

National Workshop cum Exhibition

On

Drinking Water Quality

15-16, November, 2011

Stein Auditorium, India Habitat Centre, New Delhi

Organized By:

Ministry of Drinking Water & Sanitation

Government of India



Facilitated by:



Confederation of Indian Industry



Plan 1

SESSION 1

INAUGURAL SESSION

Welcome Address and Opening remarks: Mrs. Vilasini Ramachandran, Secretary, MDWS

National Workshop cum Exhibition on Drinking Water Quality commenced with the Secretary-MDWS, Smt. Vilasini Ramachandran welcoming all the delegates. Secretary emphasized the importance of safe drinking water in human life which inter-alia, among other factors, related to monitoring drinking water quality in laboratories. She said that the national goal of NRDWP is to provide every rural person, adequate safe water for drinking, cooking and other domestic needs on sustainable basis. She also emphasized on maintaining water quality standards while supplying drinking water to the rural people by piped water supply schemes. She said that ground water is the easiest accessible source for agriculture, industry and drinking water. Sustainability of ground water is a major challenge which is being aggravated by deteriorating quality of ground water. To tackle this, State Governments need to take effective and affordable approach by involving PRIs, Civil Society, and R & D institutions. Efforts are particularly needed for awareness generation, community participation as well as institutional support and management to ensure availability of safe drinking water.

Hon'ble Minister of Rural Development and Drinking Water & Sanitation, Shri Jairam Ramesh inaugurated the Workshop by releasing two handbooks;

1. "Handbook on Drinking Water Treatment Technologies" which provides an overview of the various technologies available for treatment of contaminated drinking water.
2. "User Manual on Ground Water Prospects Maps" which explains how HGM maps should be used for identification of sites for drinking water sources and recharging.

Inaugural Address: Shri Jairam Ramesh, Hon'ble Minister of RD & Drinking Water and Sanitation, Government of India

Shri Jairam Ramesh, Hon'ble Minister of Rural Development and Drinking Water & Sanitation, in his inaugural speech, said that water quality issue, which is often taken for granted and considered a secondary issue, is a primary concern now. He expressed confidence that the presentations will lead to some concrete action plan to deal with this problem. Gist of the Hon'ble Minister's speech is as follows:

1. There has been considerable progress in providing drinking water quantity-wise. However, not much progress has been made by States in addressing water quality concerns and it is now more challenging than ever due to various reasons. The issue needs to be tackled with more focussed approach than tackled previously. To tackle drinking water quality, one approach that should be adopted, is to prioritize piped water supply schemes in 12th Five Year Plan because, in piped water supply schemes, the responsibility of providing safe drinking water rests with the agency dealing with its implementation. States should also ensure that rural schools and anganwadis are not merely covered with drinking water but provided adequate drinking water which meets quality standards as well.

2. We need to know much much money States have spent in a year on water quality. It has been observed that States have not provided reliable data on expenditure of 20 % of the approximately Rs 4000 crore which was provided to them on addressing water quality problems. States are required to be more sensitive to tackle drinking water quality problems.
3. To tackle drinking water quality problems, efforts should be made for greater reliance on surface water (wherever it is available), as over reliance on ground water is not only putting stress on groundwater availability but also giving rise to water quality problems. He said that deployment of mobile laboratories is an important approach for surveillance on water quality. Technological options in water quality affected habitations are only short term solutions though they are also required considering the fact that people are suffering due to various types of water quality problems. In the long run, safe surface water sources and artificial recharging of groundwater which dilutes the pollutants naturally, is the solution!
4. Hon'ble Minister observed that pricing of electricity and drinking water play a major role in water management. He said that the concept of free electricity (for irrigation) is not good for sustaining piped water supply schemes. Further, in a few states, electricity is charged at commercial / industrial rate which also is not a good system as it affects the functionality of schemes. He directed the Ministry to review the pricing of each state, draft a proper policy and submit the same. He also said that this matter will be taken up with the concerned Chief Ministers by him after careful review.
5. Hon'ble Minister said that Ministry of Drinking Water & Sanitation has come out with an innovative concept of MDI (Management Devolution Index) wherein 10 % of the allocated fund will be released to states which have devolved their functioning/ assets to the rural communities. He suggested that maintenance of piped water supply schemes should be taken-over by the communities and the local bodies themselves over a period of time. He said that water distribution is going to be a very important issue in the years to come. There is an increasing demand for piped water supply in various States and the people now have higher aspirations of getting safe drinking water.
6. Hon'ble Minister observed that housing, sanitation and water supply should be dealt as a composite entity and these three centrally sponsored schemes i.e. Indira Awas Yojana, NRDWP and TSC should be integrated to get more desirable result. He said that MNREGS has profound impact on water resources which states should take note of. Some positive impact in this regard is visible in Andhra Pradesh and Gujarat. Other States, however, need to do more in convergence with MNREGS.
7. Impact of safe drinking water and sanitation has direct correlation with disease burden. Investment in drinking water and sanitation will have a definite bearing on health issues. Effective IEC (Information, extension & communication) is very important in this regard because the achievement in drinking water & sanitation is also dependant on behaviour changes of the people. Social issues can not be solved by providing mere engineering solutions.
8. Hon'ble Minister said that he has been observing various types of treatment technologies for more than 25 years, but most often, these technologies do not

sustain in the field for the benefit of the public. He emphasized on special attention to be given by States for operation and maintenance problems.

9. Hon'ble Minister observed that the fund for TSC needs to be enhanced substantially as only (approx.) Rs 1600 crore is available for TSC against Rs 9325 crore for NRDWP.

Vote of Thanks: Shri T. M. Vijay Bhaskar, Joint Secretary (Water), MDWS

Joint Secretary (Water) thanked all delegates for attending the workshop. He informed that Shri Jairam Ramesh, Hon'ble Minister of Rural Development and Drinking Water & Sanitation has been associated with Rajiv Gandhi Drinking Water Mission since 1986 when Technology Mission started, and the Hon'ble Minister has been extremely focussed on Water Quality issues. He further said that behaviour change is an extremely important aspect in addressing water quality problems especially for addressing bacteriological contamination. He opined that the country is not progressing on health indices at the desired pace and needs to improve on this front. He expected that the workshop will be enriched by the inputs of the experts and expressed the hope that the outcome of the workshop will bring some valuable inputs for the 12th year plan. He expressed gratitude to the Ministers (dealing with rural water supply) from the states of Chhattisgarh, Karnataka, Maharashtra, and Manipur, and Principal Secretaries /Representatives of other States for participating in the National Workshop and said that their presence in workshop highlights the concern of the States on water quality issues and their desire to tackle the water quality problem.

Inauguration of Exhibition on Drinking water quality

National Workshop was also supplemented with an exhibition on drinking water quality, organized by Confederation of Indian Industry (CII) showcasing the advancement in water treatment technologies by GOI organizations (CSIR laboratories like NEERI-Nagpur, IMMT-Bhubaneswar, ARCI-Hyderabad, CSMCRI-Bhavnagar, CGCRI-Kolkata, NML-Jamshedpur and DAE organizations like BARC- Mumbai) and some private companies . A few international organizations like UNICEF and Water Aid along with some NGO's also demonstrated their work/activities in addressing drinking water quality problems in rural areas in the country.

Shri Jairam Ramesh, Hon'ble Minister for Rural Development and Drinking Water & Sanitation, inaugurated the exhibition on 15th November 2011 and also released an Exhibition Catalogue. He along with Ministers dealing with drinking water from Chhattisgarh, Karnataka, Maharashtra and Mizoram visited the stalls put up by CSIR laboratories, NGO's and private companies. He took keen interest in the latest technologies developed by different organizations and appreciated the efforts. He, however, said that though technologies are available, it is not found on field in rural areas due to higher capital cost and difficulties in Operation & Maintenance of the treatment plants.

Session 2

Discussions with Hon'ble State Ministers dealing with rural drinking water supply

Shri Kedar Kashyap, Minister for Public Health Engineering , Government of Chhattisgarh,

Shri Kedar Kashyap, Minister for Public Health Engineering, Government of Chhattisgarh informed that there are drinking water quality issues in Bastar, Korba, Sarguja, among other Districts, and there are 7845 drinking water quality affected habitations in the State of which 7534 habitations are iron affected, 188 habitations are fluoride affected and the rest i.e. 133 habitations are salinity affected. There are many areas in Chhattisgarh where rural population is sparse and habitations are scattered. Providing safe drinking water has been a problem in such habitations. Piped Water Supply schemes are not sustainable in many areas and are not properly managed. He suggested that Operation & Maintenance of piped water supply schemes should remain with State Government and not with the Panchayats because rural communities in many areas are not capable to handle technical responsibilities and it will take some more time to build their capacity.

Hon'ble Minister for Rural Development and Drinking Water & Sanitation, Shri Jairam Ramesh, observed that not handing over the schemes to the rural people will go against the norm. He suggested the state govt to take up the capacity building of the local bodies so that they could take up the responsibilities.

Shri Jagadish Shettar, Minister for Rural Development and Panchayati Raj, Government of Karnataka

Shri Jagadish Shettar, Minister for Rural Development and Panchayati Raj, Government of Karnataka said that money, be it from Centre, State or from external sources, should be utilised judiciously and the people for whom these projects are meant, must be benefitted. He informed that there are 15,936 rural water supply schemes in Karnataka and majority of these schemes are groundwater based which has put stress on already depleting groundwater resources in Karnataka. There are 2600 rural habitations which are yet to get safe drinking water. At some places, surface water is being tapped to provide drinking water to the rural population. He cited example of Tumkur district where Rainwater harvesting has been made mandatory in the entire taluka, and each house has a Rainwater Harvesting system, with an expense of Rs. 10000 to Rs. 15000 per house. He has personally visited Tumkur district to have an overview of the Rainwater Harvesting and the management of the water supply schemes and found it more than satisfactory. He also said that the disease burden on people is also low in this area, which is one of the indicators of the good quality of Drinking water, and noted how awareness can improve the situation. He raised the issue of electricity tariff in water supply schemes and said that many multi village schemes have gone defunct due to non payment of electricity and this needs to be looked into. He stressed that a policy decision must be taken on the O&M of the water supply schemes for the entire country.

Shri Lakshman Dhoble: Minister of Drinking Water & Sanitation, Government of Maharashtra

Shri Lakshman Dhoble, Hon'ble Minister, Government of Maharashtra, described the efforts of the rural communities and hand holding by the concerned officials of the Maharashtra Government in managing water supply schemes and tackling water quality problems. He highlighted the fact that the number of Gram Panchayats having been awarded Nirmal Gram Puraskar is maximum in Maharashtra. He also drew attention of the Hon'ble Minister for Rural Development and Drinking Water & Sanitation, Shri Jairam Ramesh, on rising river water pollution in Maharashtra due to indiscriminate discharge of industrial effluents and requested to take up the issue. The water quality of about 70 rivers is getting deteriorated day by day. He also raised concern over the rising number of hotels and illegal settlements along river beds. He emphasized upon capacity building of Gram Panchayats, as schemes are being handed over to Gram Panchayats but the technical and managerial capabilities of the Panch and Sarpanch are highly limited. Also, according to him, the priority of sanitation in the limited 5 year tenure of a sarpanch is very low due to obvious compulsions.

He also raised the issue of drinking water supply in large villages and said that a separate scheme for drinking water supply to such large villages is needed, as many such large villages may require civic amenities but may not have the budget provisions for the same.

Minister further informed that for providing safe drinking water to fluoride affected habitations in Maharashtra, many multi village supply schemes, comprising from 11 villages upto 50 villages, are being implemented for which, Rs 16,000 crore has been spent so far. Two regional piped water supply schemes are also being implemented. He requested Ministry to provide an additional funding of Rs 800 to 900 crore to complete these schemes.

Hon'ble Minister for Rural Development and Drinking Water & Sanitation, Shri Jairam Ramesh, observed that river water pollution and illegal settlement of habitations on river bed is not in his domain. He, however, said that he will try to take up the issue with the concerned Ministers. He assured Shri Dhoble that Ministry will provide all technical guidance to Maharashtra in improving the status of drinking water quality. Hon'ble Minister also congratulated Maharashtra for most NGP awards in any State (i.e. 9000 GP's out of the total 25,000 GP's that have been awarded Nirmal Gram Puraskar). He said that he has visited Gadchiroli district and observed functioning of solar energy based water supply schemes. The same may be emulated in other districts, especially in other LWE affected districts in India. He agreed to the view by Shri Dhoble, Hon' Minister, Government of Maharashtra that cleaning of rivers and construction of rainwater harvesting structures is the need of the day. In fact, the adverse effect of bad maintenance of ponds, rivers and wells has started impacting the environment.

Shri T.N. Howkip, Hon'ble Minister of Public Health Engineering, Manipur

Hon'ble Minister from Manipur informed that drinking water problems in Manipur were not significant earlier but now there is a serious concern of drinking water due to fast drying up of water sources especially in the plains. He attributed this to many reasons prominent among which being deforestation, continuing practice of jhoom cultivation and impact of climate change. Ponds have dried up and the quantity of water available has also decreased.

There are 133 water treatment plants in Manipur but most of them have gone defunct due to lack of O & M. To rejuvenate drinking water sources, State needs to put up large scale Rainwater Harvesting structures to recharge groundwater. He stressed that the Polythene pipes being in use currently are to be replaced by G.I. pipes. An important point raised by him was the sanitation coverage which is almost 80 % in Schools, Anganwadis and Community toilets, but at the individual household level it is estimated at around 30 % only. He requested MoDWS to provide funds to the tune of Rs 14,000 crore for making water treatment plants functional as well as for construction of sustainability structures.

Shri Arvind Mayaram, Additional Secretary & Financial Advisor, Government of India

Shri Arvind Mayaram, Additional Secretary-Rural Development, explained the new approach in implementation of PURA (Providing Urban Amenities in Rural Areas) wherein water, sanitation and housing have been converged. He said that tangible benefit of the projects are not observed because even after the capital investment is incurred, operation & maintenance of water supply schemes is not taken care of properly. GP's do not have the technical capacity and the funds for maintenance. Ministry of Rural Development tried to address the issue by including O & M and clubbing the major components of the scheme into one feature by awarding contracts to established contractors on public private partnership. The contract is signed by GP's with an established private sector for 3 years in a village with population between 30,000 to 40,000 after studying economic viability. Presently, there are 9 such projects which are being implemented in Andhra Pradesh, Rajasthan, Maharashtra, Uttarakhand and Kerala States. He said that success of the project will ensure providing safe drinking water to the rural people as per accepted standards. Further, if these projects succeed in achieving desirable results, more PURA projects will be taken up in other States as well.

Hon'ble Minister for Rural Development and Drinking Water & Sanitation, Shri Jairam Ramesh, thanked Ministers (dealing with rural water supply) from Maharashtra, Karnataka, Chhattisgarh and Manipur State for attending the workshop and sharing their views. He requested States to provide UC's and ASA of the fund released under NRDWP and TSC at the earliest. He said that the Ministry intends to release 2nd instalment to the States before 1st December 2011. However, 2nd instalment of the fund will not be released to the States until UC's/ASA are provided. This should be taken seriously by the States.

Session 3

Water treatment approaches for removal of chemical contaminants

Session chair: Mrs. Vilasini Ramachandran, Secretary, MDWS, Co-Chair: Ms. Lizette Burger, Chief UNICEF-CEP

3.1 Experiences of management of arsenic contamination by representative from Bangladesh by Yang Zheng, UNICEF, Bangladesh

Ms. Yang Zheng, through video conferencing presented the extensive arsenic testing results from Bangladesh and briefed about the various safe supply options. Her comparison of the combined capital and O&M costs of various supply options shows that over ten years there was not as big a difference as expected. Highlighting the need for community consultation

on the most appropriate solution, she also suggested some recommendations for health key actions, improvement of agriculture key actions and Water Supply Key Actions.

Some of the important and critical aspects to be analyzed were inadequate local capacity for arsenic testing as a bottle neck. Another important aspect to be taken care of was of Arsenic Removal Technologies (ARTs). The issue was that ARTs can effectively remove arsenic and provide arsenic-safe water to the affected population for a usually short period time until another safe water option is available.

Ms. Lizette Burger from UNICEF asked specifically about the collaboration between various ministries in Bangladesh and how it was achieved to which Ms Yang Zheng replied that though it was difficult to converge the effort but the importance of the problem was explained to them and various agencies and ministries agreed to work together. Lizette Burger remarked that dependence on local technologies was an instrumental factor in mitigating arsenic problem and the same should be considered.

Hon'ble Minister asked Ms. Yang Zheng from Bangladesh about their experiences in tackling with arsenic contamination to which Ms. Zheng said that they are going for 100 % source testing and collaboration with Ministry of Agriculture to avoid arsenic entering the food chain.

3.2 Strategies for tackling fluoride problem in drinking water and fluorosis mitigation : Dr A K Susheela, Fluorosis research and Rural Development Foundation, New Delhi

Dr. Susheela suggested that fluoride testing should be done using ion meters as it is a more reliable method than any other method. Only for screening the samples for presence of fluoride ion in drinking water, field test kits may be used. Further, reporting of fluoride contamination in drinking water by States on Ministry website should include date of testing and method of testing as well. Transportation of drinking water, if required in some areas, should be done using stainless steel tank as is done for transporting milk. She said that fluorosis is an irrecoverable disease and it has been observed that district hospitals are not properly equipped with infrastructure and with trained doctors to diagnose fluorosis at an early stage.

3.3 Latest advancements of electrolytic de-fluoridation technology: Dr Pawan Labhasetwar, Dy. Director, NEERI, Nagpur

Dr. Pawan Labhasetwar said that while the extent of contamination of sources impose more demands on development of treatment technologies, the acceptance of these technologies by water supply agencies, community and practioners and field implementation staff is equally important. He concluded that water treatment should be the last option to be exercised.

3.4 Salinity removal technologies and pros and cons of RO systems: Mr. A. V. R. Reddy CSMCRI, Bhavnagar

Mr. A. V. R. Reddy from Central Salt & Marine Chemicals Research Institute presented his views on 'Salinity Removal Technologies and Pros and Cons of RO systems' and discussed

about the important water challenges in India. Salinity and hardness in the ground water, presence of harmful contaminants like fluoride, arsenic, iron, nitrate, etc. in ground water sources, presence of microbial contamination in the surface water sources, saline water intrusion in coastal areas and industrial effluent discharge which increase pollution were other highlighted issues. The concluding remarks included acceptance of RO as a broad-based versatile solution for obtaining safe drinking water.

3.5 Nitrate Removal Technologies: Dr. Rajesh Biniwale, NEERI-Nagpur

Dr. Rajesh B. Biniwale made his presentation on Nitrate Removal Technologies. He pointed out that the treatment technology must be easy to use, affordable and cost effective, easy to maintain, in compliance with prescribed health standards and able to meet applicable drinking water standards, energy efficient, able to provide a viable disposal pathway for treatment, adaptable and scalable to different size systems. He concluded that technological interventions are possible for removal of nitrate from water, cleaning of water bodies possible with sustainable and cost effective phytoid system or a combined approach of nitrate removal from drinking water by resin with subsequent catalytic reduction of concentrated nitrate. Both the systems have negligible or no sludge generation and technologies are scalable and thus highly practicable.

3.6 Removal of toxic metals in drinking water: Dr. Padma S. Vankar, IIT-Kanpur

Dr. Padma S Vankar highlighted the basic problem of release of hazardous materials. She proposed that the environmental impact should be first avoided, then minimized and finally compensated for or offset. She advocated people-centric development process. In order to address the immediate needs of people of Balotra, she highlighted the success of R & D project taken up by IIT Kanpur. She also suggested for capacity building of stakeholders. She explained the plan for operations and maintenance and demonstrated the basic designing of bio material based filter and the cost bioremediation system. At last, she concluded that bioremediation is useful for the complete destruction of a wide variety of contaminants instead of transferring contaminants from one environmental medium to another, for example, from land to water or air, the complete destruction of target pollutants is possible. Bioremediation can often be carried out on site, often without causing a major disruption of normal activities. It can prove less expensive than other technologies that are used for clean-up of hazardous waste.

3.7 TERAFIL' green technology- Low cost & sustainable water purification systems –Dr. S. Khuntia: Institute of Minerals and Materials Technology

Dr Khuntia said that IMMT-Bhubneshwar, which is a CSIR laboratory, has already developed a low cost terrafil technology for removing excess iron, turbidity and bacteriological contamination. Capacity of this treatment system varies from 1 litre/hour to 1,00,000 litre /hour. Cost of the domestic terrafil filter is Rs 500 for 50 litre/day capacity and its life span (of the terrafil candles) is 3 to 5 years. This technology is already being used in rural areas and more than 1,00,000 domestic terrafil filters have been used in J&K, Sikkim, Himachal, Bihar, Arunachal Pradesh, Assam, Chhattisgarh, Jharkhand, Tamilnadu, Karnataka, Gujarat, UP and Odisha in the country. IMMT-Bhubneshwar has granted permission to 87 entrepreneurs for manufacturing of Terafil disc in different states for domestic use and to 75 entrepreneurs for making community Terafil water filters (1000 LPD capacity). Presently,

silver impregnation in terrafil disk is being experimented for improving its disinfection efficiency.

3.8 Nano silver impregnated/ coated terracotta filters for tackling iron and bacteriological contamination: Mr. Sanjay Bhardwaj, ACRI-Hyderabad

Mr. Sanjay Bhardwaj made a presentation on Nano-silver coated ceramic filter candles for water purification. He described the ARCI technology for water purification and the use of silver for water purification. He also stated that the potential to utilize ARCI technology of nanosilver impregnation on ceramic candles for water purification in India is going to be successful due to its easy operation, cost-effectiveness, successful validations through lab tests and field trials.

Discussion points - Session 3

Key Points:

- Deep water pumping should be monitored and excess pumping should be discouraged.
- All the departments dealing with water should work under one umbrella for better and timely implementations.
- The problem of contamination of arsenic into the food chain is to be examined and better understood for policy formulation. There is no remedy for fluorosis. Reduce fluoride to the minimum level in drinking water.
- Dealing with waste water from RO systems is a serious issues for consideration.

Session 4

Water treatment approaches for bacteriological contamination

Session Chair: Dr. R. K. Shrivastava, Director General, DGHS, MoHFW

4.1 Various disinfection technologies to tackle bacteriological contamination: Shri D. Rajasekhar, Deputy Adviser (WQ), MDWS

Mr. D. Rajasekhar briefed about the disinfection technologies in drinking water treatment such as boiling of water, chlorination, Ozonation, UV radiation, Nano filtration, RO, Solar radiation, UF membranes – silver-copper ionization, bio-sand filter, Terracotta filtration, combination of AC, IO, RO and chlorination (straws), Nano-silver candles, Hydrogen peroxide, Iodine/iodide resins. He said that boiling of water, is one of the safest and simplest ways of disinfection and highlighted the specific characteristics of the above mentioned technologies. He emphasized on the need of using proper grade of bleaching powder and also to conduct HAZOP studies while using chlorine gas as disinfectant. He stressed on proper care to be taken for disinfection by-products, and audit of Water Treatment Plants.

4.2 Importance of Water Safety Plan: Dr. Aidan Cronin, WASH Specialist, UNICEF-New Delhi

Dr. Aidan Cronin from UNICEF described water safety planning in the Indian setting. A key issue is how to reconcile demand generation for safe water, which can take several years to planning and expenditure cycles of one year. The format for water safety plan at the district

level was discussed along with the positive indicator of the interaction of various components and communication on safe drinking water. The common bottlenecks identified at various junctures were also discussed. 12 month cycle of expenditure on water supply should be made and this should be followed. He also described a 10 points score of risks around water sources. He also stressed on initiating corrective actions and better communication.

4.3 Development of bacteriological vials, convergence with NRDWP with National Health Profile and IDSP – Dr. Shashi Khare, HOD (Microbiologist), NRCN-New Delhi

Dr. Shashi Khare from NRCN informed that nearly five million people die in India each year due to waterborne diseases. These diseases affect education and result in loss of work days, which is estimated at 180 million person days annually. Out of 8 Millennium Development Goals (MDG's) set by Government of India, 3 goals are directly linked to water supply and sanitation - Reduce child mortality, Combat diseases, Ensure environmental sustainability. While briefing the types of water borne diseases, she said that Acute Diarrheal Diseases, Dysentery, Typhoid Fever, Helminthic Infections, Hepatitis A & E, Cholera are diseases due to contamination of water and food. Also, diseases like malaria, dengue and chikungunya are caused due to vectors which develop in stagnated water. She suggested that proper convergence of NRDWP, TSC and IDSP will be helpful in controlling diseases caused by water pollution. For this, NCDC is continuously in touch with Ministry of Drinking Water & Sanitation and mutual sharing of the data/information is being done on continuous basis.

Dr. R. K. Shrivastava, DGHS, said that targets for providing safe drinking water to the community can be achieved easily but we are not moving fast enough. The system of water supply and socio economic aspect in rural areas must be improved. A top down approach may not be useful in everyday scenario and innovations are need of the hour. The technology that is developed or proposed should be sustainable on the ground.

4.4 Emergency water treatment during calamities: Mr. Sarabjit Singh Sahota, Emergency Specialist, UNICEF-New Delhi

Mr. Sahota highlighted the immediate response, as tankering - from piped supplies, package treatment kits, temporary storage – bladders, tanks, bottled water in the time of need and chlorination as the technology for water purification. Point of use water treatment was also stressed upon. Household water treatment of Candle filters, Ceramic pot filters, Bios and household filters, Chlorination, Boiling, Sodis – using UV light & plastic bottle, Local natural coagulants and Chulli Filters System were also explained.

Discussion points - Session 4

Key Points:

- Water surveillance units need to be strengthened: District level units should deal with the problems at this level.
- Community participation in the government system is needed to get the right data and for the proper implementation of the schemes.
- Technologies should be designed in such a way that they should succeed in the rural areas too.
- Mapping of water borne diseases should be done to help the health departments to start health programmes in these areas.

Session 5

Water Treatment approaches by reputed NGOs

Session Chair: Mr. T. M. Vijay Bhaskar, Joint Secretary, MDWS

5.1 Community involvement in water quality testing: Mr. Umesh Desai, AKRSP(I), Ahmedabad

Mr. Umesh explained AKRSP initiatives and described how water quality problems can be solved by community participation. He highlighted the role of community at the planning, implementation and management level. He also presented the case study of Nirmala Water Testing Laboratory at Sayla, Surendranagar District Gujarat.

5.2 Experiences of community based water treatment approaches adopted in the country: Dr. Indira Khurana, Water Aid-New Delhi

Dr. Indira Khurana talked of the challenges/ learnings for freedom from fluoride project as well as discussed the strategy for the same. Talking about the sustainability measures, training of jal surakshaks (volunteers) on water – availability and quality, about arsenic, arsenic mitigation measures and assessment was considered a major strategy.

5.3 Best practices on total water quality management adopted by communities: Ms. Sunita Nadamuni, Arghyam, Bangalore

Ms. Sunita Nadamuni suggested that a collaborative approach between Deep Field Input by NGOs and Broader Process Approach by Governments is required to tackle the problem of Water Quality Management (WQM). The step by step approach was recommended starting from assessment of baseline to preparatory phase then to Solution Phase -WQ Monitoring moving to Solution Phase- Implementation and finally to O&M phase. She emphasized on the fact that looking to the abstract nature of the problem there cannot be a single perfect solution, and efforts may be made for a "Family of Solutions"

5.4 Involving schools in water quality monitoring & treatment: Mrs. Yllaylee Das, Plan India

Ms. Yllaylee Das from Plan India introduced the project "Abolishing Water Poverty – Promoting child rights to end child poverty One School at a Time". After describing the project, she briefed about the technology of aqua tower and stated that it includes hollow fiber, membrane housed within a protective canister through which untreated feed water enters. Technology of See-Saw Pump was also outlined by her. Role of School Management for regular maintenance of the installed systems, repairs required after the installation, monitoring of the system during establishment and post installation so that it works seamlessly and promoting child rights to end child poverty were also explained.

Discussions - Session 5

Key Points:

- Gender mainstreaming and youth involvement is an important aspect and it should not be neglected and must be integrated in various programmes of Govt/ NGOs.
- Communities should be sensitized at various levels for a proper toxic waste management..

- Involvement of NGOs in rural areas should be a long term affair . Capacity building of Panchayat is very much needed.
- Drinking water system in Schools should be properly monitored and through it, many health issues in children could be tackled.

Session 6

Latest advancements in water treatment approaches

Session chair: Dr. T. Ramasami, Secretary-DST, Government of India

6.1 Affordable water purification using nanotechnology: Dr. T. Pradeep, IIT-Chennai

Dr. T. Pradeep explained the use of nanotechnology in water purification. Water is contaminated by microbial, organic impurity, heavy metal etc. & to purify the water, technologies like sedimentation, absorption etc. are used. Nanotechnology offers many solutions to remove the contamination. In India, we should look at a perspective of ground water availability, water quality, population and water contamination due to fluoride. It was also stated that microbiologically safe water is the first concern because 80% of all drinking water related problems are due to microbes. Anti-bacterial performance has been successfully checked for Salmonella Enteric and Shigella³ Dysentery. Nanotechnology-based product is a complete solution for safe water. Some upcoming technologies like Nanotubes, Dendrimers, Magnetic particles etc were also introduced which would make pure water affordable. The need to have collaborative efforts is on the fronts of new sensors for ultralow sensing in water, Visual displays, sustainable purification technologies; combining solar, membrane and materials, Water harvesting and Aquaporins. He emphasized on more R & D work taken up as pilots jointly by IIT-Madras and MDWS.

6.2 Community water centre: Mr. Karunakar Reddy, SATPL

Mr. Reddy introduced Smaat aqua, which was established in 1998, which provides end-to-end solutions for water, air and energy management solutions. Smaat Aqua initiated community water centers to provide safe drinking water to 6 lakh people population in India and is responsible for execution and maintenance of the entire project for 10 years on a build – operate – maintain – transfer (BOT) mode.

6.3 Evaluation of safety for drinking water treatment products as per International standards: Dr. T. N. V. V. Rao, Underwriters Laboratories, Bangalore:

Dr. T. N. V. V. Rao explained about the requirement of safety evaluation as the technologies are used for treatment and performance of the product. He also highlighted the benefits of toxicity evaluation for promoting public health and safety, demonstrating reliability to consumers, supplementing enforcement of regulations and differentiating manufacturers. He quoted the examples of exempted & non-covered products US Water Standards. He also talked about structural performance & minimum performance requirements and elective performance claims.

6.4 Ground water contamination in terms of removal of excess arsenic, fluoride, iron, nitrate etc.: Ms. Renu Saraf, Ion Exchange India Ltd.

Ms. Renu Saraf explained ground water contaminants in terms of removal of excess fluoride, iron, arsenic, nitrate, and disaster management unit and eco+ puriline. She

emphasized on Total Water Management for the domestic and communities' purposes and specific features for addressing rural needs. She explained the various technologies in this regard. She also mentioned about Disaster Management Unit (DMU). She also informed that Ion Exchange techniques have contributed a lot to the Jalmani project, to provide non-electric systems for schools in rural India.

6.5 Latest advancements in water treatment approaches in point-of-use treatment devices: Dr. S. K. Sisodia, Eureka Forbes Pvt. Ltd.

Dr. S K Sisodia from Eureka Forbes Limited, presented the latest advancements in water treatment approaches in point-of-use treatment devices. He pointed out that the most suitable technologies for rural environment should not require electricity, running water or service. The challenges in this regard is to address the key by-products formed by the principal disinfectants and controlling them in output water and to describe the balance between microbiological and chemical health risks and emphasise the safety of consumer first, along-with claims on microbiological quality.

6.6 Making Maharashtra Fluoride free through EDF technology: Mr. Abhijeet Gaan, NAPL, Nagpur Aquatech Pvt. Ltd.

Mr. Abhijeet Gaan, Director NAPL talked about the EDF Technology for fluoride removal. He also talked about various successfully working projects under taken by the community. For non-availability of electricity, alternatives like Solar Cells & Solar Pumps were suggested. The other products for WQM introduced were Electro-Chlorination Plant, ENCEE CHLOR for disinfection, for salinity removal Reverse Osmosis Plants and AQUA-RO. Similarly for arsenic and nitrate removal Electro-Chemical Plants were recommended.

Dr. T. Ramasami said that dramatization of the problems should be avoided. The technology should be cost effective. The cost of the delivered water that was not discussed in the session, should have been discussed and more thought should be given to it. He emphasized on giving more thoughts in this regards and said that the technology developed should be like a showcase product which can be applicable for large scale population. Responding to a query regarding reject water disposal and possible ground water contamination, Dr. Ramasami remarked that it is good to note that the Ministry is concerned not only about water quality, but practical aspects of reject management and possible groundwater contamination.

Discussion points - Session 6

Key Points:

- There are many technologies available to deal with the water challenge but the need is to instal them where they could give maximum benefit.
- Ionization is a good solution for virus removal, waste water, Sewage water and leaching treatment..
- Nano technology is an easy solution which could be used at various levels to deal with water purification. However it has some limitations also.
- The de-generated waste could be used as cheap fertilizer after going through proper technical procedures.

Concluding session

This session was specially designed for the participants from the states to share experiences, discuss areas of concerns and seek clarifications on issues related to quality of water. Various state representatives from Jharkhand, Tamil Nadu, Gujarat and Nagaland shared their experiences and success stories.

Shri Shardendu Narain from Jharkhand briefed about the steps being taken by the state in mitigation of Fluoride, and Arsenic in various parts of the state.

Twad Board representative raised the concern of understaffing of the laboratories and that the salary to the staff in laboratories is insufficient.

Gujarat representatives informed that they could mitigate the problems of Fluoride and Salinity to a large extent by shifting to surface water.

Chief Engineer, Nagaland appreciated the quality of interaction at the workshop, and termed it as a beneficial exposure. Further he added that most of their sources are surface water based, and therefore there are not major water quality issues. However, the State needs more data on groundwater, and hence requested the support of MoDWS in Groundwater mapping and remote sensing studies of the water resource.

Representative from CGG, Hyderabad requested that social audit of the water supply schemes may be made mandatory, as the consumers may demand samples under RTI act.

Chhattisgarh representative briefed about how their state is managing the quality issues of Fe, F, and Salinity. It was also informed that the state has installed EDF plants and IRP's with the support of NEERI.

Bihar representative informed about the efforts of the State govt. in mitigation of Fe, F, and Arsenic, and about installation of Iron Removal Plants (IRP's) in Ara, Bhagalpur and Munger.

Arunachal representative stated that there is no chemical contamination in the state in drinking water sources, except Fe, which is being taken care of. He suggested to set up a special high level committee for hilly areas to tackle such issues, and taking the help of IIT Guwahati on various technical matters in drinking water supply.

Orissa stressed an important point by stating that in Fluoride affected areas they have not gone for any defluoridation, but instead have gone for alternate source. He also shared that shallow aquifers at 80 to 100 ft are contaminated with fluoride, but the deeper aquifers are not having any contamination, and therefore fluoride free water is being tapped from deeper aquifers. At the same time habitations are being discouraged to use shallow handpumps. The state is utilising sustainability funds for quality mitigation through artificial recharge of groundwater.

Andhra Pradesh representative briefed about having 51 District and Division level laboratories and that the state is trying to mitigate the problems of Fluoride, and salinity.

Also, they are monitoring the kidney patients and testing of Strontium and Selenium is also being taken up in high disease burden areas. The representative stated that the testing facilities are going to be expanded.

Assam representative suggested that technological options for surface water based sources should have been discussed in the workshop. In Assam, 76 blocks are Arsenic affected, while fluoride contamination has been reported in 4 Districts. Surface water sources are being used for quality mitigation. The state has also been successful in isolating some bacteriological contaminated areas with poor hygienic conditions.

Representative from Himachal Pradesh pointed out that they do not have any major quality issue except salinity in a few areas. The representative suggested that the cattle population may also be considered while deciding the minimum per capita water requirement of a habitation.

Secretary directed Mr D Rajasekhar, DA(WQ) to respond to the queries raised by the states. He responded as follows:

- Surface water is the solution for quality mitigation but availability of surface water is not universal, and where available, it would take longer time to implement the surface water based schemes.
- The minimum assured salary to a chemist is Rs 3500 but they get incentives over and above this in proportion to the tests conducted by them.
- For Nagaland, HGM maps are under preparation.
- All North Eastern States may take the help of North East Space Application Centre, Shillong.

Mr Sujoy Majumdar, Director (Water) suggested that 5% support fund has enhanced to 8%. He also suggested that NGO's may be engaged for Water Quality Surveillance. He also informed that Aquifer Mapping is being done by CGWB, and the states may take the benefit by converging the data with CGWB.

Summary of Recommendations

Approach

1. Long-term sustainable solution for tackling water quality problems, especially arsenic, fluoride and salinity is alternate safe surface water based piped water supply schemes providing household connections.
2. Wherever feasible, artificial recharge of groundwater be undertaken for dilution of contaminants insitu, especially for fluoride and salinity problems, since this could yield simple, low cost and permanent solution for drinking water quality problems.
3. Community involvement and mobilization be mandatorily made right from inception stage to post-implementation stage, till they can operate and maintain the systems commissioned.
4. It is more important to understand "How" systems are implemented than "What" systems are implemented.

5. Convergence between Integrated Disease Surveillance Programme (IDSP), National Rural Health Mission (NRHM), NRDWP and TSC should be promoted at all levels. A joint action plan has to be developed.
6. Block Resource Centres (BRCs) should be established early for assisting GPs and also to establish co-ordination between the GPs and District level authorities for O&M of water supply systems and technologies set up.

Engineering & Technology

7. In-situ drinking water treatment technologies may be taken up by State Governments, as short-term solutions, since people cannot be put at risk.
8. Life cycle cost i.e., both capital and O&M costs shall be amongst the prime-deciding factors while choosing any technology
9. Terafil technology for iron removal is one of the green and low cost technologies which may be considered by States apart from conventional aeration based systems.
10. Use of solar energy may be promoted in a big way, wherever required while implementing short-term treatment technologies.
11. Some of the green technologies which do not use conventional electricity power like Ultra-filtration may be considered by the States for improvement of turbidity and bacteriological quality of drinking water in rural habitations and in rural schools.
12. Raw and product water testing analysis and certificate of performance from CSIR laboratories, especially NEERI, Nagpur should be insisted for all water treatment technologies.

Operation & Maintenance

13. There shall be a proper O&M protocol developed by the States while procuring insitu water treatment products for providing safe drinking water. States may consider including O&M costs for 3-5 years along with spares/consumables required for 5 years into the capital cost at the time of procurement. In addition, handholding of the community for 2 years be included in the procurement contracts.
14. States should reduce electricity tariff to be charged on community drinking water supply schemes.
15. It is important to procure consumables like bleaching powder ensuring desired levels of purity.

Monitoring & Evaluation

16. Water quality testing laboratories at the district and sub-district levels shall be commissioned in all districts with priority to endemic disease prone areas.
17. 100% testing of all drinking water sources may be taken up by the States in a phased manner along with collecting GPS co-ordinates and depth of water.
18. Water Safety Plan with the 10-point checklist shall be implemented for all bacteriologically contaminated areas with priority to JE&AES affected areas.
19. Field test kits alongwith refills and H₂S vials shall be made available to all GPs in the country.
20. There is an urgent need to prepare and follow a uniform drinking water quality monitoring protocol and standardize requirements for laboratories set up at various levels.

21. Use IDSP data for identifying habitations for implementing water safety plans.

IEC and capacity building activities

22. The component of awareness generation (IEC) and training of grass root workers of the village for O&M shall be necessarily included while procuring any water treatment devices.
23. Training of BRCs and field level engineers and technicians of the Rural water supply department on all O&M issues of water treatment units should be one of the mandatory conditions while releasing work orders.
24. Refresher training to grass root workers and PHED engineers on various aspects of water quality monitoring and surveillance may be taken up at regular intervals.

Mrs Vilasini Ramachandran, Secretary, Ministry of Drinking Water and Sanitation, Govt of India, concluded that the workshop has been immensely successful and beneficial for the participants, and thanked the presenters and participations for the suggestions and innovations which are likely to be considered in the 12th FiveYear Plan. She also pointed out that water treatment is a short term solution while the surface water based PWS is a long term alternative solution that ensures availability, quality and sustainability.

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