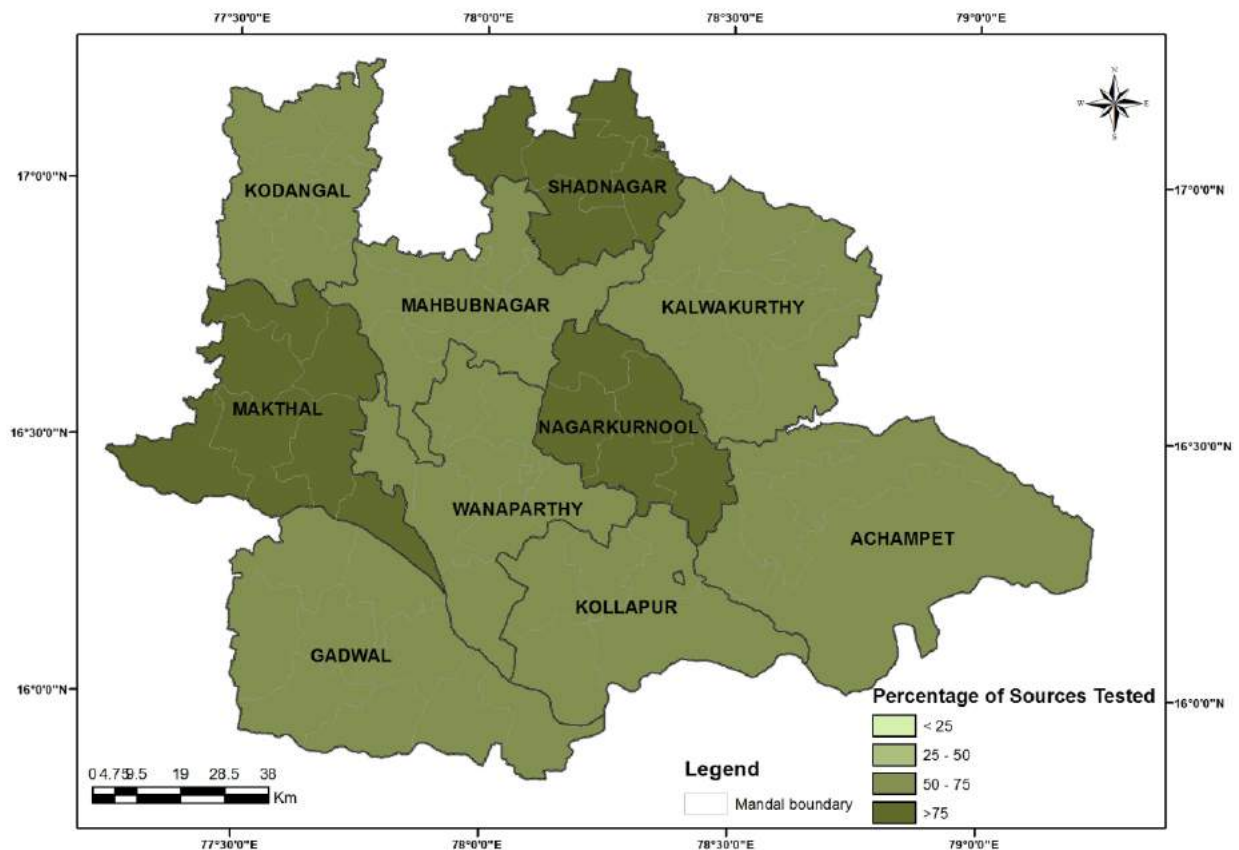
## II Karimnagar



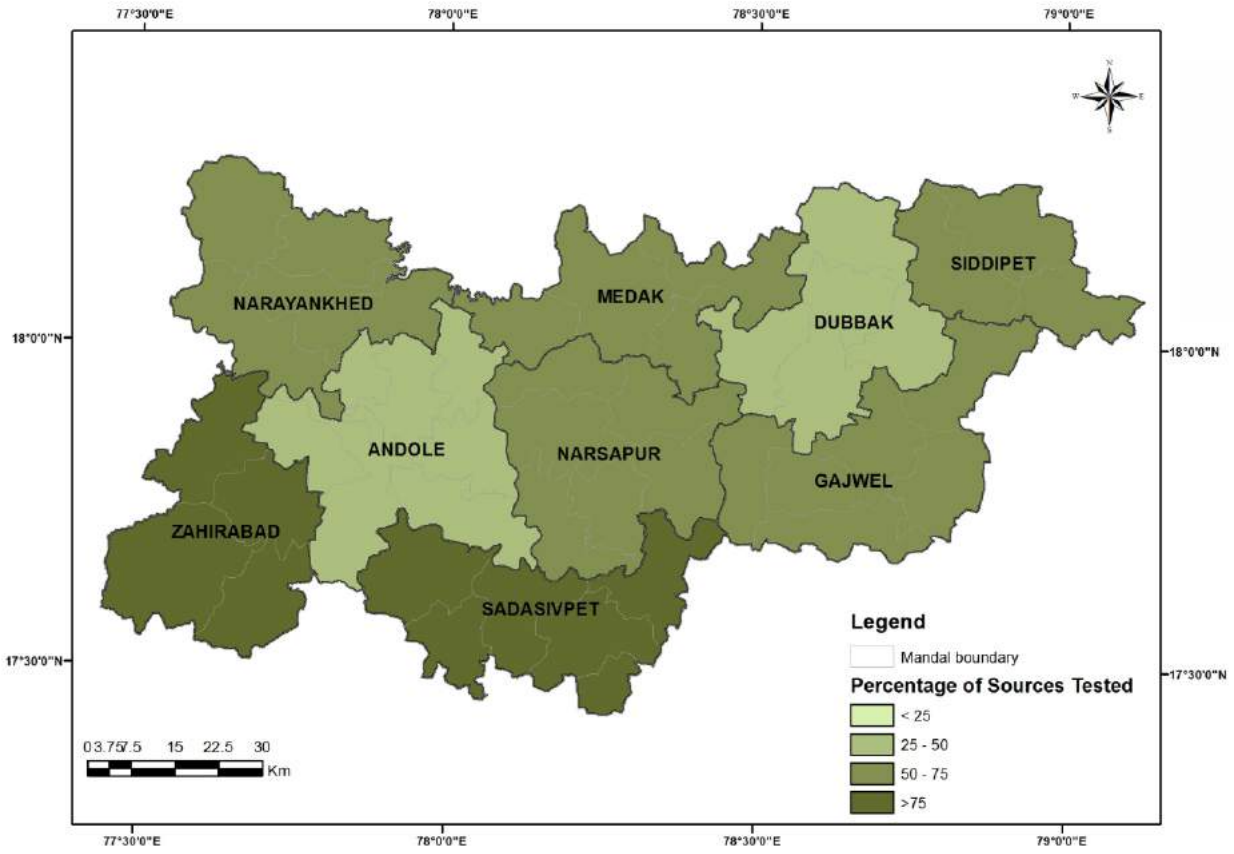
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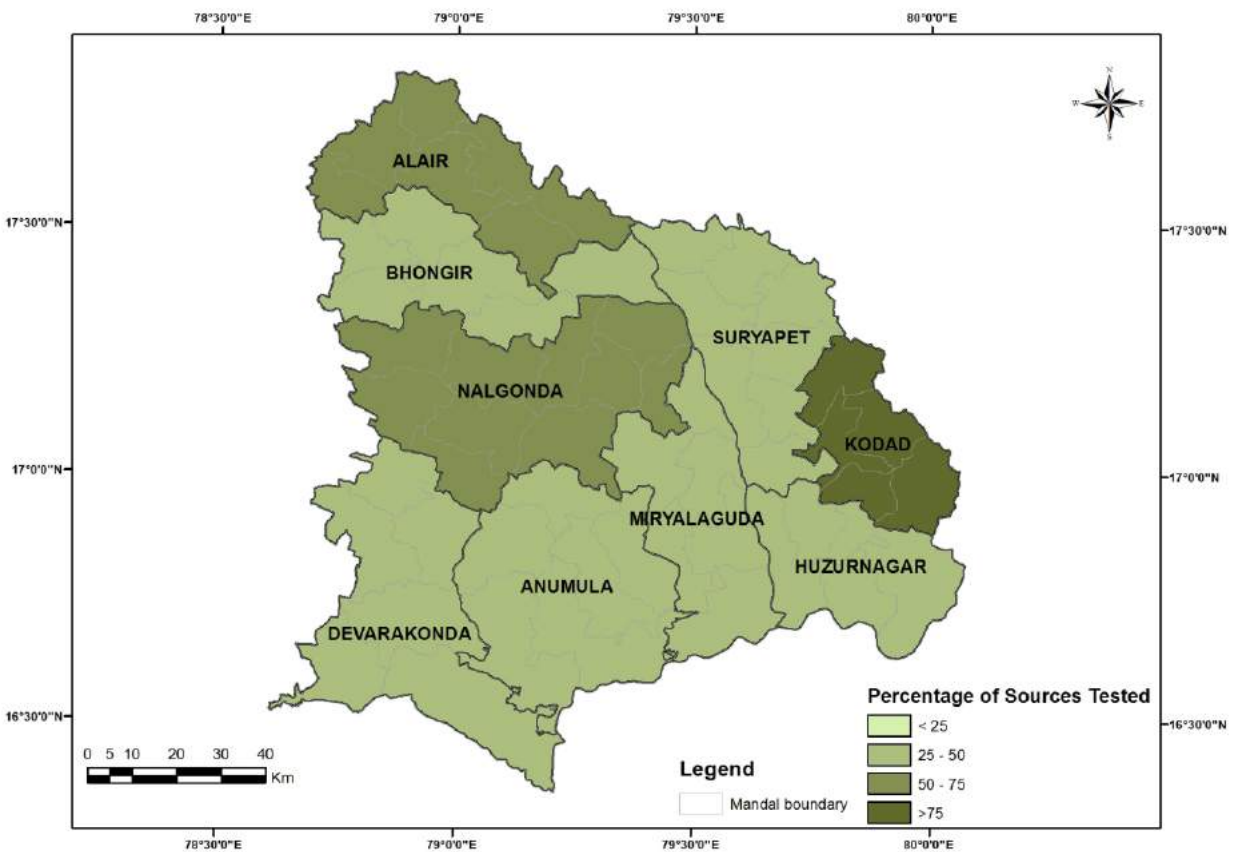
### IV Mahabubnagar



### V Medak

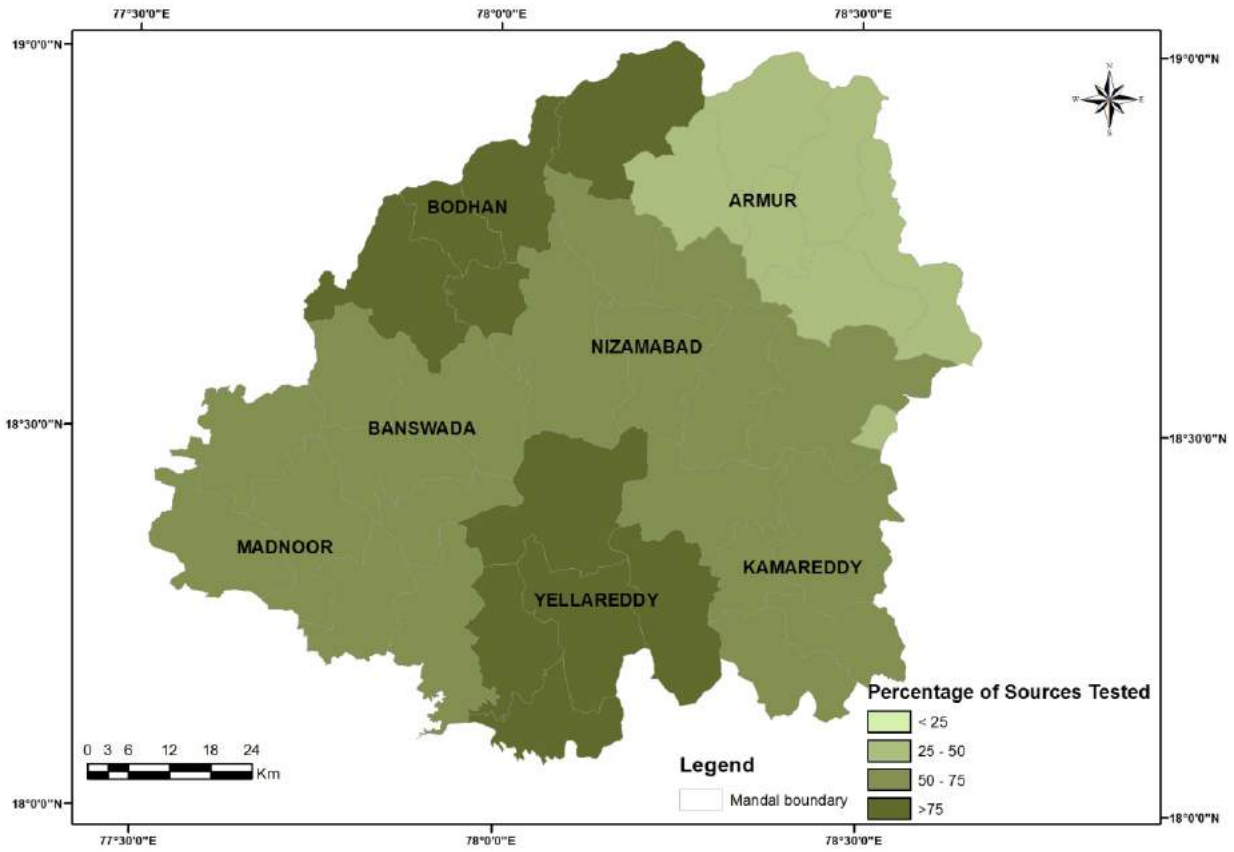


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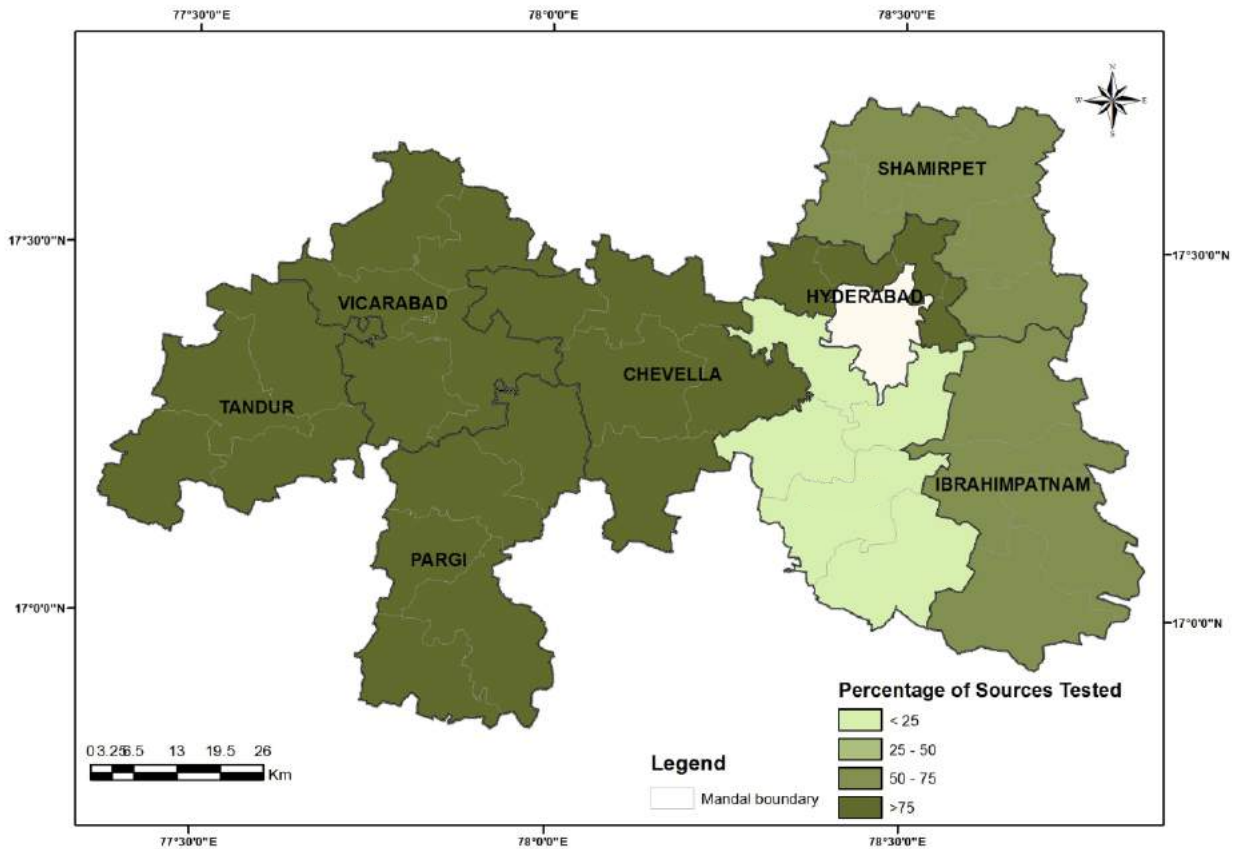




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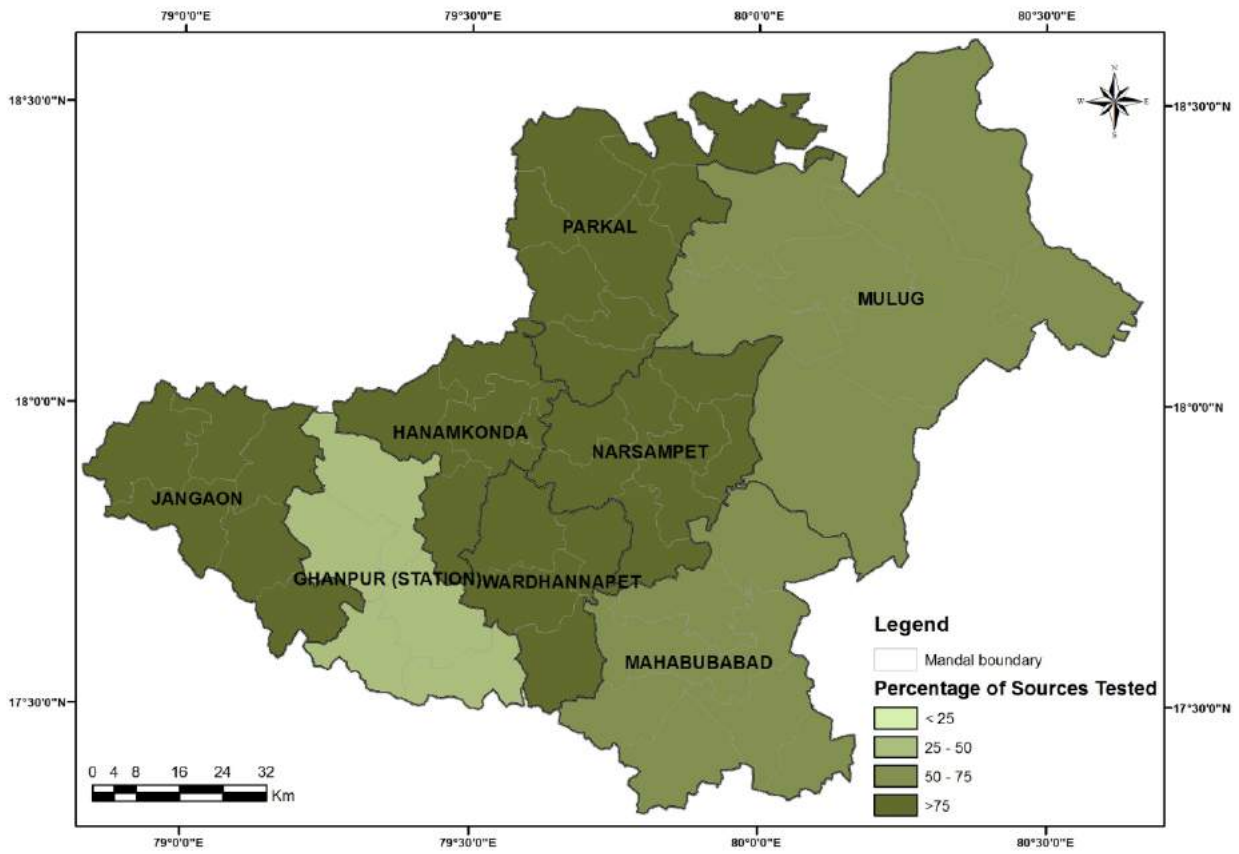


### VIII Rangareddy





## IX Warangal





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