

## Technical Report

# CAPACITY BUILDING PROGRAM ON BRIDGING THE GAPS AMONG TECHNOLOGICAL INNOVATIONS, POLICY INTERVENTIONS AND GROUND REALITIES FOR THE STAKEHOLDERS

12-16 October 2020



Organised By



## OVERVIEW

The world is undergoing a critical COVID-19 health crisis which is further elevated by the natural disasters and economic crisis. The issues related to water availability are yet unanswered despite the known fact and importance of water in fighting the COVID-19. Some issues such as water quality have been completely overlooked and these are directly related to the present Covid-19 and immunity needs. It is therefore important to accelerate and empower key stakeholders who directly deal with the problem of Arsenic, with the potential technologies and interventions required to mitigate the water quality issues. Efforts are on to share such knowledge through virtual training and capacity building programs in an integrated manner given the urgency to deal with the water quality issues. This program is conveniently divided into a series of workshops specific to the States of Bihar and Assam.

## OBJECTIVES AND EXPECTED OUTCOMES

### Workshop Day 1

The first session aimed at disseminating potential technologies to mitigate Arsenic and to create awareness of the supporting schemes that exist. The aim of the training was to build the capacity of Executive Engineers, Assistant Engineers, and Junior engineers or officials of similar rank from the various departments, CSO representatives etc.

### Workshop Day 2 and Day 3

The state-specific sessions for Bihar and Assam were platforms where the expert speakers on the panel were government officials and CSO representatives. The workshop sessions 2 and 3 provided the insights from officials from water, health, nutrition and other relevant departments on state-specific water quality policies. Officials from CSO and NGO representatives shared their treasure of knowledge from the ground realities, the opportunities, gaps and challenges they face as they work at the ground level. Executive engineers, local CSOs/NGOs people, ASHA and Anganwadi workers, ANMs, Rural Water user association and other stakeholders from the state were invited to benefit as participants in this workshop.

## EXPECTED OUTCOMES

1. Follow-up engagement with existing key stakeholders and adding up new stakeholders
2. Knowledge sharing of potential technologies among various stakeholders by the experts
3. Contribute to the policy frameworks in the government to leverage in the ground level to mitigate the arsenic in the targeted districts of Assam and Bihar,
4. Ensure the quality water to the vulnerable groups.
5. Preparation of policy brief on Water quality from both states (Assam and Bihar)
6. Discussion Paper from the Workshops for dissemination

# WORKSHOP SESSIONS

Capacity building program on Bridging the gaps among technological innovations, policy interventions and ground realities towards mitigation of Arsenic in drinking water

12<sup>th</sup>, 14<sup>th</sup> and 16<sup>th</sup> October 2020 (Monday, Wednesday & Friday)  
Time: 10:30 to 12:00 hrs (IST)



**Day 1**  
**12 October 2020 – Monday**

**Capacity building (Technology) towards mitigation of Arsenic in drinking water in Rural parts of Assam and Bihar**

Agenda

10:30 to 10:40 hrs	Introduction to the program and setting up	Ms. Suchita Jain Associate Fellow SaciWATERS
10:40 to 10:50 hrs	Algal technology	Dr. Thomas Kiran Foreign Researcher University of Tsukuba, Japan
10:50 to 11:00 hrs	Arsenic mitigation technology	Dr. R. L. Goswamee Senior Principal Scientist CSIR-NEIST, Assam
11:00 to 11:10 hrs	Ground learnings from the project	Mr. B. Prithvi Ram Associate Fellow SaciWATERS
11:10 to 11:20 hrs	Arsenic mitigator bacterial technology	Dr. Bishun Deo Prasad Assistant Professor Bihar Agriculture University
11:20 to 12:00 hrs	Discussion, Q/A and closing remarks	

Registration link: [http://saciwaters.org/au\\_workshop](http://saciwaters.org/au_workshop)

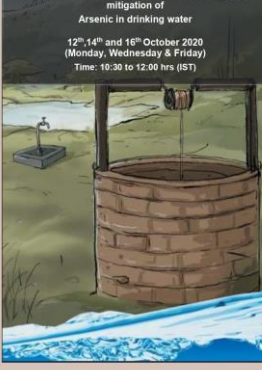






Capacity building program on Bridging the gaps among technological innovations, policy interventions and ground realities towards mitigation of Arsenic in drinking water

12<sup>th</sup>, 14<sup>th</sup> and 16<sup>th</sup> October 2020 (Monday, Wednesday & Friday)  
Time: 10:30 to 12:00 hrs (IST)








**Day 2**  
**14 October 2020 – Wednesday**

**Capacity building (Policy) towards mitigation of Arsenic in drinking water in Rural parts of Assam and Bihar**

Agenda

10:30 to 10:40 hrs	Introduction to the program and setting up	Ms. Suchita Jain Associate Fellow, SaciWATERS
Session Moderator – Dr. Ashok Ghosh Chairman, BSPCB & HD, MCSRC		
10:40 to 10:50 hrs	State specific ground water policies towards mitigation of arsenic	Dr. Dipankar Saha Former Director, Central Ground Water Board
10:50 to 11:00 hrs	State specific PHED policies towards mitigation of arsenic	Mr. Gopal Singh Executive Engineer (Retd.) PHED, Bihar
11:00 to 11:10 hrs	State specific health policies towards mitigation of arsenic	Dr. Ragini Mishra State Surveillance Officer State Health Society, Bihar
11:10 to 11:20 hrs	Evasion rather than mitigation: The sustainable solution	Dr. Anshuman Kishor, Associate Professor Bihar Agriculture University
11:20 to 11:30 hrs	Ground realities- Dissemination of Pilot level findings from the project (Bihar -Policy)	Mr. Asif Shahab, Associate Fellow SaciWATERS
11:30 to 12:00 hrs	Discussion, Q/A and closing remarks	

Registration link: [http://saciwaters.org/au\\_workshop](http://saciwaters.org/au_workshop)  
Kindly write to [suchita@saciwaters.org](mailto:suchita@saciwaters.org) in case of any problems faced in receiving the webinar link after registration

Capacity building program on Bridging the gaps among technological innovations, policy interventions and ground realities towards mitigation of Arsenic in drinking water

12<sup>th</sup>, 14<sup>th</sup> and 16<sup>th</sup> October 2020 (Monday, Wednesday & Friday)  
Time: 10:30 to 12:00 hrs (IST)



**Day 3**  
**16 October 2020 – Friday**

**Capacity building (Policy) towards mitigation of Arsenic in drinking water in Rural parts of Assam and Bihar**

Agenda

10:30 to 10:40 hrs	Introduction to the program and setting up	Ms. Suchita Jain Associate Fellow, SaciWATERS
Session Moderator – Er. A. B. Paul Chief Engineer (Retd.), PHED, Assam		
10:40 to 10:50 hrs	Assam-state specific health policies towards mitigation of arsenic	Dr. K. K. Moismdar Professor, KPC Medical College Kolkata
10:50 to 11:00 hrs	Assam-State specific PHED policies towards mitigation of arsenic	Mr. Biswadeep Das Adtl. Chief Engineer PHED, Assam
11:00 to 11:10 hrs	Ground realities from "Civil Society Organizations" perspective	Mr. Prithibhusan Dela Director Gramya Vikash Mancha
11:10 to 11:20 hrs	Ground realities- Dissemination of Pilot level findings from the project (Assam -Policy)	Mr. Asif Shahab, Associate Fellow SaciWATERS
11:20 to 12:00 hrs	Discussion, Q/A and closing remarks	

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## WORKSHOP SUMMARY

The Capacity Building Programme towards Mitigation of Arsenic in Drinking Water in Assam & Bihar under Project Civil Society Voices, Vulnerable Communities and Localised Platform for addressing Water Quality Challenges were coordinated and organized by **the Arsenic Knowledge and Action Network of SaciWATERS** with financial support from **European Union** and **Cap-Net** using an online platform. It was a three part series, from **12-16 October 2020**.

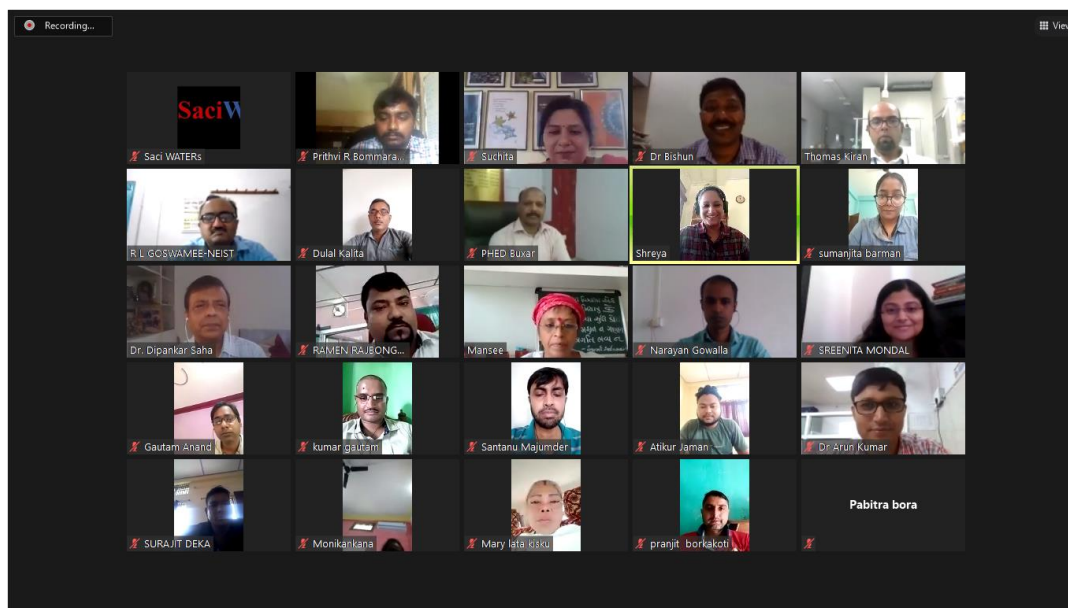
This report provides a glimpse of the sessions, with lessons, conclusions and suggestions for a way forward.

### DAY 1:

#### INTRODUCTION

This training session was kick-started with the welcome note by **Ms Suchita Jain**, Associate Fellow at SaciWATERS. She also gave a general introduction about SaciWATERS, the arsenic programme, the goal of the workshop and the agenda of day 1. Later she introduced **Dr Dipankar Saha**, the moderator of the day 1 of the workshop to the participants and other resource persons of the workshop.

**Dr Dipankar Saha** started moderating the session by thanking SaciWATERS and welcoming the resources persons and the participants. He gave a very brief introduction about the arsenic problem and importance of the training session.



**Dr Rajib Lochan Goswamee**, Senior Principal Scientist at CSIR-NEIST, Assam started workshop session by introducing the CSIR-NEIST, a leading scientific research institute in India working on arsenic mitigation technologies and also their research activities supported by various national and international funders. Later he discussed the **de-fluoridation and de-arsenication plant** developed by CSIR-NEIST and mentioned differences of these technologies from existing other technologies. He further shared his viewpoints that “developing a new technology for quick removal of Arsenic from contaminated soil and drinking water is a must. There are organisms in both terrestrial and aquatic environments that could accumulate or change the form of As, including several species of bacteria that reduce As(III) to the less

toxic As (V), could be coupled with adsorption or coagulation technique they may produce a good alternative remediation technique.”

**Dr Thomas Kiran**, Researcher at the University of Tsukuba, Japan started the lecture session by explaining the threat associated with heavy metals on aquatic organisms. Later he discussed arsenic removal using diatom algae technique. He further mentioned that the biosorption of pollutants using naturally inspired sources like microalgae has considerable advantages. Diatoms are the most dominant and diverse group of phytoplankton which accounts for 45% oceanic primary productivity. They perform a pioneer part in the biogeochemistry of metals in both fresh and marine water ecosystems. The diatoms play a significant role in degradation, speciation, and detoxification of chemical wastes and hazardous metals from polluted sites. Thereafter, an overview was presented about the ability of diatom algae to phycore mediate heavy metals by passive adsorption and active assimilation from their aqueous environments with an emphasis on extracellular and intracellular mechanisms involved in contaminant uptake through the frustules for preventing heavy metal toxicity.

**Dr Bishun D. Prasad** began the session by explaining the arsenic problem in general and in agriculture in particular. He further discussed the bioremediation of arsenic contaminated soil using *Pseudomonas* sp. (As17) in rice. This technology helps in arsenic removal from rice and he explained the process of strategic experimentation. i.e.

- As17 bacterial isolates can able to grow up to 25mm of Sodium arsenite (NaAsO<sub>2</sub>)
- Bacteria were identified by sequencing 16s rDNA
- The bacterial culture was submitted in ICAR-NABIM,
- As17 treatment reduces approx. 50% reduction in arsenic treatment in rice seed

**Mr Prithvi Ram** continued the session quoting the SDG 6 and by explaining the project Civil Society Voices, Vulnerable Communities and Localised Platform for addressing Water Quality Challenges stating the statistics from Assam and Bihar. He further discussed the social risk associated with adaptation of new technologies, followed by explaining the success and failed story of Bihar.

## DISCUSSION

The discussions during the Q & A session also brought out: (a) the risk associated with further release of As when the modified sludge materials are used in buildings, specially while used in the underground bases with oxygen stress ambience. If rainwater, flood water or any sort of other water logging could trigger release As from those materials while they are oxygen stressed, as both Assam and Bihar are flood prone states. (b) effect of species difference As(III) and As(V) and the ratio therein and the effect of water pH on removal efficiency with both the different technologies, i.e. Algal Technology or the CSIR-NEIST technology (c) the field level effect to apply the As17 bacteria, when there are ample number of As reducing bacteria which will reduce As(V) to As(III)

## CONCLUSION

The session was concluded by requesting the support and participation in the District Platform for Water Quality and Capacity Platform.

## DAY 2:

### INTRODUCTION

The executive director of the coordinating body, SaciWATERS, **Dr Mansee Bal Bhargava** started the session 2 with an introductory note on the arsenic knowledge and action network of SaciWATERS. Later, she introduced Dr Ashok Ghosh who moderated the session on the 2nd day of the workshop.

**Dr Ashok Ghosh** lucidly explained the arsenic related problems of Bihar. His discussion brought forth the following issues: **(a) Spatial distribution of arsenic in groundwater:** In Bihar geographically, arsenic is confined in two sides (north and south) of the Ganga river and the Tarai Area. Towards Jharkhand, south from Ganga Belt the proportion of arsenic decreases and fluoride increases. The major problem of Bihar is out of 38 districts, few have a problem of arsenic, few have fluoride, few have iron and nitrate. Every district of Bihar has some problem in terms of groundwater quality. One of his findings is that there is hardly any district of Bihar where the problem co-exists, i.e. arsenic and fluoride together. Bhagalpur is the only district in Bihar, where a few parts of it have high arsenic content and a few parts have more fluoride content. **(b) Lack of information:** There are around 18 districts of Bihar which have a problem of arsenic (more than 10 mg/liter ) in the groundwater. However, the Bihar Govt has not updated the information. **(c) Problem with mitigation technology:** The major problem of mitigation is the structure installed for mitigation has ownership issues (not well defined) and lack of long term operations and maintenance. As an impact of it the structures become dysfunctional with time. His Finding is that as long as there will be no community engagement, mitigation will not be sustainable. The major issue is the social integration of technology, acceptability of the technology by the community. He further mentioned that in this matter of social integration, the role of NGOs are very important. **(d) Piped water supply scheme:** He praised the state government initiative “Har Ghar Nal ka Jal”, for providing piped water to all the households, however, he also mentioned the gaps of scheme, i.e. the importance of supplying quality water to the households, not explicitly mentioned in the policy document. The major issue with the scheme is that many places are getting piped water supply from surface water, but there are maximum places which are getting the supply from groundwater. Therefore, the possibility of arsenic/fluoride contamination cannot be ignored. **(e) Sludge Management:** He further pointed out the problem of sludge management in mitigating arsenic from groundwater. The disposal of sludge on the ground could increase the recycling of arsenic in groundwater. **(f) The problem of arsenic in the food chain:** He shared the cases of Bhagalpur, where crops and vegetables (potato, wheat, rice, vegetables etc.) have huge arsenic content. Dr Ghosh concluded with the discussion that there are places in Bihar Where the As contamination is low in the groundwater still the disease burden is high due to consumption of As contaminated food. Therefore, along with drinking water, irrigation water is also an important issue as arsenic invasion takes place through the food chain.

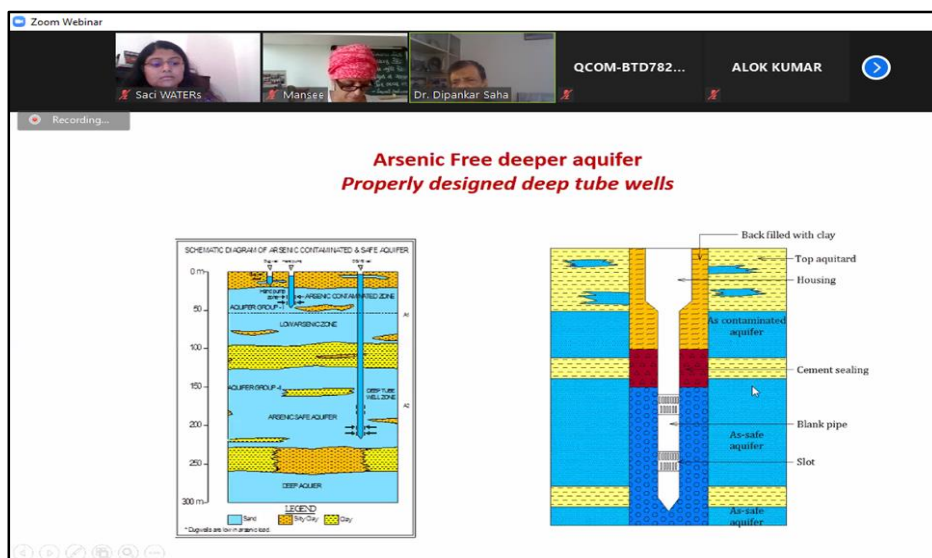
**Dr Dipankar Saha** started the discussion with the geographical distribution of arsenic contamination in groundwater across various states of India. He discussed the intensive arsenic problem of the Ganga-Brahmaputra basin and shared his experience with other states like- Punjab, where the arsenic issues have emerged very recently. Later he raised the following issues: **(a) The patchy distribution of arsenic in groundwater:** The distribution of arsenic in groundwater found in patches, in areas with varied rock types. Therefore, the genesis of arsenic varies based on the rock type and local conditions. **(b) Diverse origin and occurrence of arsenic:** He mentioned about the general theory of arsenic contamination, which says that overexploitation of groundwater is one of the major reasons behind increasing arsenic contamination. Though Assam and Bihar is a flood prone region, still the arsenic concentration is high. He pointed out that arsenic has diverse origin and occurrence and therefore, there should be regional strategies to tackle the problem of arsenic. **(c) Protection of arsenic free deeper aquifer:** The Ganga plain has a unique feature of having a multilayered aquifer system, where the deeper aquifer is free of arsenic contamination and backbone of community water supply. Therefore, proper designing of deep tubewell is important so that

water from shallow aquifers could not enter into the deeper aquifer. Proper monitoring of pumping hours of tubewells along with discharge are also very important. **(d) Recharge of aquifer:** The recharge mechanism of deeper aquifer is completely different from the shallow aquifer. He mentioned that this is a very important aspect of regional planning to supply community water from arsenic-free deeper aquifers.

He further discussed what should be there in the state specific policy:

- Local knowledge about the aquifer is very important, instead of generalizing the depth of the deeper aquifer
- Regulation of pumping hour and discharge of the wells
- Cement sealing should be done in a proper way while constructing a well.
- Adapting the technology by the community is very important along with pricing of it.
- Waste disposal and community involvement is very important
- Important to monitor the source in case of water supply from surface water.
- Proper maintenance of pipe water system
- Specific policy is required for agriculture sector

He concluded the discussion by mentioning that it is important to monitor arsenic and fluoride, etc at source and user points.

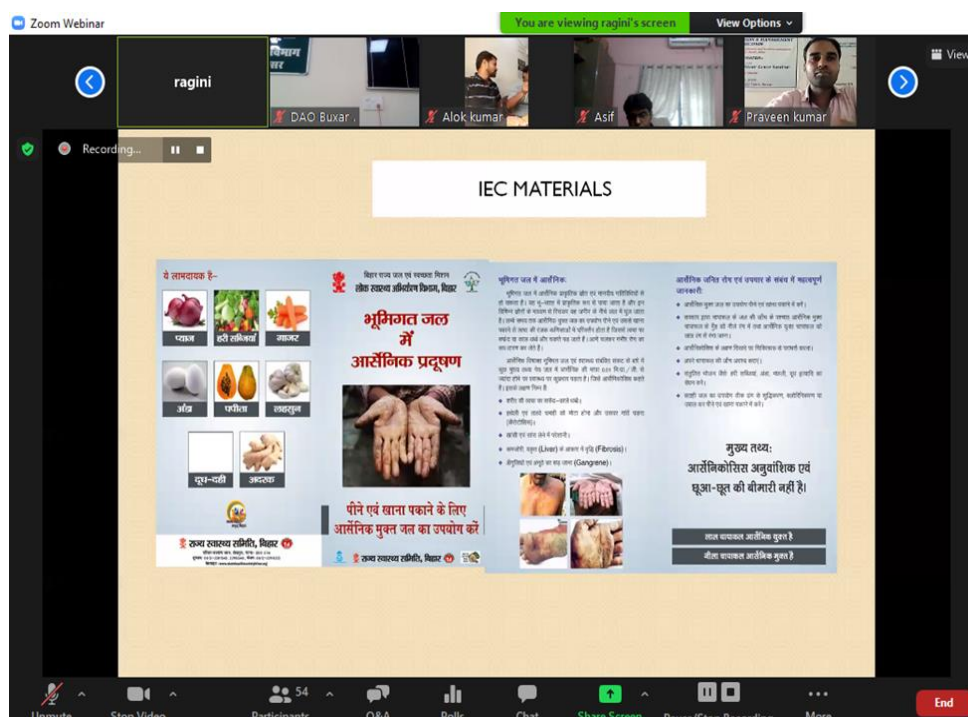


**Mr Gopal Singh** discussed 4 aspects of the arsenic issue in Bihar, viz. (a) causes (b) effects (c) remedies (d) disposal of sludge and (e) treatment of arsenicosis. Mr Singh explained the forceful extraction of groundwater as one of the major reasons for arsenic contamination in the groundwater. He also shared his experience about the preliminary symptoms of arsenicosis, like- memory loss, loose motion, headache etc. He also explained the initiative, such as- district and state-level water testing laboratories taken by the public health engineering department along with NEERI in the mitigation of arsenic in groundwater and sludge management. His presentation also brought out issues, like- (a) social stigma associated with arsenicosis (b) lack of water testing facilities for irrigation water and proper policies for it (c) lack of medical practitioners with proper knowledge of treatment of arsenicosis. He concluded his presentation by mentioning the extensive need of research on disposal media in the long run.

**Dr Ragini Mishra** presented the impacts of arsenic contamination in groundwater on human health and how the state government of Bihar is trying to deal with the issue of arsenicosis.

1. The state health society of Bihar has generated awareness among the communities regarding arsenicosis and its symptoms based on the guidelines shared by the Centre.
2. She also shared the results and the challenges of the preliminary results of the health survey conducted by the Health Department of Govt of Bihar in 13 arsenic affected districts of Bihar in 2016.
  - (a) As the doctors were not trained in arsenicosis, at the preliminary stage it was difficult to find out the cases of arsenicosis. Later on, the team identified 41 cases of cancer and arsenicosis in 13 districts of Bihar. The survey found that the maximum cases are prevalent among the female population in the age group 51-60. A large number of breast cancer cases were also identified during the survey. Most of the people of the affected regions are illiterate and belong to the wage-labourer category and use water from hand pumps as the source of drinking water.
  - (b) She also informed about the formation of arsenicosis surveillance and response action committee representation from DM, CMO, Forensic Science expert for routine surveillance and interventions. This platform is further helping in the capacity building of the district and block level officials to deal with the arsenic-related problem. She also mentioned that the problem of flooding and the covid situation has interrupted the health intervention.

She also explained about the short term action plan prepared by the health department for the prevention of arsenicosis and associated cancers and how it has been implemented with the help of the frontline workers, such as ASHA, ANM, Block health managers etc. She informed about the study of cancer patients in the 25 arsenic-free districts of Bihar. She also shared the IEC materials and arsenic health card designed by the state health society for awareness generation.



**Dr Anshuman Kohli** presented his view on the issues of the arsenic problem i.e. 'Evasion rather than mitigation: The sustainable solution' based on the principle of 'prevention is better than cure'. He raised the concern about rice production using groundwater in the arsenic affected areas and limited efforts from the policy maker's side to prevent it. He also discussed the solutions viz (a) use river water and surface water



for the purpose of drinking instead of using groundwater (b) involvement of the grassroots level organisation (c) rainwater harvesting and harnessing of surface water.

**Mr Asif Sahab** presented about the initiatives taken by SasiWATERS to deal with the arsenic issues in Buxar and Bhagalpur districts of Bihar . He shared the information about the district level platform (a decentralised platform), a heart and soul of arsenic mitigation at the ground level. He also discussed the importance of community awareness for mitigating arsenic-related challenges and sustainability of the measures already taken at the government level viz. maintenance of arsenic removal filters, water ATMs, etc.

## DISCUSSION

The Q and A session saw discussion on: (a) the suitable timing (season) for arsenic test from ground water through FTK (b) if Cement Sealing would be really promoted since it is also affecting percolation at large (c) Society must Come Together to Solve Social-Ecological Issues.

## DAY 3:

### INTRODUCTION

The session on day 3 started with the welcome note by **Ms Suchita Jain**. She introduced **Dr A B Paul** who moderated the session on the 3rd day of the workshop.

Dr A B Paul started the session by sharing a brief background of the arsenic problem in Assam. He discussed the initiative by UNICEF in finding out the arsenic contamination in groundwater by water testing of 87000 public water sources and about the arsenic treatment plants installed in Assam. His lecture brought forth the following issues: (a) limited knowledge of arsenic contamination in private water sources. (b) 21 districts of Assam are affected by arsenic and the trace was first found in 2006 in Nalbari (c) The affected areas of Assam are using filters, surface water and 1000 stand-alone solar energy-based treatment plant by the PHED department of Assam (d) Absorption technology and activated-carbon is being widely used in Assam for removal of arsenic. However, it is difficult to monitor the standalone plants scattered over a large geographical area and the role of the water user committee in the maintenance of those plants (e) Problem of nano-technology used for arsenic removal

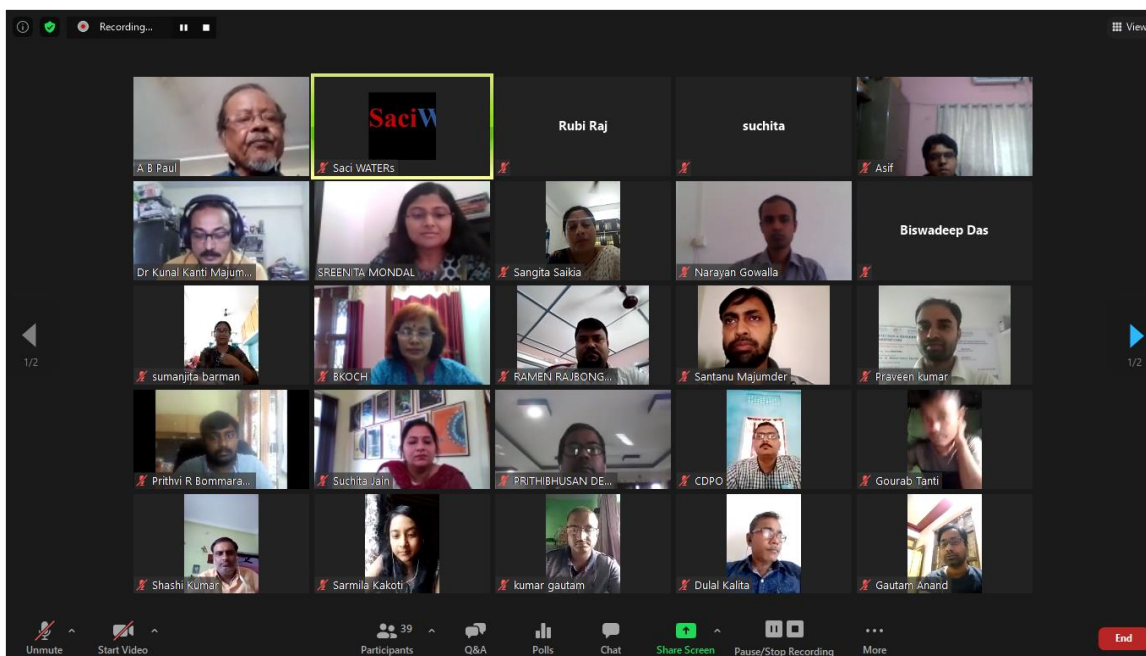
**Dr Kunal Kanti Majumdar** presented a few research findings on the epidemiology of Arsenicosis. He mentioned that arsenic is widely found in the earth crust in both inorganic and organic form, while inorganic arsenic is more toxic than organic. Presence of arsenic mainly in West Bengal & Assam is of geogenic origin.

He presented statistics which show that around 30 Million people are at risk for arsenic contaminated drinking water, out of which I million are from India and 5 millions are from Bangladesh. At present, more than 70 countries are affected by arsenic contamination in the groundwater. He brought forth the issues to be addressed: (a) Creating awareness among the people regarding the risk of arsenic and the early symptom of arsenicosis (b) Increase the number of arsenic clinics and develop the capacity of medical practitioners. He further mentioned the initiatives adopted by Assam government along with other national international agencies initiates several interventions. (c) screening of all public tube wells in rural areas and Providing safe drinking water (d) installation of arsenic test laboratories (e) engaging multiple stakeholders in the way

of mitigating arsenic problem, viz. NGOs, Scientists, community etc.

He also presented a plan of action taken by UNICEF, which includes (a) establishment of community based water quality (b) establishment of health surveillance system (c) development & Implementation of sustainable & affordable technology (d) marking of tube wells based on 50mg/L cut-off (e) networking & information sharing and (f) research & Development.

Dr Majumdar concluded the lecture by discussing the activities performed in Assam supported by state govt & SaciWATERS, INREM. Viz. (a) stakeholders meeting on training of medical officers of the health department (b) organizing Health Camps to identify cases of arsenicosis (c) development of IEC Materials (Banner, Posters, Cards, Booklets & leaflets) (d) preparing short films containing information about arsenicosis (e) Demonstration of local made arsenic removal



**Mr Biswadip Das** gave a brief description of the approaches of the state government Assam in mitigating arsenic from groundwater. He mentioned that the arsenic problem was there for a long time in Assam, however, became visible only after 2006 when the number of affected habitations increased drastically. However, the levels are not that high in comparison to West Bengal and Bihar. He informed about the two fold approach adopted by PHED of Assam: (a) first, it has tried to provide water from alternative safe sources in the arsenic affected districts and (b) construction of community water treatment plants as an interim measure. The community was also informed to collect water from those safe sources. He concluded his discussion by mentioning the importance of water testing to find out the levels of arsenic contamination in the groundwater.

**Mr Prithibushan Deka** mentioned about 5 arsenic removal plants in 5 different villages and how since 1987 people have shifted to surface water to tube well water and how their organization has started mobilizing the panchayat to ensure safe water to the community.

**Mr Asif Shahab** provided information on two district platform meetings held in Nalbari and Jorhat district of Assam in 2018 & 2020. He explained the importance of nation initiative for arsenic as the frontline workers like- ASHA, ANM and medical officers on ground have limited exposure to the problem associated with arsenic. He brought forth some ground realities, viz (a) why revival of user community is required (b) Pump operators doesn't have a fixed salary for operating the scheme (c) PHED collects water samples are

annually but slow follow-ups (d) Majority of the mid day meals cooked by using groundwater and therefore children are at risk (e) Water testing is required in regular intervals (f) piped water is not reaching to the community because of broken pipes & T-socket and the initiative taken by SaciWATERs in that respect.

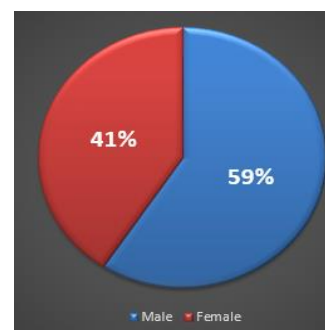
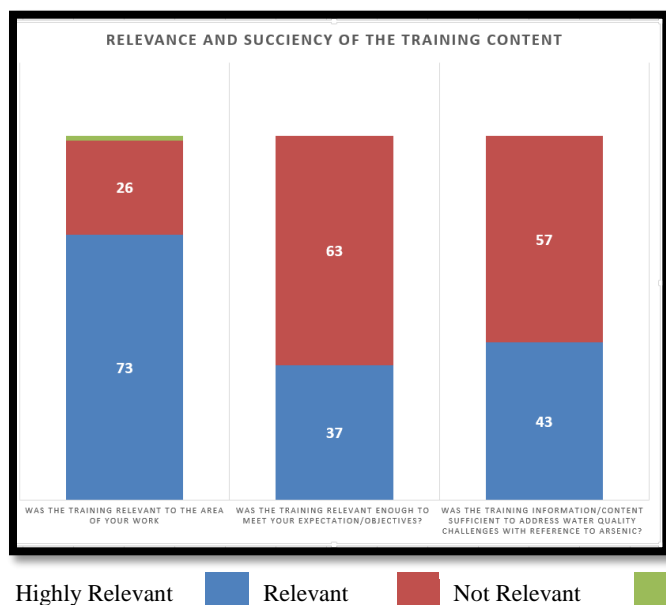
He concluded the session by discussing the need of monitoring at grass root level at a regular interval and capacity building to the community as they are politically disorganized.

## DISCUSSION

The Q and A session saw discussion on: (a) few schemes as an alternative source to Arsenic (b) how to assess the threat from water used for cooking (as villagers may not always use the filter water) and food stuff (raw vs cooked rice) for any possibility of linked health impacts like arsenicosis (c) simple process for removing arsenic or fluoride in rural areas.

## FEEDBACK EVALUATION

With 41 percent of female participants, a total of 81 people responded to the feedback calls immediately after the training program. The feedback was very positive from most of them.

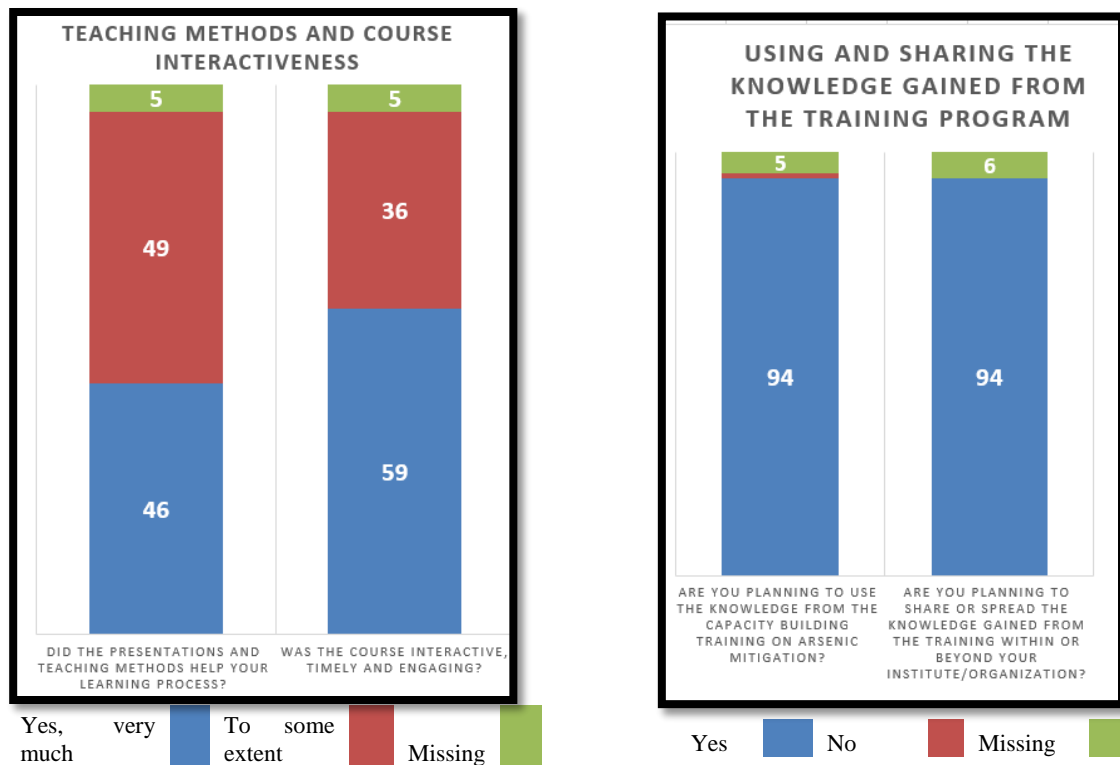


A large chunk of respondents (73 %) found that the training was highly relevant to their area of work. One of the participants expressed, it was more technical and it was not relevant to her. Thirty-seven percent of participants said that it was highly relevant to meet their objectives and the remaining uttered it as relevant. On sufficiency of training content to address water quality challenges concerning arsenic almost forty- three percent informed that it was highly relevant.

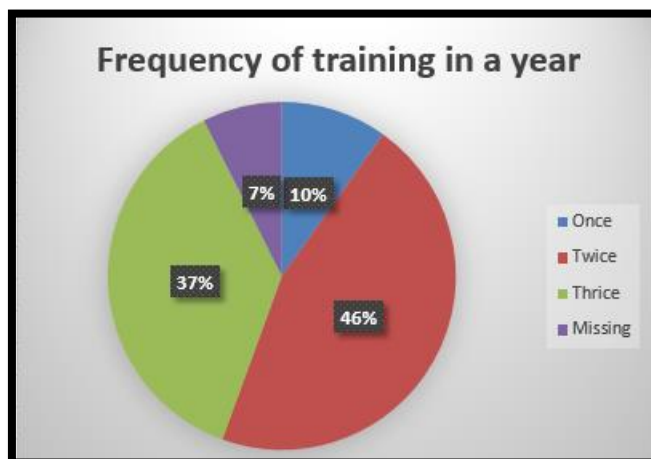
Nearly fifty percent of participants felt that the teaching methods helped them very much in their learning process and the remaining half said that methods were helpful to some extent. About sixty percent shared that the course was interactive, timely and engaging.

On using and sharing of knowledge gained from this training program, almost all the participants said that they themselves are going to use this knowledge and they will spread the same within and beyond their organizations. Participants from Integrated Child Development Services told that with SaciWATERs they will establish nutrition gardens for arsenic-free food for children and adolescents and advise them to consume green vegetables and other healthy food. Participants from different

government departments informed that they will spread awareness on the issue of arsenic to their subordinates through their internal monthly meetings and informal talks and emphasized the necessity of awareness among the ground staff and community. People working in the health sector added that regular health screening and health camps could help deal with the harmful impacts of arsenic on health.



Understanding the importance of arsenic issues and role of awareness, participants expressed that the training session was good and knowledgeable and there is a requirement of such trainings on a regular interval. Forty-six percent wants such trainings to be conducted at least twice-a-year while thirty-seven percent opted for thrice-a-year. Only ten percent responses received for once-a-year. There were mixed responses on physical and virtual training methods. Few of them suggested that the entire training session should be fully conducted in the local language only.



## CONCLUSIONS AND WAY FORWARD

The workshop brought out several initiatives and the way forward with a few key ones listed below.

- It could bring several stakeholders to a common problem with a common goal of mitigating arsenic problems in drinking water and public health.
- It was quite successful in knowledge sharing of potential technologies among various stakeholders.
- The issues brought out by the experts can be incorporated while designing the policies to mitigate water quality issues and
- Finally, the importance of community engagement in mitigating arsenic problems in the affected areas.

The SaciWATERs Arsenic Knowledge and Action Network along with Cap-Net network will continue its initiative to bring diverse stakeholders together; for the common goal of solving water quality issues related to arsenic contamination.

## LIST OF PARTICIPANTS

<b>Title</b>	<b>First &amp; Middle</b>	<b>Last Name</b>	<b>Gender</b>	<b>Country (Nationality)</b>	<b>Designation</b>	<b>Name of the institution</b>
Mr.	Pratul	Chaudhary	Male	India	Asst. EE	PHED
Mr.	Pratap	Bordoloi	Male	India	Asst. EE	PHED
Ms.	Chumki	Sharma	Female	India	Chemist	PHED
Mr.	Srimanta	Hazarika	Male	India	Teacher	Govt Primary School
Mr.	Gaurab	chutia	Male	India	Secretary	Student association
Mr.	Rajib	Sharma	Male	India	Secretary	Student association
Mr.	Boluram	Das	Male	India		PWSS
Mr.	Avtar	Singh	Male	India	Executive Engineer	PHED
Mr.	Animesh	Barman	Male	India	JE	PHED
Mr.	Ramen	Rajbongshi	Male	India	Chemist	PHED
Mr.	Nalini	Barman	Male	India	Health Officer	Health
Mr.	Manoj	Barman	Male	India	Block Development Officer	Madhupur
Mr.	Pranab	Barman	Male	India	JE	PHED
Mr.	Arup Kumar	Das	Male	India	SDM	Chatma
Mr.	D.	Majumdar	Male	India		PHED, Belsor
Mr.	Pramanand	Prasad	Male	India	Executive Engineer,Buxar	PHED
Mr.	Ravi	Shankar	Male	India	Chemist PHED,Buxar	PHED
Mr.	Alok	Kumar	Male	India	Ass. Executive Engg.	PHED
Dr.	Jitendra	Nath	Male	India	Civil Surgeon,Buxar	Health
Dr.	K K	Roy	Male	India	ACMO	Health
Dr.	Ashutosh	Chaturvedi	Male	India	Epidemologist,Buxar	Health
Dr.	Nirmal Kumar	Ojha	Male	India	MOIC	Health
Mr.	G. N.	Singh	Male	India	BHM, Simri	Health
Ms.	Tarni	Sinha	Female	India	DPO	ICDS
Mr.	Mahendra	Kumar	Male	India	DC	ICDS
Ms.	Sangeeta	Kumari	Female	India	CDPO,Simri	ICDS
Ms.	Suneeta	Kumari	Female	India	CDPO, Buxar Sadar	ICDS
Mr.	Krishnandan	Chakravorty	Male	India	District Agriculture officer	Agriculture Deptt.
Ms.	Suparna	Sinha	Female	India	Assitant Director Horticulture	Horticulture Deptt.
Mr.	Ranjeet Kumar	Singh	Male	India	Executive engineer	PHED east
Mr.	Bikash Kumar	Singh	Male	India	S.D.O	PHED east
Mr.	Praveen Kumar	Singh	Male	India	Lab. in charge	PHED Laboratory
Mr.	Ali	Gouhar	Male	India	Assistant Lab. incharge	PHED Laboratory
Mr.	Subash Chandra	Sinha	Male	India	Excutive engineer	PHED west
Mr.	Pradeep	Kumar	Male	India	S.D.O	PHED west
Ms.	Kumari	Sima	Female	India	Epidemiologist	Health (IDSP)
Mr.	Firoz	Ahmad	Male	India	MO PHC Barohiya	Health
Dr.	Arfa	Nazmine	Female	India	MO RH Nathnagar	Health
Mr.	Mithlesh	Kumar	Male	India	BCM PHC-Kahalgaoon	Health
Mr.	Mobin	Ahmad	Male	India	BCM RH Pirpainti	Health

Ms.	Kiran	Kumari	Female	India	BCM RH Nathnagar	Health
Ms.	Arpana	Rasid	Female	India	BHM RH Nathnagar	Health
Mr.	Sunil Kumar	Poddar	Male	India	MO Ayush Nathnagar	Health
Dr.	Anjana		Female	India	MOIC RH- Nathnagar	Health
Ms.	Archana	Kumari	Female	India	D.P.O	ICDS
Ms.	Pooja	Kale	Female	India	D.P.A	ICDS
Ms.	Punam	Kumari	Female	India	C.D.P.O	ICDS
Ms.	Anjana	Kumari	Female	India	C.D.P.O	ICDS
Ms.	Meri Lata	Kisku	Female	India	C.D.P.O	ICDS
Mr.	Ajay Kumar	singh	Male	India	Assistant Director	Horticulture
Mr.	Krishna Kant	Jha	Male	India	D.A.O	Agriculture
Mr.	Nandlal	Yadav	Male	India	Pump Operator	PHED
Mr.	Nagendra Singh	Yadav	Male	India	Pump Operator	PHED
Mr.	Hare Ram	Paswan	Male	India	Pump Operator	PHED
Mr.	Bijay Kumar	Pandey	Male	India	Pump Operator	PHED
Mr.	Lal G	Paswan	Male	India	Pump Operator	PHED
Mr.	Anil	Kushwaha	Male	India	Pump Operator	PHED
Mr.	Dhanji	Kharwar	Male	India	Pump Operator	PHED
Ms.	Bindu	Sinha	Female	India	ANM, Brahmipur,PHC	Health
Ms.	Neelam Kumari	Sinha	Female	India	ANM, Brahmipur,PHC	Health
Ms.	Ranju	Kumari	Female	India	ANM,Simri	Health
Ms.	Chameli	Kumari	Female	India	ANM,Simri	Health
Ms.	Sumeetra	Kumari	Female	India	ANM	Health
Ms.	Kusum	Kumari	Female	India	ANM	Health
Ms.	Malti	Kumari	Female	India	ANM	Health
Ms.	Poonam	Kumari	Female	India	ANM	Health
Ms.	Jaymeetra	Kumari	Female	India	ANM	Health
Ms.	Sangeeta	Kumari	Female	India	ANM	Health
Ms.	Bindu	Devi	Female	India	ANM	Health
Ms.	Meena	Kumari	Female	India	ANM	Health
Ms.	Kunti	Devi	Female	India	ANM	Health
Ms.	Pushpa	Devi	Female	India	ASHA	Health
Ms.	Shanaj	Begum	Female	India	ASHA	Health
Ms.	Rinku	Devi	Female	India	ASHA	Health
Ms.	Meera	Devi	Female	India	ASHA	Health
Ms.	Kiran	Devi	Female	India	ASHA	Health
Ms.	Phoolmati	Devi	Female	India	ASHA	Health
Ms.	Reetu Kumari	Singh	Female	India	ASHA	Health
Ms.	Kanchan	Devi	Female	India	ASHA	Health
Ms.	Ranju	Devi	Female	India	ASHA	Health
Ms.	Urmeela	Devi	Female	India	ASHA	Health
Ms.	Reeta	devi	Female	India	ASHA	Health
Ms.	Urmeela	Devi	Female	India	ASHA	Health

Ms.	Chandu	Devi	Female	India	ASHA	Health
Ms.	Leela	Devi	Female	India	ASHA	Health
Ms.	Lalsa	Devi	Female	India	ASHA	Health
Ms.	Urmeela	Devi	Female	India	ASHA	Health
Ms.	Poonam	Devi	Female	India	ASHA	Health
Ms.	Meera	Devi	Female	India	AWW	ICDS
Ms.	Taramati	Devi	Female	India	AWW	ICDS
Ms.	Sonam	Devi	Female	India	AWW	ICDS
Ms.	Shanaj	Begam	Female	India	AWW	ICDS
Ms.	Aneeta	Kumari	Female	India	AWW	ICDS
Ms.	Rekha	Pathak	Female	India	AWW	ICDS
Ms.	Laleeta	Devi	Female	India	AWW	ICDS
Ms.	Kumari	Anichharani	Female	India	AWW	ICDS
Ms.	Shobha	Devi	Female	India	AWW	ICDS
Ms.	Sareeta	Upadhayay	Female	India	AWW	ICDS
Ms.	Chemma	Devi	Female	India	AWW	ICDS
Ms.	Geeta	Devi	Female	India	AWW	ICDS
Ms.	Pooja	Singh	Female	India	AWW	ICDS
Ms.	Chanda	Devi	Female	India	AWW	ICDS
Ms.	Chandrawati	Devi	Female	India	AWW	ICDS
Ms.	Usha	Devi	Female	India	AWW	ICDS
Ms.	Poonam	Devi	Female	India	AWW	ICDS
Ms.	Pushpa	Devi	Female	India	AWW	ICDS
Ms.	Leela	Devi	Female	India	AWW	ICDS
Ms.	Devanti	Devi	Female	India	AWW	ICDS
Ms.	Urmeela	Kumari	Female	India	AWW	ICDS
Ms.	Babeeta	Devi	Female	India	AWW	ICDS
Ms.	Sangeeta	Devi	Female	India	AWW	ICDS
Ms.	Meena	Devi	Female	India	AWW	ICDS
Ms.	Pachratna	Devi	Female	India	AWW	ICDS
Ms.	Kumari Amrita	Yadav	Female	India	AWW	ICDS
Ms.	Usha	Devi	Female	India	AWW	ICDS
Mr.	Sajan Kumar	Das	Male	India	Pump operator	PHED (Mechanical)
Mr.	Mithun	Kumar	Male	India	Pump operator	PHED
Mr.	Abhi		Male	India	Pump operator	PHED
Mr.	Raju	Mandal	Male	India	Pump operator	PHED
Mr.	Balkrishna	Panday	Male	India	Pump operator	PHED
Dr.	Vijay Kumar	singh	Male	India	Civil surgeon	Health
Mr.	Ajay Kumar	Singh	Male	India	ACMO	Health
Mr.	Md.Faizan Alam	Asrafi	Male	India	DPM	Health
Dr.	Sukesh	Kumar	Male	India	MOIC RH Pirpainti	Health
Ms.	Guriya	Rani	Female	India	ANM Nathnagar	Health
Ms.	Rubi	Kumari	Female	India	ANM Kahalgaon	Health



Ms.	Usha		Female	India	ANM -Ekdara	Health
Ms.	Maryam	Bano	Female	India	ANM- Pasurampur	Health
Ms.	Shweta	Kumari	Female	India	ANM-Govindpur	Health
Ms.	Sanju	Sinha	Female	India	ANM- Khawasapur	Health
Ms.	Kshuboo	Kumari	Female	India	ANM	Health
Ms.	Sima	Kumari	Female	India	ANM	Health
Ms.	Anita	Kumari	Female	India	ANM- Srirampur	Health
Ms.	Monika	Shree	Female	India	Anm-srirampur	Health
Ms.	Shobha	Kumari	Female	India	ANM- Gosaidaspur	Health
Ms.	Vandana	Kumari	Female	India	ANM- Gosaidaspur	Health
Ms.	Kumari	Jyoti	Female	India	ANM-Batoriya	Health
Ms.	Nandani		Female	India	ANM- Bhuwalpur	Health
Ms.	Babita		Female	India	ANM- Beriya	Health
Ms.	Ranjita	Kumari	Female	India	ANM- Ajmeripur	Health
Ms.	Sobha	Kumari	Female	India	ANM Birabnna	Health
Ms.	Usha	Kumari	Female	India	ANM-Barohiya	Health
Ms.	Renu	Devi	Female	India	ASHA-Olpura	Health
Ms.	Manisha	Devi	Female	India	ASHA- BaluTola	Health
Ms.	Fool	Kumari	Female	India	ASHA- Nayanagar Ranidiyara	Health
Ms.	Manju	Devi	Female	India	ASHA- Sonu tola	Health
Ms.	Archana	Devi	Female	India	ASHA- Nandgola	Health
Ms.	Kiran	Devi	Female	India	ASHA- Barohiya	Health
Ms.	Madhu Mala	Devi	Female	India	ASHA- Srimatpur	Health
Ms.	Madhumala	Kumari	Female	India	ASHA facilitator	Health
Ms.	Jalmala	Devi	Female	India	ASHA facilitator	Health
Ms.	Sunita	Kumari	Female	India	ASHA- Shankarpur	Health
Ms.	Bandana	Devi	Female	India	ASHA- Bhuawalpur	Health
Ms.	Sunahla	Kumari	Female	India	ASHA- Gosaidaspur	Health
Ms.	Kanchan Kumari	Gupta	Female	India	ASHA- Birabnna	Health
Ms.	Babita	Kumari	Female	India	ASHA- Batoriya	Health
Ms.	Geeta	Devi	Female	India	ASHA Facilitator	Health
Ms.	Abhilasha	Kumari	Female	India	L.S Pirpanti	ICDS
Ms.	Priti		Female	India	L.S Bhualpur	ICDS
Ms.	Sruti		Female	India	L.S Rattipur	ICDS
Ms.	Aahana		Female	India	L.S Batoriya	ICDS
Ms.	Sarita	Kumari	Female	India	L.S Kahalgaon	ICDS
Ms.	Lalita	Rani	Female	India	L.S.Kahalgaon	ICDS
Ms.	Priyanka	Bharti	Female	India	Anganwadi worker	ICDS
Ms.	Nirmala	Devi	Female	India	Anganwadi worker	ICDS
Ms.	Renu	Kumari	Female	India	Anganwadi worker	ICDS
Ms.	Rubi	Devi	Female	India	Anganwadi worker	ICDS
Ms.	Nutan	Devi	Female	India	Anganwadi worker	ICDS
Ms.	Kumari	Sapna	Female	India	Anganwadi worker	ICDS

Ms.	Jaimala	Kumari	Female	India	Anganwadi worker	ICDS
Ms.	Meena	Kumari	Female	India	Anganwadi worker	ICDS
Ms.	Rani	Kumari	Female	India	Anganwadi worker	ICDS
Ms.	Punam	Kumari	Female	India	Anganwadi worker	ICDS
Ms.	Kshuboo	Kumari	Female	India	Anganwadi worker	ICDS
Ms.	Kiran	Kumari	Female	India	Anganwadi worker	ICDS
Ms.	Mamta	Devi	Female	India	Anganwadi worker	ICDS
Ms.	Munni	Devi	Female	India	Anganwadi worker	ICDS
Ms.	Bijayalaxmi	Kotoki	Female	India	AWW	ICDS
Ms.	Dipa	Hazarika	Female	India	AWW	ICDS
Ms.	Anu	Patro	Female	India	ASHA	Health
Ms.	Usha	Dutta	Female	India	ASHA	Health
Ms.	Rajumoni	Tamuli	Female	India	ANM	Health
Ms.	Reba	Dutta	Female	India	ANM	Health
Mr.	Jayata	Gogoi	Male	India	Farmer	
Ms.	Aamika	Das	Female	India	PRI member	
Mr.	Luhit	Gogoi	Male	India	Farmer	
Mr.	Probeswar	Kurmi	Male	India		PWSS
Mr.	Pabitra	Bora	Male	India		PWSS
Mr.	Manash	Polong	Male	India		PWSS
Mr.	Keshram	Gonju	Male	India		PWSS
Mr.	Guluk	Dutta	Male	India		PWSS
Ms.	Runu	Das	Female	India	ASHA	Health
Ms.	Rita	Barman	Female	India	ASHA	Health
Ms.	Rekha	Sharma	Female	India	ASHA	Health
Ms.	Anima	Deka	Female	India	ANM	Health
Ms.	Anima	Mishra	Female	India	ANM	Health
Ms.	Gita	Haloi	Female	India	ANM	Health
Ms.	Junu	Rabha	Female	India	ANM	Health
Ms.	Loni	Mahanta	Female	India	ANM	Health
Ms.	Runuma	Baruah	Female	India	ANM	Health
Ms.	Sabita	Das	Female	India	ANM	Health
Ms.	Bharati	Deka	Female	India	ANM	Health
Ms.	Kanika	Deka	Female	India	ASHA	Health
Ms.	Mahima	Kalita	Female	India	ASHA	Health



**Organised By**



**PROJECT**  
**"CIVIL SOCIETY VOICES, VULNERABLE COMMUNITIES AND LOCALISED PLATFORM**  
**FOR ADDRESSING WATER QUALITY CHALLENGES"**



**CAPACITY BUILDING PROGRAM ON BRIDGING THE GAPS AMONG**  
**TECHNOLOGICAL INNOVATIONS, POLICY INTERVENTIONS AND GROUND**  
**REALITIES FOR THE STAKEHOLDERS**

**12-16 OCTOBER 2020**

**TIME-10:30 TO 12:00 HRS (IST)**

**Registration link:**

**[http://saciwaters.org/eu\\_workshop](http://saciwaters.org/eu_workshop)**

**[www.saciwaters.org](http://www.saciwaters.org)**

## **Background**

The world is undergoing a critical COVID-19 health crisis which is further elevated by the natural disasters and economic crisis. The issues related to water availability are yet unanswered despite the known fact and importance of water in fighting the COVID-19. Some issues such as water quality have been completely overlooked and these are directly related to the present Covid-19 and immunity needs. It is therefore important to accelerate and empower key stakeholders who directly deal with the problem of Arsenic, with the potential technologies and interventions required to mitigate the water quality issues. Efforts are on to share such knowledge through virtual training and capacity building programs in an integrated manner given the urgency to deal with the water quality issues. This program is conveniently divided into a series of workshops specific to the States of Bihar and Assam.

## **The topic of the program**

Capacity building program on bridging the gaps among technological innovations, policy interventions and ground realities for the stakeholders involved in the project titled "Civil Society Voices, Vulnerable Communities and Localised Platform for Addressing Water Quality Challenges".

## **Objectives of the workshop**

### **Workshop 1**

The agenda for the first session is aimed at disseminating potential technologies to mitigate Arsenic and to create awareness of the supporting schemes that exist. The training aims to build the capacity of Executive Engineers, Assistant Engineers, and Junior engineers or officials of similar rank from the various departments, CSO representatives etc.

### **Workshop 2 & 3**

The state-specific workshops for Bihar and Assam are platforms where the expert speakers on the panel are government officials and CSO representatives. The workshop would provide insights from officials from water, health, nutrition and other relevant departments on state-specific water quality policies. Officials from CSO and NGO representative would share their treasure of knowledge from the ground realities, the opportunities, gaps and challenges they face as they work at the ground level. Executive engineers, local CSOs/NGOs people, ASHA and Anganwadi workers, ANMs, Rural Water user association and other stakeholders from the state have been invited to benefit as participants to this workshop.

**Day 1****12 October 2020****Capacity building (Technology) towards mitigation of Arsenic in drinking water in rural parts of Assam and Bihar****Introduction 10:30- 10:40****Session Moderator**

Dr. Dipankar Saha  
Former Director,  
Central Ground Water Board

**10:40 to 10:50 hrs**

Algal technology  
Dr. Thomas Kiran  
Researcher, University of Tsukuba, Japan

**10:50 to 11:00 hrs**

Arsenic mitigation technology  
Dr. Rajib Lochan Goswamee  
Senior Principal Scientist  
CSIR-NEIST, Assam

**11:00 to 11:10 hrs**

Ground learnings from the project  
Mr. Prithvi Ram Bommaraboyina  
Associate Fellow  
SaciWATERS

**11:10 to 11:20 hrs**

Arsenic mitigator bacterial technology  
Dr. Bishun Deo Prasad  
Assistant Professor  
Bihar Agriculture  
University

**11:20 to 12:00 hrs****Discussion, Q/A and closing remarks**

**Day 2****14 October 2020****Capacity building (Policy) towards mitigation of Arsenic in drinking water in rural parts of Bihar****Introduction 10:30- 10:40****Session Moderator**

Dr. Ashok Ghosh  
 Chairman,  
 BSPCB & HoD, MCSRC

**10:40 to 10:50 hrs**

State specific policies pertaining to ground water department towards mitigation of arsenic

Dr. Dipankar Saha  
 Former Director, Central Ground Water Board

**10:50 to 11:00 hrs**

State specific policies pertaining to PHED department towards mitigation of arsenic.  
 Mr. Gopal Singh, Exective Engineer (Retd.)  
 PHED, Bihar

**11:00 to 11:10 hrs**

State specific health policies towards mitigation of arsenic  
 Dr. Ragini Mishra,  
 State Health Society, Bihar

**11:10 to 11:20 hrs**

Ground realities- Dissemination of Pilot level findings from the project  
 Mr. Asif Shahab,  
 Associate Fellow, SaciWATERS

**11:20 to 12:00 hrs****Discussion, Q/A and closing remarks**

**Day 3**  
**16 October 2020**

**Capacity building (Policy)towards mitigation of Arsenic in drinking water  
 in rural parts of Assam**

**Introduction 10:30- 10:40**



**Session Moderator**

Dr. A B Paul  
 Retired Chief Engineer  
 PHED



**10:40 to 10:50 hrs**

State specific health policies towards  
 mitigation of arsenic

Dr. KK Majumdar  
 KPC Medical College, Assam



**10:50 to 11:00 hrs**

State specific policies pertaining to PHED  
 department towards mitigation of arsenic

Mr. Biswadeep Das  
 Additional Chief Engineer, PHED



**11:00 to 11:10 hrs**

Ground realities  
 Prithibhusan Deka

Director,  
 Gramya Vikash Mancha



**11:10 to 11:20 hrs**

Ground realities- Dissemination of Pilot  
 level findings from the project

Mr. Asif Shahab,  
 Associate Fellow, SaciWATERS

**11:20 to 12:00 hrs**

**Discussion, Q/A and closing remarks**

## **Saci WATERs Organizing Committee**

Dr. Mansee Bal Bhargava, Executive Director,  
Ms. Suchita Jain, Associate Fellow  
Mr. Prithvi Ram Bommaraboyina, Associate Fellow  
Mr. Asif Shahab, Associate Fellow  
Ms. Judith Christiana, HR  
Ms. Sumanjita Barman, District Coordinator, Nalbari, Assam  
Mr. Narayan Gowala, District Coordinator, Jorhat, Assam  
Mr. Gautam Anand, District Coordinator, Buxar, Bihar  
Mr. Kumar Gautam, District Coordinator, Bhagalpur, Bihar  
Mr. Sai Kiran, Field Coordinator

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[info@saciwaters.org](mailto:info@saciwaters.org)



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**SaciWATERs**  
SOUTH ASIA CONSORTIUM FOR INTERDISCIPLINARY  
WATER RESOURCES STUDIES



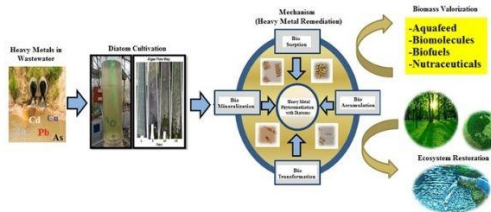
**TECHNOLOGIES TOWARDS MITIGATION OF ARSENIC**  
 PROJECT "CIVIL SOCIETY VOICES, VULNERABLE COMMUNITIES AND LOCALISED PLATFORM FOR ADDRESSING WATER QUALITY CHALLENGES"

**COMMUNICATION**

**ARSENIC MITIGATION: A DIATOM ALGAE PERSPECTIVE**

Dr. Thomas Kiran  
 Researcher, University of Tsukuba, Japan

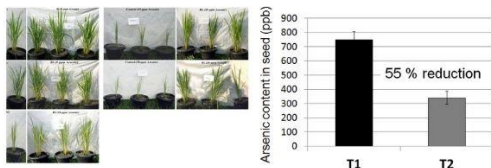
Exposure to heavy metals is a major threat to aquatic bodies and is a global concern to our four main spheres of the earth viz. atmosphere, biosphere, hydrosphere, and lithosphere. The biosorption of pollutants using naturally inspired sources like microalgae has considerable advantages. Diatoms are the most dominant and diverse group of phytoplankton which accounts for 45% oceanic primary productivity. They perform a pioneer part in the biogeochemistry of metals in both fresh and marine water ecosystems. The diatoms play a significant role in degradation, speciation, and detoxification of chemical wastes and hazardous metals from polluted sites. Herein, an overview is presented about the ability of diatom algae to phycoremediate heavy metals by passive adsorption and active assimilation from their aqueous environments with an emphasis on extracellular and intracellular mechanisms involved in contaminant uptake through the frustules for preventing heavy metal toxicity.



**BIOREMEDIATION OF ARSENIC CONTAMINATED SOIL USING PSEUDOMONAS SP. (AS17) IN RICE**

DR. BISHUN D. PRASAD  
 BIHAR AGRICULTURAL COLLEGE,  
 SABOUR (BIHAR)

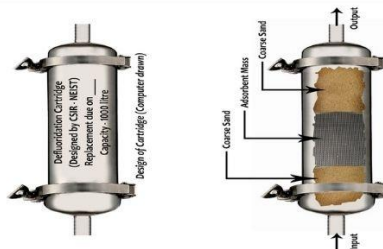
- As17 bacterial isolates can able to grow upto 25mM of Sodium arsenite (NaAsO2)
- Bacteria were identified by sequencing 16s rDNA
- Bacterial culture were submitted in ICAR-NABIM, Mau
- As17 treatment reduces approx. 50% reduction in arsenic treatment in rice seed



**DEFLUORIDATION AND DEARSENICATION PLANT DEVELOPED BY CSIR-NEIS<sup>1</sup>**

Dr R L Goswamee  
 CSIR- North East Institute of Science and Technology, Jorhat

Developing a new enhancing technique for a quick removal of Arsenic complexes from contaminated soil and drinking water resources and having less negative impact to the environment is must. There are organisms in both terrestrial and aquatic environments that could accumulate or change the form of As, including several species of bacteria that reduce As(III) to the less toxic As (V), could be coupled with adsorption or coagulation technique they may produce a good alternative remediation technique.



Arsenic impacts millions of people globally through various points of contamination, there are various technological solutions, but in few cases these solutions are inaccessible for those who need them most as a result of lack of common repository of information of source of contamination at habitation level. Therefore, it is hard to implement and in few cases even hinders the genesis of feasible arsenic mitigation technology. There is also need for common arsenic consortium, where all institutions and clusters work together and provide sustainable technologies. In addition, arsenic-affected areas, would cultivate a responsive behavior about arsenic in communities



WHEN A COMMUNITY GETS ACCESS TO CLEAN WATER, IT CAN CHANGE JUST ABOUT EVERYTHING.

