

**Three day Residential workshop on
“Design, Organize and Management of
Water Quality Monitoring”
under National Hydrology Project**



राष्ट्रीय जल विज्ञान परियोजना

NATIONAL HYDROLOGY PROJECT

Hotel Citadel, Bengaluru

July 10th-12th, 2019



**Organised by Central Pollution Control Board,
Regional Directorate (South), Bengaluru**

Background

National Hydrology Project is a Central Sector Scheme with Budget Outlay about Rs. 3,640 Crore, with World Bank Assistance for a project duration of 8 years being implemented in India by Ministry of Water Resources. There are 49 Implementing Agencies (including 10 from Central Government and 39 from States) with an objective to improve the extent, quality, and accessibility of water resources information, decision support system for floods and basin level resource assessment/planning and to strengthen the capacity of targeted water resources professionals and management institutions in India. Components of NHP include Water Resources Monitoring Systems, Water Resources Information Systems, Water Resources Operations and Planning Systems and Institutional Capacity Enhancement.

Introduction

The three day workshop on "Design, Organize and Management of Water Quality Monitoring' under National Hydrology Project was organised by Central Pollution Control Board (CPCB) during 10th- 12th July 2019 at Hotel Citadel, Bengaluru. The Chief Guest for the inauguration ceremony, Dr. U. Sridharan, Advisor (Sc. 'G'), MoEF&CC inaugurated the workshop along with Sh. S. Suresh, Regional Director, CPCB, Bengaluru and Dr. M. Madhusudanan, AD (Sc. 'E'), CPCB by lighting the ceremonial lamp.

Sh. S. Suresh welcomed the delegates from all over the country and introduced the participants to the National Hydrology Project and the agenda of the workshop.

Dr. U. Sridharan delivered the inaugural address by laying emphasis on the need to conserve water. He stressed upon the fact that the fresh water resources are under tremendous pressure and are dwindling quickly on the planet and thus it is the responsibility of each and every person to take some action in preservation of this natural resource. Even though legislation is in place, the enforcement on the ground is still lagging. Dr. Sridharan hoped that programmes like these could help gain knowledge and identify the missing links because of which efficient water management is still a distant reality.



Day 1:

Dr. M. Madhusudanan from CPCB, kicked off the first technical session for the day by describing the ground realities of our water management system. He stressed upon the fact



that from over 280 lakes in and around Bengaluru a few decades ago to only 30-40 lakes at present and even those lakes are not in a good condition is a major cause of concern and that extreme water scarcity events like the one that happened in Chennai a month ago may not remain isolated events. It was urged that the treated water should be used for rejuvenation of dried water bodies instead of flowing back to the drains. Further

emphasis was laid on the lack of proper water usage. For instance, India receives 4000 BCM rain of which India uses 600 BCM. This alarming rain usage gap may be reduced by aptly utilising and managing rain water to address the water woes of the country. Dr. Madhusudanan informed the delegates that there is a consensus on the need for a Water Quality Index and a Minimal National standard for water quality, however, the technicalities of the same are still under debate. Regarding rejuvenation of polluted water bodies, the mandate of CPCB, SPCBs and other bodies in various stages of a rejuvenation action plan was also described by Dr. Madhusudanan. He further urged the delegates to provide their comments on the guidelines for the restoration of polluted water bodies including rivers published by CPCB, so that the guidelines may be suitably amended to accommodate the site-specific needs across the country.



The second technical session of the day was by Sh. D R Kumarswamy from Karnataka State Pollution Control Board (KSPCB). Sh. Kumarswamy examined the historical usage and accessibility of water resources and even delved into the theological connection to conserve and manage water.

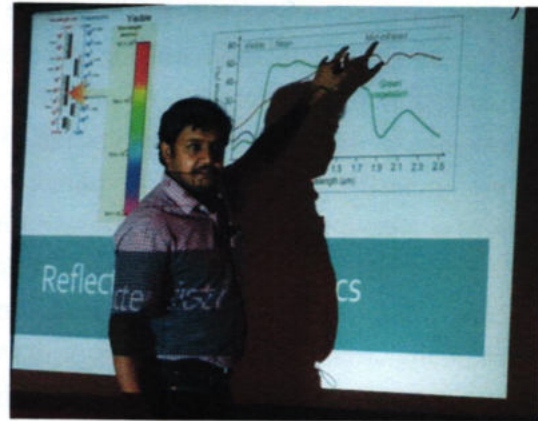


Dr. Priyanka Jamwal from ATREE, started the third technical session by discussing the two sustainable goals that talk of water. She touched upon various aspects and applications of water quality data. Water quality data need not be used only for its conventional use to check compliance with discharge standards but also for source apportionment, modelling and predicting water quality under different scenarios and developing visible water quality indicators. Dr. Jamwal presented case studies on each of these to highlight

the process and the utility of doing the studies. She also informed the delegates about the

usage of *Chemcatchers* (sensors), thought still debateable, for detecting the trail of antibiotics and other organic pollutants.

The last technical session for the day by Dr. HS Sudhira, from Gubbi Labs, was very interactive and engaging. Dr. Sudhira started off with an introduction to remote sensing and talked about the application of state of the art technology to evaluate and observe terrain or water bodies in several modes: Spatial, temporal, spectral and radiometric. The data required for this can be obtained by using the satellites orbiting the earth which beam data continuously. The same may be used and peeled layer by layer to obtain useful information. He introduced the delegates to Google Earth Engine, a free to use and on the go computational browser based tool with datasets (images) from decades of satellite data.



Day 2:

Prof. Sekhar Muddu from IISc, Bengaluru, started the first technical session for the day and talked about the Critical Zone Observatory and its services. He explained the concept of a Critical zone i.e. the heterogeneous near surface environment in which complex interactions



involving rock, soil, water, air and living organisms regulate the natural habitat and determine the availability of life sustaining resources and that Critical zone services include retarding (attenuating) the contaminants discharged in the environment. He further elaborated on the network of Central Zone observatories around the world and the physical, geochemical,

isotopic and mineralogical characterisation and modelling of ecosystem (from soil to aquifer to bedrock) that forms the basis for these observatories. He described the takeaways and perspectives obtained from the first such observatory present in India i.e. the Kabini Central Zone Observatory located in Karnataka. He further encouraged the delegates to visit the observatory to understand better the role of ecosystem in our survival.

The second technical session introduced the delegates to the economic cost of water pollution, a measure most of us generally overlook. It was helmed by Dr. Ravi DR, from Karnataka State Pollution Control Board (KSPCB). Dr. Ravi started by explaining the concept of free goods i.e. Goods that are available for free are generally overexploited but have a cost associated with them at a later stage. Ecosystem services (soil formation, water

purification, climate regulation, etc.), if a value is assigned to them, that the planet does for free will run into trillions of dollars, therefore there is a need for economic valuation of earth's resources so as to bring environment into decision making process. Dr. Ravi stressed that it is imperative to perceive water as a finite resource to prevent its exploitation. He proposed several measures for the same, namely a separate green tax, fines, a fixed rate of consumption, etc. Dr. Ravi drove his point home by presenting two case studies, one of an industry that polluted its surrounding areas and has spent more than Rupees 30 Crores in cleaning it up and the second of the monetary valuation of lakes in Hubli-Dharwad region which came out to be around Rupees 1977 crores.



Sh. S. Jeyapaul from CPCB, started the third technical session for the day by stating an interesting fact that when errors occur in results, in 67% of cases, it is due to error in



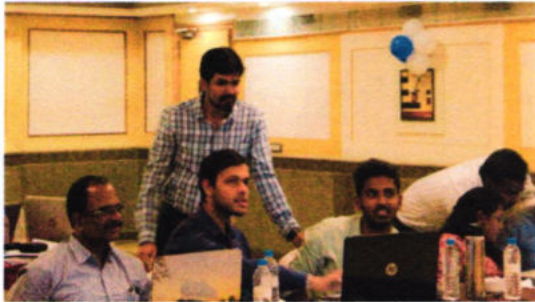
sampling. Thus, the session was focused on the importance of sampling. It is important to pick the correct spot for sampling as a sample collected from an edge may not be representative of a complete water body. Sh. Jeyapaul stressed on the importance of proper sample labelling, sample preservation and sample transportation. Apart from these, the correctness of results that are

obtained from the lab can be checked using a few theoretical measurements including sum of anions, sum of cations and calculated values of TDS and EC. A simple demonstration using an excel sheet of sample results yielded interesting conclusions regarding the same.

The fourth technical session of the day was by Dr. K V Gururaja, from SSADT. Dr. Gururaja highlighted the usage of statistics in real life especially in laboratories where results must always be presented alongside the relevant measures of central tendency. He explained several kinds of data types and data representation techniques and elaborated upon their usage with practical examples. Since, Excel is not able to accommodate for all such statistical computations and representations, therefore, open



source software R language (run through R Studio) can be used to scrutinise the raw results obtained directly from the lab.



applications.

In the last technical session for the day, Dr. Gururaja gave a hands-on training session on how to use R for analysis. Using correlation and statistical models, he demonstrated the ease of use of R to obtain meaningful results. The delegates themselves tried working on the same and got a better understanding of how statistical models can be used in practical

Day 3:

Dr. S. Suresh Kumar from Knowledge Lens Innovation Labs Pvt. Ltd., kicked off Day 3 with the first technical session on Online Water Quality Monitoring System. Online water quality monitoring systems have introduced a concept of self-monitoring by the polluters themselves but it is vulnerable to manipulations and incorrect measurement techniques. Only the values of pH and TOC can be directly obtained, the rest are derived. Dr. Kumar explained in-depth the various prevalent technologies for different parameters of online water quality monitoring and also elaborated on the issues plaguing the



same. He also stressed on the appropriate positioning of sensors and sampling ports which is paramount to correct functioning of any Online Water quality monitoring system. The delegates actively participated in the session as they all had faced first hand several issues



that Dr. Kumar described.

The second technical session for the day by Dr. V Deepesh from CPCB stressed upon the importance of setting objectives and regular review of information needs while chalking out monitoring networks/programs. He started out with the need for water quality monitoring followed by the basic requirements of a water network design. He explained stage wise the entire process of network design, talking alongside about the site selection procedure and how algorithms can be used for optimisation and design of monitoring networks. Dr. Deepesh also talked about Sharps' and modified Sanders' method for sequential monitoring stations in river basins.

Dr. K Ravichandran from Central Ground Water Board (CGWB) presented his feedback about the workshop so far as well as his experiences from working in CGWB. He started by thanking CPCB for organising such programmes which help everyone gain a meaningful insight into the water quality mechanisms prevalent in India and the issues that plague them. He started off from the basics about water quality, the impurities in water and the diseases/deformities that impure water can lead to. Further, Dr. Ravichandran explained how several data analysis methods, statistical as well as graphical tools can be used and interpreted to obtain significant information about water quality. The key takeaway from his speech was to interpret WQM results in conjunction with the site specific conditions especially the geological and hydrological considerations.



The last technical session for the day by Sh. S. Jeyapaul from CPCB started off with a discussion on the need, requirements and advantages of accreditation. Since CPCB, Bengaluru has a NABL accredited laboratory, Sh. Jeyapaul shared his experience about the same, the process involved and the legal provisions around it. He also talked in-depth about



the various aspects of QA & QC, Internal Quality Control and type of errors along with the importance of calibration. Sh. Jeyapaul stressed on the pro-active role that the top management must play in ensuring the laboratory abides by all relevant quality controls.

Sh. S. Suresh, Regional Director, CPCB deliberated in the last session the highlights of the three day workshop. He briefly explained the learning outcomes and the takeaways from each of the sessions held in the workshop. Sh. Suresh further stressed upon the need to have a Water Quality Index on the same lines as Air Quality Index and urged all delegates to push their respective departments to achieve the same.



Post this session, the delegates voiced their opinions about the workshop. Majority of the delegates appreciated CPCB and insisted on more such workshops where all government stakeholders could meet and discuss the present condition of water resources in the country as well as discuss the shortcomings, the country can improve upon. They desired for a field visit to be included in the next workshop, so that real life practical experience can be gained.

Workshop on "Design, Organize and Management of Water Quality Monitoring"

The valedictory session was concluded by a vote of thanks by Dr. M. Madhusudanan from



CPCB, coordinator of the workshop. He expressed his sincere thanks to Sh. S. Suresh, Regional Director- CPCB for his guidance, and the delegates for heartily participating in the workshop and the organising team who worked dedicatedly to make the workshop a success. The overall efforts made by all colleagues of RD(S) were highly

appreciated and the contribution in successful completion of the programme especially by Dr. V Deepesh was put on records. The event concluded with the distribution of certificates to the delegates.

Thus, the three day workshop was successfully brought to a close with a mission to improve the water quality across the country. The technical expertise available in the country must be utilised to the fullest to chalk out action plans which must be implemented on war footing, in order to protect the environment and its resources for future generations. It was also felt that these types of workshops should be conducted frequently in order to tackle the burning issues head on. The programme ended with the realisation that the responsibility for preserving our already dwindling resources, especially water resources lie on each of us. In the words of Mr. Lester Brown, *"We have not inherited this earth from our forefathers; we have borrowed it from our children."*

Glimpses of the workshop



Workshop on "Design, Organize and Management of Water Quality Monitoring"





- SPECIMEN COPY -

DESIGN, ORGANIZE AND MANAGEMENT OF WATER QUALITY MONITORING



*Three-day workshop organized
by Central Pollution Control Board (CPCB)
under*



राष्ट्रीय जल विज्ञान परियोजना

NATIONAL HYDROLOGY PROJECT



MoWR, RD&GR
Government of India

CERTIFICATE

This is to certify that

Dr Mr/ Ms.....

Successfully participated/ completed three-day training/ workshop

'Design, Organize and Management of Water Quality Monitoring'

Organized by Central Pollution Control Board (CPCB), Regional Directorate (South), Bengaluru

Under the National Hydrology Project (NHP)

At Bengaluru, July 10-12, 2019

Dr. M Madhusudanan
Additional Director, CPCB

*Awarded On
July 12, 2019*

S Suresh
Regional Director, CPCB