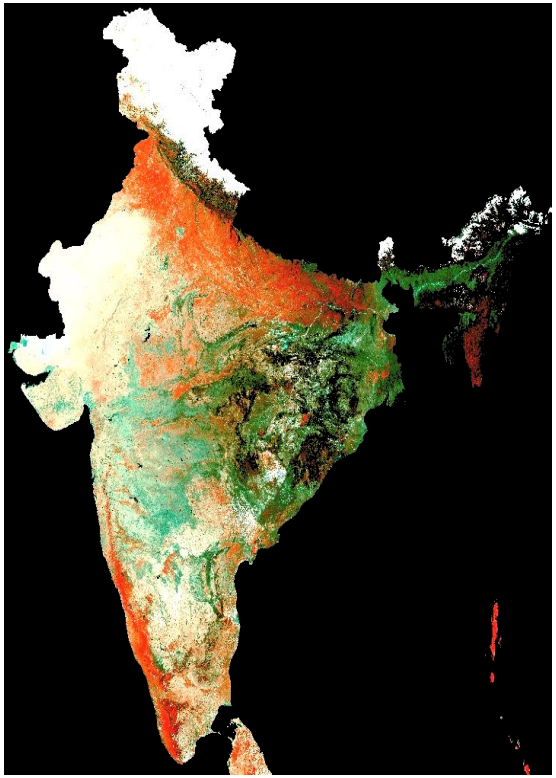


Drinking Water Quality in Rural India - Monitoring, Surveillance & Remediation

D.Rajasekhar, DA(Water Quality)
Ministry of Drinking Water and Sanitation

DEFINING WATER QUALITY AND TYPE OF SCHEMES UNDER
NATIONAL RURAL DRINKING WATER PROGRAMME

- PIPED WATER INTO ALL HABITATIONS. WELL BEFORE SDG 2030
- TAPS IN ALL HOUSEHOLDS. PRIORITY IN ODF VERIFIED VILLAGES.
- PROVIDE POTABLE WATER (IS-10500 – 2012 and subsequent amendments)
- PROVIDE SAFE DRINKING WATER IN ALL CONTAMINATED HABITATIONS. PRIORITY – ARSENIC AND FLUORIDE

Current Status

- Total rural habitations : 17.26 lakh
- % population which have piped water within 100 m : 57%
- % of households which have taps: 17.8%
- No. of habitations getting poor
- Quality of water: 0.69 lakh (4 %)
- No. of habitations getting less than 40 lpcd: 3.08 lakh (22%)

ISSUES ON WATER QUALITY

- Arsenic – West Bengal, Assam & Punjab
- Fluoride – Rajasthan, Karnataka, West Bengal, Telangana
- Heavy Metals (Uranium, Chromium, Aluminum, Lead, etc.) - Punjab
- Free Silica – Punjab and AP. (Maharashtra ?)
- Acute Encephalitis Syndrome – 5 States
- Diarrhea and Dysentery – Evenly spread
- Disinfection By-products (Tri Chloro Methanes) – Not yet focused
- Others – Iron, Manganese, Salinity & Nitrate – Rajasthan, West Bengal, Odisha, Assam

Action Plan for Achieving Vision POTABLE WATER IN CONTAMINATED AREAS

- There are total 69,258 contaminated habitations as on 12/6/2018
- In addition many habitations affected with heavy/ toxic metals especially in Punjab. This needs inspection and updated by the State
- Disinfection is mandatory in PWS schemes
- Water supply from safe surface sources is the preferable long-term sustainable solution.
- As short to medium-term solution, provision of community water purification plants will have to be provided.

COMMUNITY WATER PURIFICATION SYSTEM (RO PLANT) FOR TACKLING FLUORIDE PROBLEMS IN KARNATAKA – SHORT TERM SOLUTION (TECHNOLOGY ILLUSTRATIVE)

Action Plan for Achieving Vision Potable Water in Contaminated Areas (Contd..)

- Cost-effective and easy to maintain technologies to be set up through Government schemes/ State budget/ CSR, District Mineral Funds and private funding.
- Some States have been set up RO plants. Wastage of water and reject management are major issues.
- Cost of product water is 10-20 paise per litre and there should be in built mechanism for O & M agreement for seven years.
- In 60 Acute Encephalitis Syndrome affected districts safe water is provided through conversion of shallow public hand pumps to India Mark-II hand pumps and pumping from deeper aquifers to stand posts/taps.
- Continuous R&D on water quality & treatment through ICDWQ, CSIR and other reputed institutions

Disinfection Technologies

1)Boiling of water

2) Chlorination

3) Ozonation

4) UV radiation

5) Nano filtration

6) RO

7) Solar radiation

8) UF membranes –

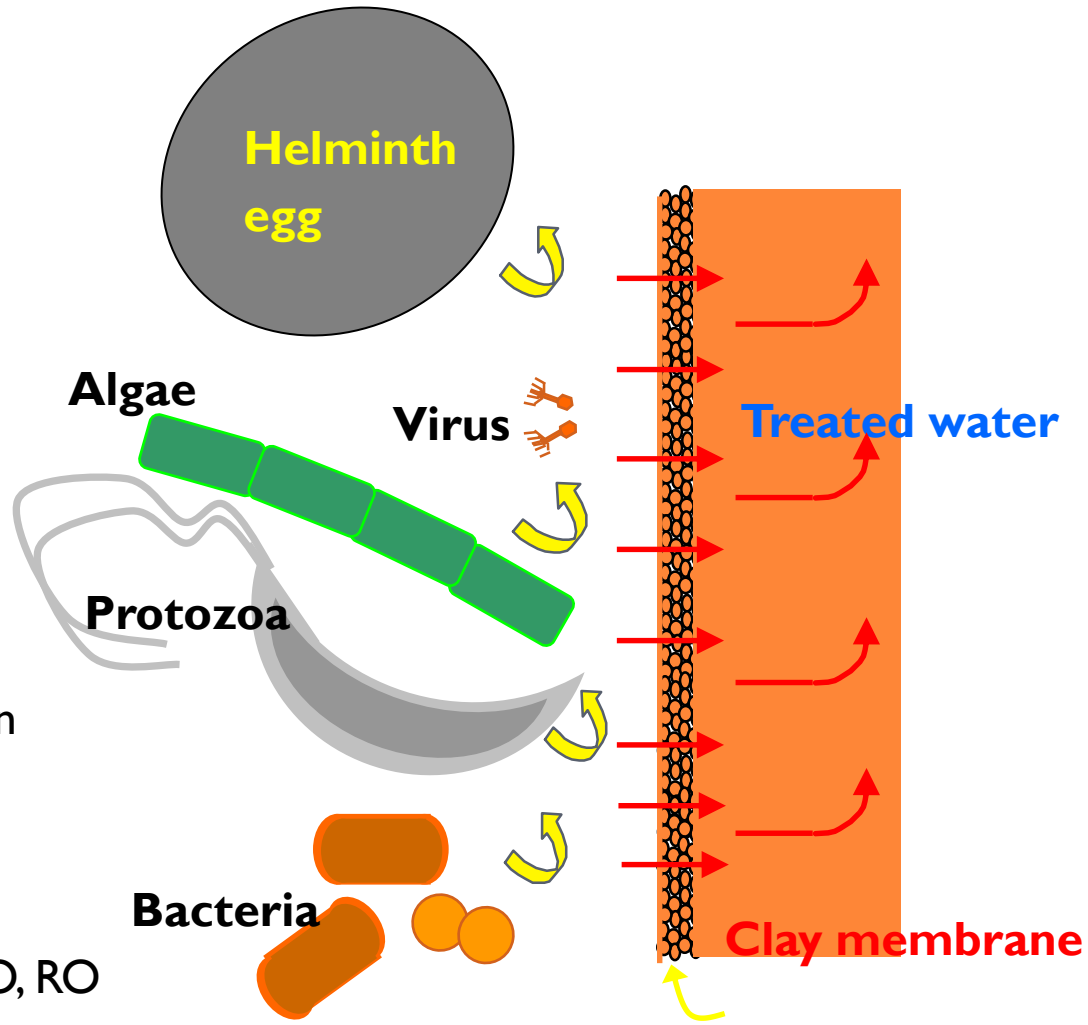
9) Silver-Copper Ionization

10) Bio-sand filter

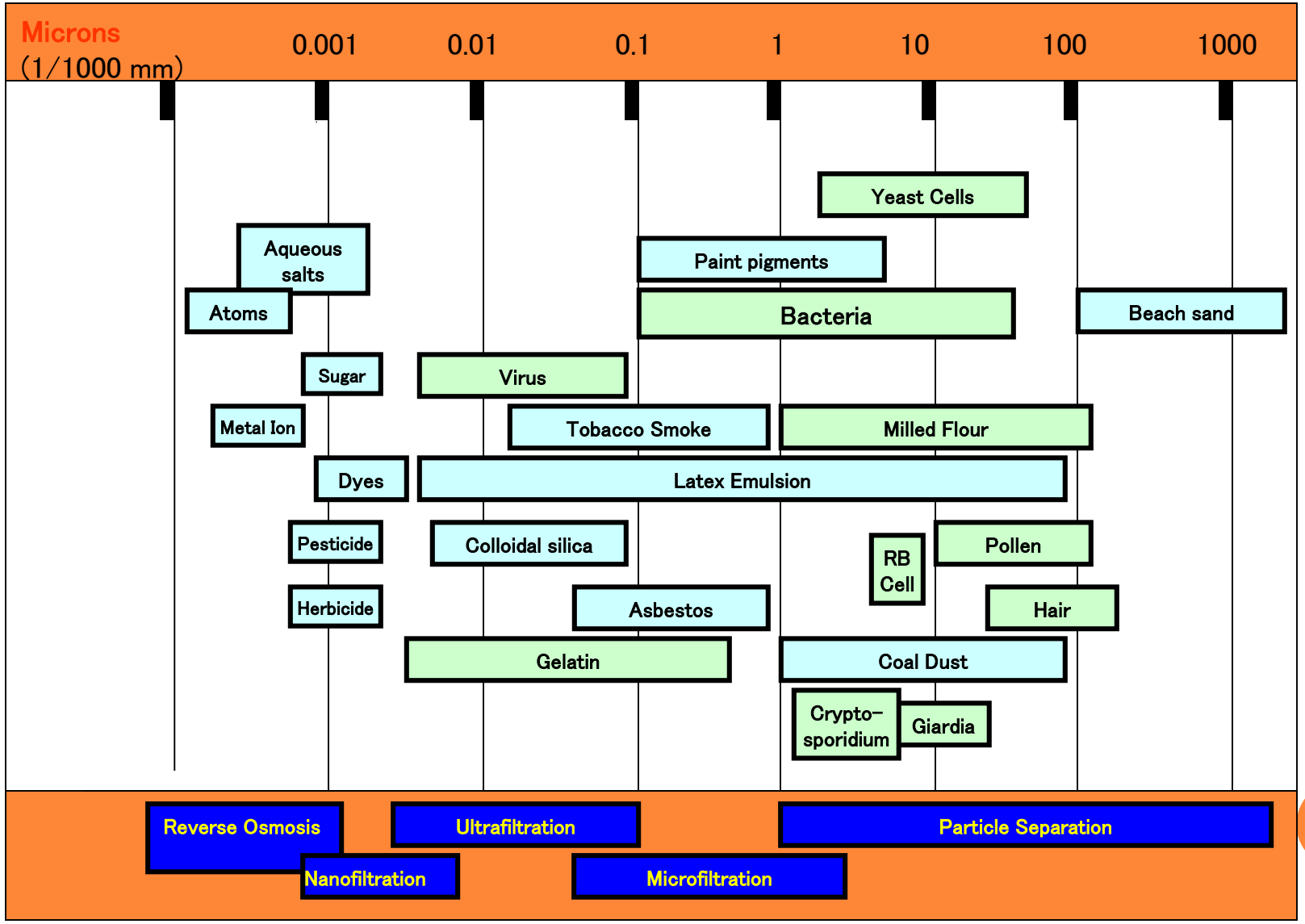
11) Terracotta filtration

12) Combination of AC, IO, RO and Chlorination (Straws)

13) Nano-Silver candles(ACRI)



Scale of Magnitude for Filtration Processes



COMMUNITY WATER PURIFICATION PLANTS AS ON 12/4/2018

Technology	Plants installed	Habitations covered	Population benefitted
RO	19,178		
Adsorption	385		
Solar Electrolytic Defluoridation	2,122		
Ion Exchange	98		
Nano technology	1,996		
Electric Defluroidation	507		
Total	22,164	16,926	2,41 crore

WATER QUALITY MONITORING & SURVEILLANCE

- 2,169 labs set up at various levels including 83 mobile labs (37 NABL accredited lab-and one ISO 9001 lab- TWAD, Chennai)
- Avg 36-40 lakh sources are tested in Labs during 2014-15
- Many Labs have few manpower
- No trained Chemists
- Uniform Protocol not followed by some States – to be enquired during meeting with Chief Chemists
- As per information known to me, Chemical FTKs are used in few States. No emphasis on procurement of refills.

- ❑ FTKs stored in Labs and Block offices
- ❑ Bacterial vials to be promoted in a bigger waye. Very effective IEC tool also due to colour change.
- ❑ Sanitary survey formats already given in Protocol. Can be used in ODF verified villages.

UNIFORM DRINKING WATER QUALITY MONITORING PROTOCOL

- Released in Feb' 2013
- Aims at standardization of laboratories
- Suggest requirements for Labs at various levels
  - Laboratory space
  - Equipment
  - Chemicals
  - Glassware
  - Manpower
  - Water sample collection & testing procedures
  - Frequency of water quality testing
  - Waste-water disposal protocol
  - Sanitary survey formats
- 3% of funds released to States is earmarked for WQMS
- Hiring of Lab buildings allowed. Funding provided for laboratory building construction at State level

Problem Definition for NABL Accreditation

- No compromise in Quality of drinking water supplied to our people
- Drinking water specifications (IS-10500: 2012) have been made more stringent (More parameters have been included and permissible limits of some of the already included parameters have been made more stringent.).
- Toxic metals such as Chromium, Lead, Nickel, etc. have been found in drinking water sources in some of the States.
- Inadequate monitoring of Disinfection Byproducts (DBPs) in drinking water treatment plants after chlorination.
- Pesticides are suspected to be found leached in some drinking water sources. Testing needs to be started quickly.
- Uranium is fouynd leaching as understood from AMD in some States.
- Many of the district and below level laboratories in States are not functioning upto the optimum levels

WHY NABL ACCREDITATION REQUIRED ?

- A Recognition of Testing Competence
- A Benchmark for Performance
- A Marketing Advantage
- International Recognition for WQT Laboratory
- Laboratory accreditation provides **formal recognition** to competent laboratories, thus providing a ready means for customers to identify and select reliable testing, measurement and calibration services.
- To maintain this recognition, laboratories are **re-evaluated regularly** by the accreditation body to:
  - ensure their **continued compliance with requirements;** and
  - check that their **standard of operation is being maintained.**
- The laboratory may participate in relevant **proficiency testing** programs between reassessments, as a further demonstration of technical competence.

SUGGESTED INFRASTRUCTURE UNDER EXISTING UNIFORM PROTOCOL

S.N.	Infrastructure	State Laboratory	District Laboratory	Sub-Dist. Laboratory
1.	Space for Analysis	80 m^2 (incl. 20 m^2 for bio. testing)	60 m^2 (incl. 20 m^2 for bio. testing)	50m^2 (incl. 10m^2 for bio. testing)
	Space for Storage (in m^2)	45	25	20
	Space for office & library (m^2)	45	15	10
	Total space req. (in m^2)	170 (later increased to 557.4 Sqm)	100	80
2.	No. of Computers	03	01	01
3.	Internet	Yes	Yes	Yes
4.	No. of UPS	02	01	01
5.	Inverters (back up time= 3 hrs)	02	02	01
6.	Printer	02	01	01
7.	Telephone facility	Yes	Yes	Yes
8.	Fax	Yes	Yes	Yes
9.	AC	Yes	Yes	Yes
10.	Provision for Fume hood	Yes	Yes	N.R.
11.	Provision for gas connection	Yes	Yes	Yes (only LPG)

SUGGESTED INFRASTRUCTURE FOR LABORATORIES UNDER UDWQMP

	State level lab	Dist. Level lab	Sub Dist. lab
Total Number of Parameters to be monitored in different level of laboratories	78 *	34 *	19 *

Suggested Minimum staff for State Level Water Testing Laboratory:

Chief Chemist/Chief Water Analyst:1, Assistant Chemist/ Water Analyst : 3 Microbiologist: 1, Laboratory Assistant: 3, Data Entry Operator: 2 Lab Attendant: 2 * : Varies with local geo-hydrology

Other Suggestions under Uniform Drinking Water Testing Monitoring Protocol

- **Function of different types of laboratories clearly defined.**
- **Minimum qualifications for laboratory staff indicated.**
- **Minimum Remuneration (on 2012 Rate) for staff (on contract basis) indicated.**
- **Water Safety Plan for different type of water supply schemes have been mentioned. Priority to ODF verified villages since the aim is for PWS. Unicef assistance will be required for hand holding the States.**
- **Provision of laboratory wastewater treatment.**
- **Mobility allowances for sample collection indicated. States to decide.**

ROADMAP AHEAD…….

- **The Ministry proposes to get NABL accreditation for State level laboratories in First Phase (1 State level laboratory in each State).**
- **The Ministry has recently accorded approval for construction of State level laboratories for Andhra Pradesh, Telangana, Madhya Pradesh, Odisha, Uttarakhand with 100 % financial support from WQMS Funds.**
- **An MoU may be signed between Ministry and NABL after taking views of the States in the Workshop.**
- **NABL to prepare financial proposal for these laboratories in consultation with the Ministry.**
- **Accreditation has to be Time-Bound and full proof for all States. They have to render their full co-operation with NABL authorities.**
- **Every State to inform atleast 2-4 district level laboratory for NABL accreditation during second phase depending on size and local conditions. The Ministry is deputed it Officers to visit 2 laboratories during 8-10 July 2018 as part of benchmarking.**

RANGA REDDY DISTRICT WATER TESTING LABORATORY – TELANGANA (SECRETARIES AT CENTRE AND STATE

AMRITSAR DISTRICT WQ TESTING LAB PUNJAB

PHE Laboratory, VADODARA (Ideal preposition)

Entrance Of PHELab Vadodara

PHE Laboratory, VADODARA

Front view of Lab

PHE Laboratory, VADODARA

Instrument room

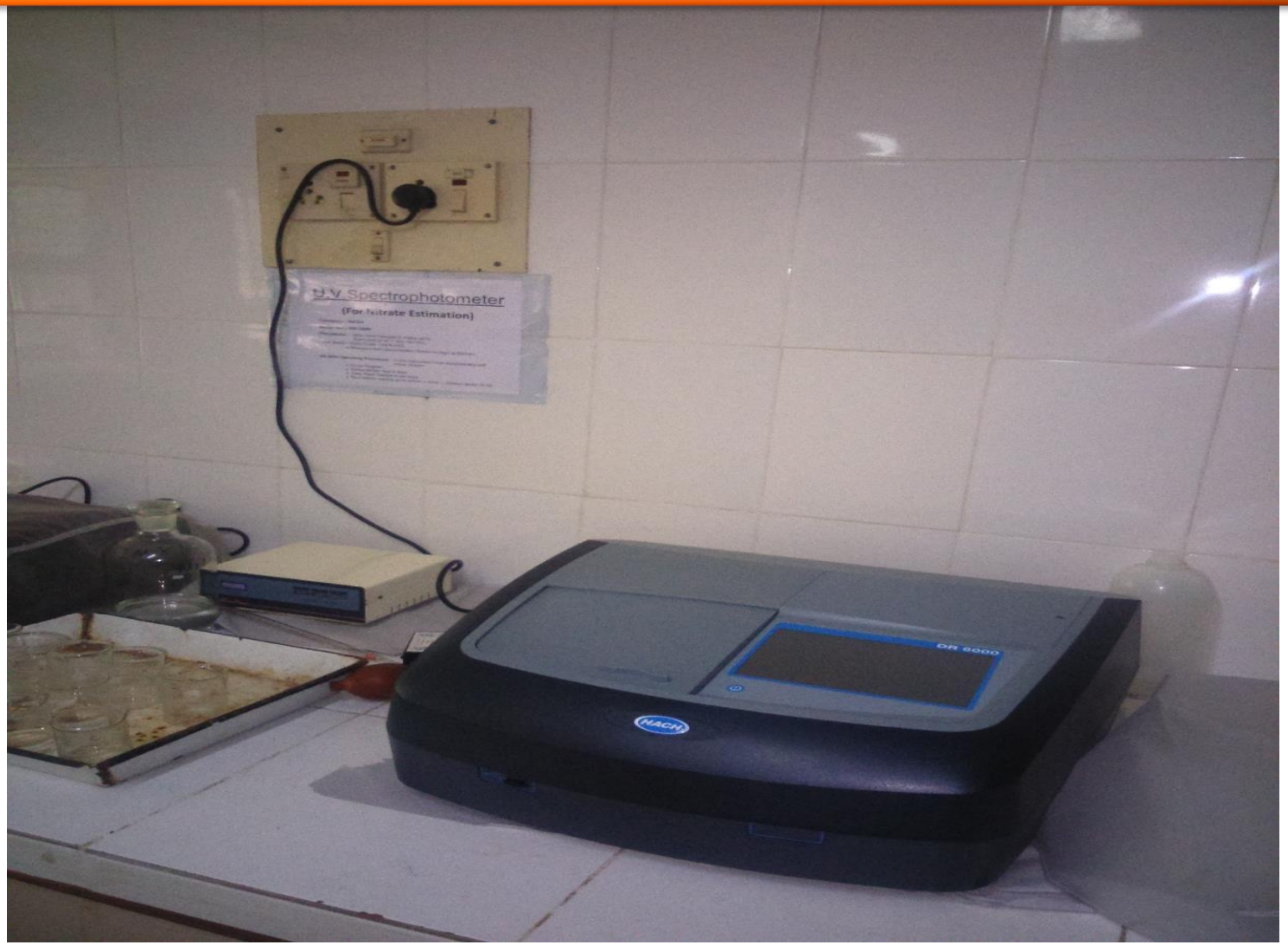
PHE Laboratory, VADODARA

Instruments-1

PHE Laboratory, VADODARA

Instruments-2

PHE Laboratory, VADODARA



instruments

PHE Laboratory, VADODARA

Instuments

PHE Laboratory, VADODARA

Working on UV-Spectrophoto meter

PHE Laboratory, VADODARA

Technical guidance

PHE Laboratory, VADODARA

Working with Fluoride Ion meter

PHE Laboratory, VADODARA

Working on Nephelo turbidity meter

PHE Laboratory, VADODARA

Working with monopan balance

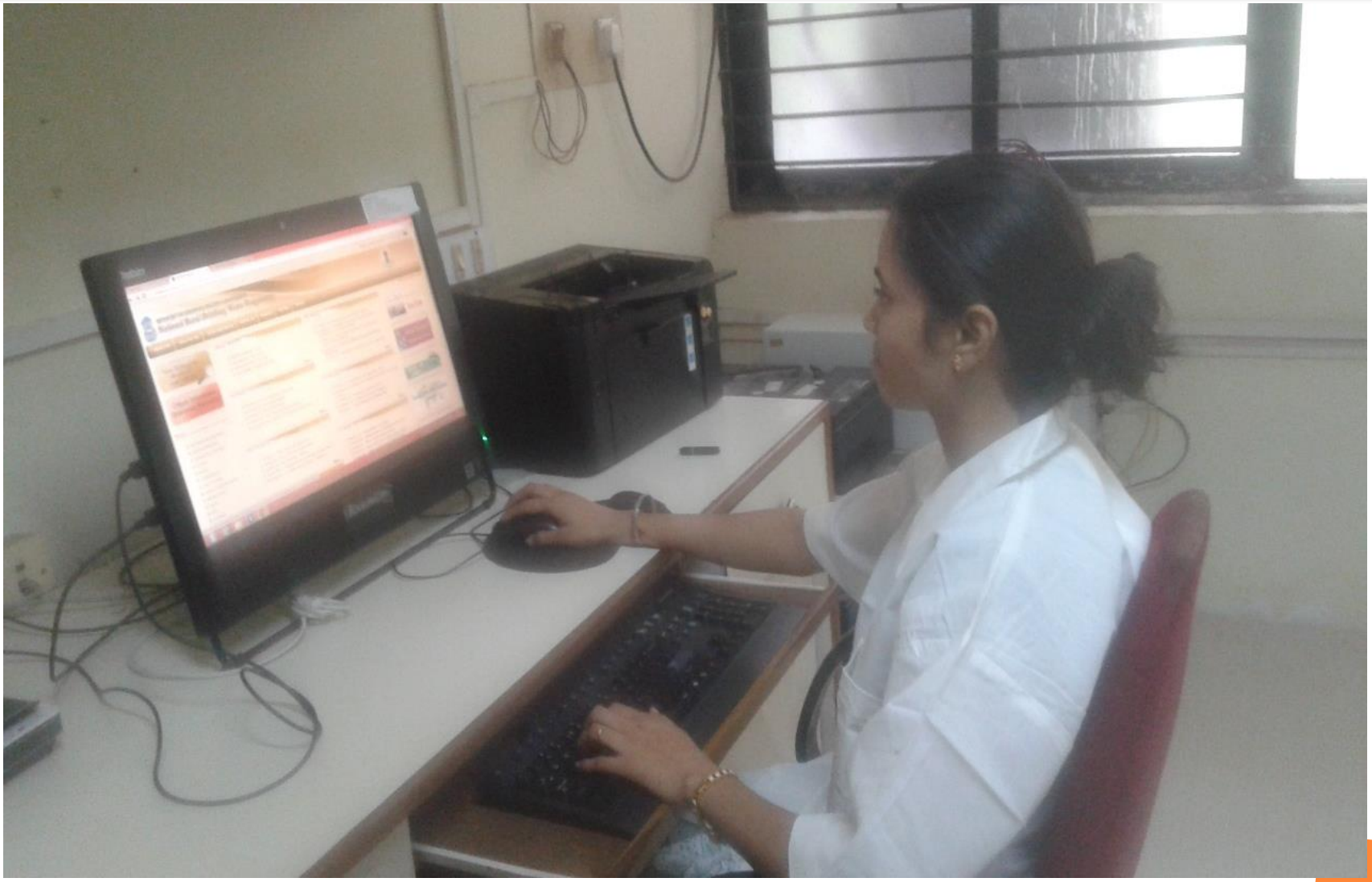
PHE Laboratory, VADODARA

Working with EC meter

PHE Laboratory, VADODARA

Working with Laminar flow

PHE Laboratory, VADODARA



IMIS Software working

PHE Laboratory, VADODARA

IMIS Data Entry

PHE Laboratory, VADODARA

Chemical lab-1

PHE Laboratory, VADODARA

Chemical lab-2

PHE Laboratory, VADODARA

Titrimetric analysis-1

PHE Laboratory, VADODARA

Titrimetric analysis-2

PHE Laboratory, VADODARA

Chemical analysis cell

PHE Laboratory, VADODARA

Bacteriological analysis cell

PHE Laboratory, VADODARA

Technical store

PHE Laboratory, VADODARA

Record room

PHE Laboratory, VADODARA

Tech discussion for NABL with Std.methods & UDWQMP

Monitoring & Evaluation

- Robust award winning IMIS in place (www.mdws.gov.in)
- SMS based monitoring in the country.
- Direct contact with Gram Panchayat Sarpanch over their mobile.
- National and Regional Review meetings, Workshops at regular intervals.
- Independent third party evaluation on key aspects of implementation
- High level Technical Committee constituted for empanelment of technologies headed by Dr R.A.Mashelkar

Awareness Generation & Capacity Building

- 4 specialized trainings provided to States through CIPET for understanding Quality Manual required for NABL accreditation. 20-30 Labs planned for NABL accreditation.
- Capacity building of Engineers, Chemists, Bacteriologists, and PRI functionaries by selected KRCs.
- Trained 26.7 lakh grass root workers in GPs since inception of WQMS in 2006.
- Convergence of different flagship programmes like NRHM, SSA, ICDS, RGPSA etc.
- Abridging gaps between district and GP through block and cluster resource coordinators.
- Building capacities of GPs for testing of water quality using field test kits.
- Awareness generation in regional languages through audio-visual, Mass media, inter-personal communication.
- Use of social media like Facebook, Tweeter etc.


Thank You ....
WATER
Warrants
Adequate
Testing for
Effective
Regulation of
Quality