

**Title:** *Network approach to the wicked problems of water quality-Arsenic Knowledge and Action Network*

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## 1. Introduction

Wicked problems have been a tag line for many issues and mostly linked to those tricky situations/issues that have confounded solutions, appearing in various fields ranging from environmental problems to urban planning to business management.

Within that spectrum and from the criteria's defined by Rittel & Webber (1973), water quality problems also rightly fall into the purview of wicked problems. An inherent characteristic of wicked problems is that they have no defined solutions and their circular nature usually brings new problems the moment we think we have a solution. For example, to avoid consumption of water that had microbial contamination, there were massive, concerted and well-meaning efforts to shift usage pattern from surface water to tube-wells so as to tap "pure" groundwater. In many parts of Bangladesh and India, this large-scale effort resulted in exclusive usage of groundwater for drinking water. While partially resolving one problem, it was later found out was that more than 30% of tube-wells in Bangladesh and many million in India contained arsenic beyond standard permissible levels leading to several other health complications (WHO recommends 10 µg/l<sup>1</sup>; Indian and Bangladesh standard at low up to 50 µg/l<sup>1</sup>). As seen here, solving one problem led to many new ones (Khan, et al. 2009; Chakraborti et al 2009; Saha & Sahu 2015).

This paper strives to understand water quality problem of arsenic from a wicked problem perspective. It further utilizes the coping mechanism of collaborative strategy and analysis to examine the efforts and results experienced by Arsenic Knowledge and Action Network.

## 2. WICKED PROBLEMS-SOLUTION OPTIONS

The phrase of "wicked problems"<sup>4</sup> was coined way back in 1974 by (Rittel & Webber, 1973). They defined wicked problems as that which is an opposite of a tame problem. A tame problem can have a definitive and agreed problem statement for which one-shot solutions can be designed. Tim Curtis explains that wicked

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<sup>4</sup> The term wicked here according to (Rittel & Webber, 1973) is not because they are bad or evil problems but rather because the problems are '..."malignant" (in contrast to "benign") or "vicious" (like a circle) or "tricky" (like a leprechaun) or "aggressive" (like a lion, in contrast to the docility of a lamb)' (pg.160).

problems/issues on the other hand are the opposite, as it "is a social problem in which the various stakeholders can barely agree on what the definition of the problem should be, let alone on what the solution is."

One easy approach is to designate wicked problems as insurmountable and give up on them altogether. However, problems linked to water quality are serious and their implications affect millions of lives daily. Resolving this wicked problem is convoluted and tricky, nevertheless essential.

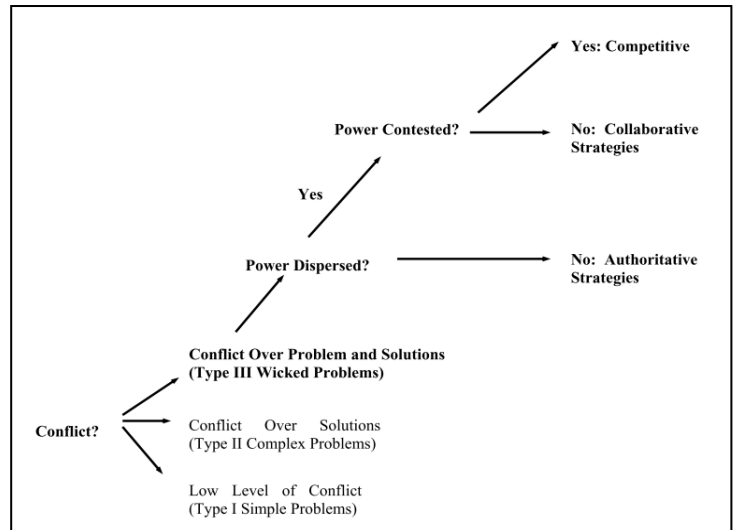


Figure 1: Approaches to resolve wicked problems

Wicked problem research suggests three coping strategies (Roberts, N. 2000).

1. Authoritative strategies
2. Competitive strategies
3. Collaborative strategies

All the strategies designed and used to resolve wicked problems have their share of flaws and difficulties yet, one strategy that has been known to be ‘least bad’ way of ‘making wicked problems governable” is that of collaboration or through open networks (Roberts, N. 2000; Bandelli, et al., 2009; Ferlie & Fitzgerald, 2011).

### 2.1. WICKED PROBLEM OF ARSENIC

Arsenic (As) is an element that is fairly recent in the water quality vocabulary dating a few decades back and the incidences of its reporting within over 20 countries from around the world reporting groundwater arsenic contamination (Bordoloi, 2012).

This element that is known to plague Bangladesh is now becoming a common manifestation in several parts of India. While arsenic essentially has geological origins, there are a variety of factors that contribute to increased mobilization of arsenic and thereby an increase in its concentration in groundwater (Reza et al., 2010, Express, 2013, Chakraborti et al., 2013,).

This problem is also socially complicated primarily because its presence in water is neither visible, nor does it affect smell or taste of water. Thereby making it an invisible and slow poison. As large populations within India rely on groundwater to meet the domestic, agricultural and other needs, there are increasing numbers susceptible to the arsenic poisoning.

Further the manifestations of the diseases and associated health risks are diverse and spread over a long period of time, making it difficult to make direct one-to-one

association of cause and effect. Arsenic poisoning is a slow process taking 5-10 year to show its effects through skin lesions, although consuming high concentration can manifest these symptoms and different variations of cancer within 2-5 years (Chaurasia et.al., 2012 Majumder & Mazumder, 2012; Das et al., 2012).

The growing number of occurrences of arsenic in groundwater is now recognized as a serious public health concern with the potential of seriously affecting large numbers of people. As of 2008, solely within West Bengal there are about 26 million people potentially at risk of drinking arsenic polluted water (Chakraborti et al., 2009). Apart from W. Bengal, arsenic has also pervaded aquifers and thereby tubewells in the states of Jharkhand, Bihar, Uttar Pradesh in flood plain of Ganga River; Assam and Manipur in flood plain of Brahmaputra and Imphal rivers, and Chhattisgarh. As of 2008, approximately 50 million people (W. Bengal included) are vulnerable to groundwater contaminated by arsenic (Ghosh and Singh, nd).

As dire as the situation seems, there have been several efforts exerted towards identification and understanding arsenic spread and mitigation. While much work has been done in the past to identify arsenic aquifers along with several technology options for filtration there has been few who have been able to sustain these efforts beyond a project period. Further, there has been hardly any space for learning and reflection along with concerted and collaborative effort to learn from each other and work towards holistic solutions.

### **3. NETWORK APPROACH FOR ARSENIC**

Utilizing an open network approach to address this wicked problem, Arsenic Network at the one level works to bring attention and knowledge collation on arsenic issues. At another level to assist in sharing knowledge; build capacity, further advocacy, and create spaces for interdisciplinary and multi-sectorial joint consultation and action. The Arsenic Network based on the concept of network solutions through an open system seeks to bring together different streams of knowledge and action towards solutions for living safely with arsenic.

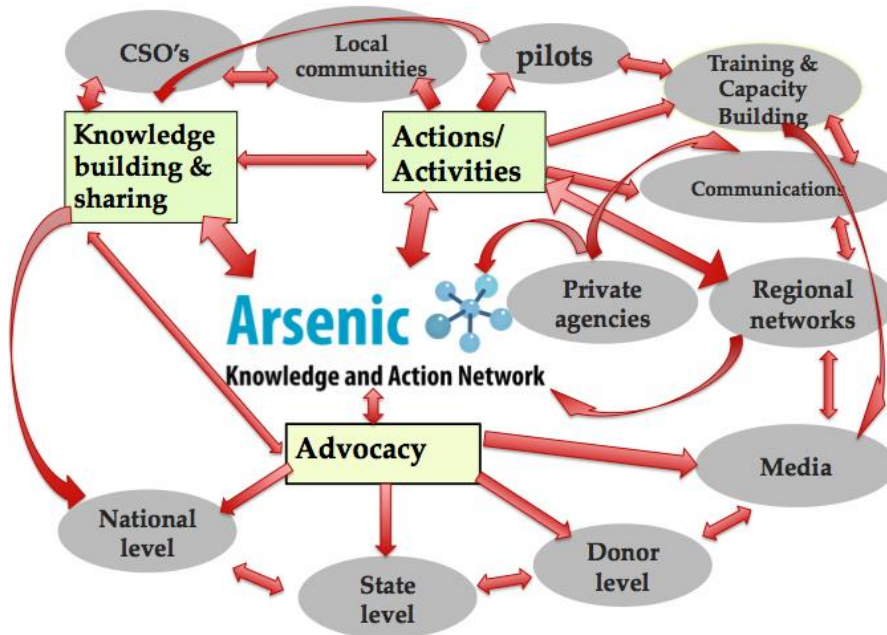


Figure 2: Arsenic Knowledge and Action Network- mode of approach

### 3.1. Knowledge collation and sharing platforms

An easy medium for bringing together the networks collective knowledge has been website and social media and other existing knowledge platforms. The Arsenic Network website has been a one point source for information. However since the structure of a website being one directional, face book discussion pages are also used as a medium for two way sharing. Regular newsletters that collate and share ongoing efforts from the ground, lab and around the world have aimed to tangibly create regular information sharing through concise information packages. In the case of our efforts in Assam since 2013, other multiple forms of knowledge collation have been visible like State of the Sector Report on Arsenic in Water, case studies on innovative practices of arsenic mitigation, internship studies on arsenic and discussion series articles.

### 3.2. Action research: Fostering innovation and change through reflective action

#### 3.2.1. Fostering platforms for joint consultations and action research

To understand the challenges and gaps along with identifying pathways to overcome them and resolve arsenic problem we initiated a communication campaign. This took shape of open and facilitated consultation meeting and workshops for joint deliberation among various sectors to recognize existing gaps, and define actions to be taken along with mechanism to share responsibilities.

**Assam:** This effort has successfully occurred within three of the six affected states in India. AKAN through mobilized and facilitated action research being taken up on communication strategy engagement in Assam, which enabled

the community and local governmental agencies through ongoing deliberation and action to share their concerns and also highlight their priorities through a participatory process of planning. This facilitated process grew through local consultation building ground up consciousness about the problem of arsenic. This heightened awareness and understanding of challenges has led to local innovation in collaboration with state level academic organization (CSIR-NEIST) for providing alternate water supply. This included cleaning up and recharging local surface ponds and creating local simple water filtration mechanism at source.

The community also further collaborated with PHED to complete connection of water supply to the villages. As a comprehensive understanding of the problem grew, new priorities that emerged. One of them included planning to identify patients affected due to arsenic toxicity. Building further collaborations, the health department, CSIR-NEIST and PHED came together and organized a health awareness and consultation program at Titabar Civil Hospital, Titabar, Assam. There was also a health camp conducted for general public.

The ensuing consultation raised several new areas of concerns one of them was the exclusion of community from water quality testing processes. For the same, discussions have been happening with PHED to involve the community in water testing, which is also mandated under National Rural Drinking Water Policy (NRDWP) guidelines. The community is also looking to initiate social enterprises to provide alternate supply of water through different employment schemes.

**Bihar:** In Bihar, the consultations have taken the shape of on-ground mitigation solution jointly taken ahead by multiple stakeholders each contributing to fill the gaps that past efforts have been unable to accomplish. To enable open and transparent decision making, the process moved from a secretariat driven to open network driven decision-making. Here a core group came together with decision of initiating action in 3 districts. The action research takes different focus in each district, based on the need of the region. The partners here include hospitals, academic institutions, local and international NGO's and government bodies.

**Uttar Pradesh:** Arsenic is found in 12 districts of UP and to address this challenge it was envisioned that 'Jal Choupal' in coming times would act as an effective platform be used for taking forward activities that would contribute towards better water and health within UP. 'Jal Choupal' in UP has emerged as a group of different individuals who are working on or are interested to work on water quality issues in UP. 'Jal Choupal' is completely apolitical and has no allegiance to any political party or institute and organization. It is hoped that 'Jal Choupal' would play an important role in ensuring better water and health for the people of UP.

**West Bengal:** West Bengal has been on the forefront of arsenic research and action. Taking this learning ahead AKAN has been utilizing the learning and expertise to inform action in other regions of India. Further, there is also consistent effort to integrate and initiate convergence and collaboration within departments and agencies in West Bengal as initiated within other states.

### **3.2.2. Bridging/addressing the gap in capacity relevant to the technical aspects of arsenic**

Recognizing the multi sectorial nature, there were also gaps identified in capacities of different sectors such as doctors, CSO's, engineers' and media personnel. Taking this ahead there have been trainings mediated through relevant governmental agencies and experts for doctors, Civil Society Organization and communities on diagnosis and mitigation options. The trainings with doctors have aimed at sustaining the interest of health professionals in addition with focusing on ASHA (Accredited Social Health Activists) workers, ANMs (Auxiliary Nurse Mid-wives) who are directly engaged with the community on the ground.

### **3.2.3. Leveraging the existing local capacity for alternatives in terms of local infrastructure, knowledge and communication:**

The network through its team has been engaging with the community on identifying methods to impact the behavior of the community towards preferring surface water sources for drinking to ground water. For instance community came forward to clean the ponds in their village. They also devised local infrastructural solution in using pond water for drinking purposes based on local knowledge. Our local team has been consistently working towards utilizing effective communication channels for exchanging information on arsenic in water. Some of these channels have been the school children, members of mothers group in schools, local media, members of Self Help Groups (SHGs) etc.

### **3.3. Advocacy: Using evidence to enable change**

Taking the concerns of the grassroots and issues to the policy Arsenic Network through its advocacy effort has been able to interact and inform Members of Parliament within India, the issues of arsenic as a serious health risk within India was also raised within the parliament discussion as a result. At the state level there have also been interaction with multiple level of government bureaucrats. In the case of Assam continued interactions have led to a joint interest shown by WSSO (Water and Sanitation Support Organization), PHED (Public Health Engineering Department) and Department of Health about the issue of arsenic in water.

### **3.3.1. Moving towards convergence with programs, institutions and service delivery organization that cater to issues of safe water and/or water quality:**

The network in its approach has been identifying opportunities and scope for convergence with existing programs like Swachh Bharat Mission, MGNREGA for different infrastructure works on ground etcetera. Interactions with PHED have been fruitful who have acknowledged the initiatives of the network for addressing the issue of arsenic in drinking water. Out of the network's efforts in Assam, Safe Water and Health Centre for Assam (SWaCHa), earlier known, as State Water Quality and Health Resource Centre for Assam would soon serve as a single point of contact for addressing the issue of arsenic and fluoride in drinking water.

## **4. CHALLENGES:**

As activities of the Network grew so did the challenges faced.

- Aligning interests and brining about decision for joint decision-making on issues that involve action have been time-consuming processes. This requires maintaining patience of partners involved and building a level of comfort with ambiguity.
- As there are few existing success models for joint action on arsenic issues, there are few precedents that can be followed.
- Further, different partners come with different perspectives, merging perspectives in an efficient manner is another challenge that has been faced in such multi-sectorial engagements.
- Maintaining the interest of partners involved through the ambiguity towards shaped action, individual eccentricities' and ensuring clear communication and understanding across network partners from different backgrounds
- Creating pathways for providing the affected and vulnerable communities access to the collective knowledge available on web. Most of these communities live on subsistence allowance, with limited means and literacy.

## **5. CONCLUSIONS**

*Learning without reflection is a waste, reflection without learning is dangerous- Confucius*

The Arsenic Knowledge and Action Network at its inception in 2014 started with 30 odd members and today has a growing number of around 300 individuals, governmental, non-governmental and private institutions. The wicked problem of arsenic requires everyone's attention, it requires coming together of multiple sectors to address its multi-pronged challenge. These efforts have now resulted in new pilots that take into consideration previous learning and include more robust framework for mitigation. This is an initial effort and results are slowly being observed. However, for such an effort to be sustainable it also requires systems at every region that allow and enables joint action.

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