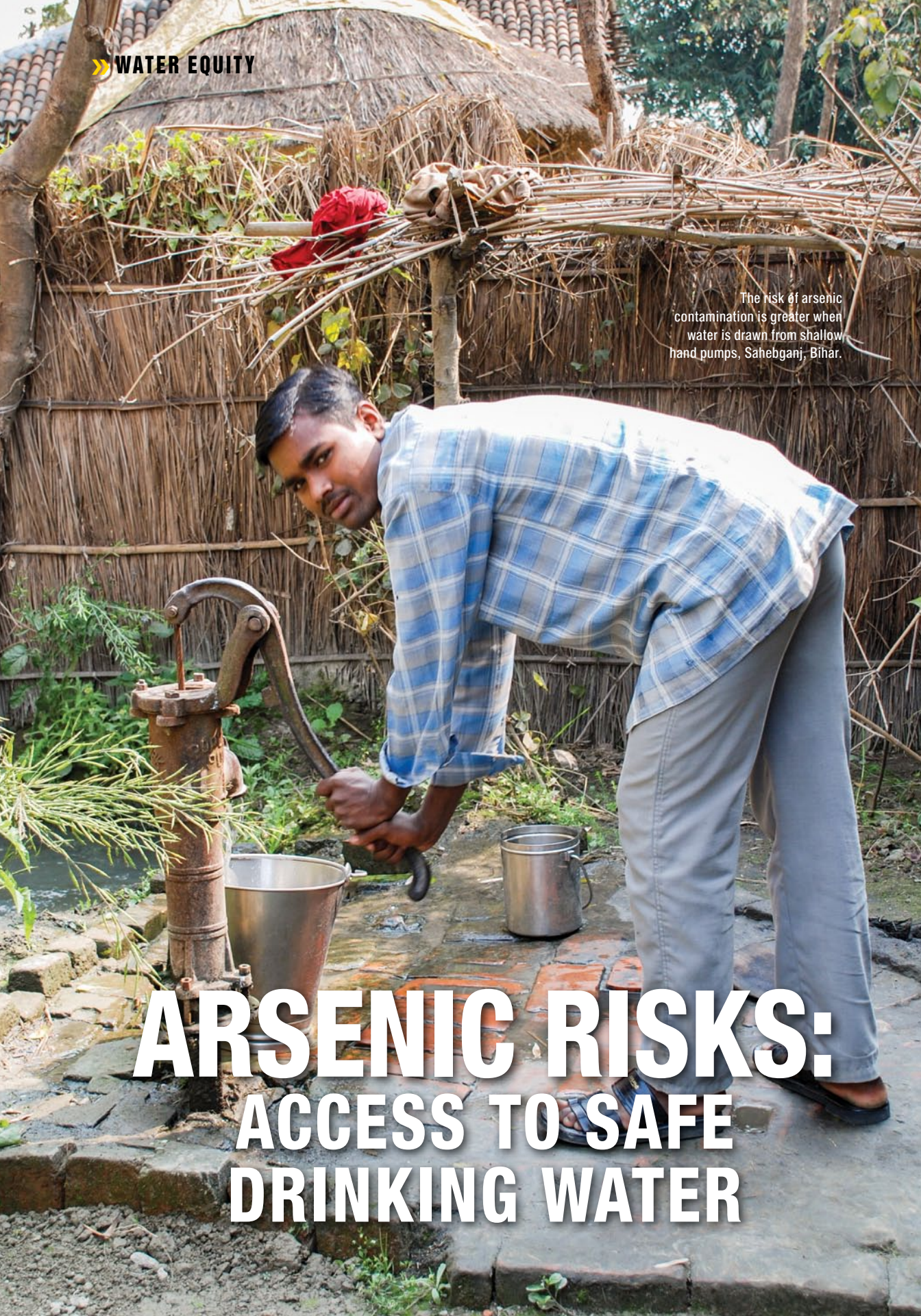

The risk of arsenic contamination is greater when water is drawn from shallow hand pumps, Sahebganj, Bihar.

ARSENIC RISKS: ACCESS TO SAFE DRINKING WATER

By **MANISH MASKARA** *and* **SAFA FANAIAN**

Groundwater has increasingly been reported to include largely geogenic and anthropogenic contaminants such as iron, bacteria, arsenic, fluoride, nitrates etc. Over the decades, there has been a growing concern about arsenic contamination due to its severe health consequences.

Bangladesh was among the first to identify and initiate its struggle against arsenic although many districts in the Terai region of Nepal, India and Pakistan also have arsenic contamination. It is a complex challenge because it is dangerous even in minute quantities (>10 µgl1) although WHO recommends 10 µgl1 while India and Bangladesh allow up to 50 µgl1. It is neither visible, nor does it affect smell or taste. Further, poisoning symptoms appear overtime and involve complicated testing and diagnosis. In India 86 districts located in Bihar, West Bengal, Assam, Punjab, Karnataka, Haryana, Jharkhand, Uttar Pradesh and parts of Manipur and Chhattisgarh are affected (Fig. 1) (Central Ground Water Board, 2014).

Extent, sources and effects of arsenic contamination

Arsenic contamination is mostly present in shallow aquifers, which results from the holocene aquifers, originating from Himalayan sediments in the fluvial plains of Ganga-Brahmaputra in India. Though arsenic contamination in the Gangetic plain dwindles after a certain depth, it is not always the case for other geographies (Chakraborti et al 2009). Drinking water through shallow tubewells is one of the important pathways along with its entry into human bodies through the food chain (Chaurasia, Mishra and Pandey, 2012; Kundu, Pal and Majumder, 2012).

The population exposed to arsenic in West Bengal is from the lower socioeconomic strata and is prone to liver and cardiovascular diseases as well as skin manifestations in children from exposure to arsenic above 50mg/l in ground water. Incidences also vary with dose and duration of exposure, ethnicity and nutritional status of children. It is shown that the children exposed to arsenic toxicity have lower IQ scores as compared to normal children (Das et al., 2012; Majumdar and Mazumder, 2012). Pigmentation, keratosis, arsenicosis, chronic respiratory disease, liver fibrosis, peripheral vascular disease and cancer are other possibilities (Mazumder et al. 2010). Several studies have also reported of different kinds of arsenical skin lesions from affected villages of Jharkhand, Bihar, Uttar Pradesh and Chhattisgarh.

Response to the problem

Only recently, in March 2017, the Central Ministry of Water Resources, Government of India, has launched a sub-mission for arsenic mitigation. Post the inter-ministerial meeting in 2015, West Bengal, Assam and Bihar have put in place a Master Plan for arsenic mitigation. Other affected states are operating on a 'need-to-do' basis with a provision for water supply through treatment plants.

The Master Plan has short/immediate, medium/intermediary and long-term interventions. The short-term action plan includes mapping of arsenic affected sources, painting contaminated tube wells and setting up of deep tubewells. Medium/intermediate term step involves installing treatment and filtration units. Long-term plans take care of construction and setting up of treatment plants and piped water supply schemes from surface water bodies. The main responsibility for water supply in these affected regions is that of the Public Health and Engineering Department (PHED) under the state government, which is also responsible for

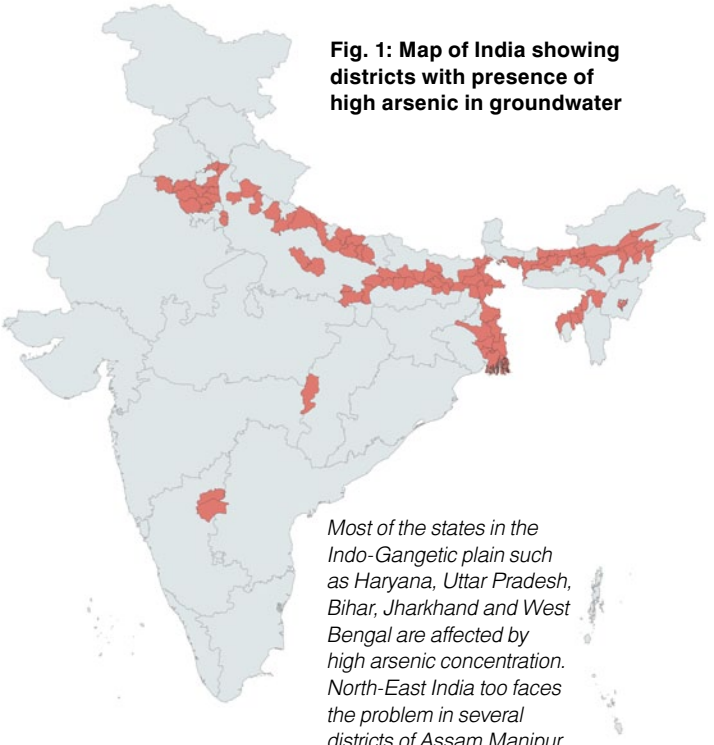

Fig. 1: Map of India showing districts with presence of high arsenic in groundwater

Most of the states in the Indo-Gangetic plain such as Haryana, Uttar Pradesh, Bihar, Jharkhand and West Bengal are affected by high arsenic concentration. North-East India too faces the problem in several districts of Assam,Manipur and Tripura.

Map not to scale

Arsenic affected districts

Source: SaciWATERs, Hyderabad,India.

maintaining laboratories to test and report the quality of water being supplied to communities. They also carry out various awareness building activities. Central Ground Water Board (CGWB) maps aquifers and identify the contaminated regions. The Board also had budget for awareness and dissemination of these results (Lok Sabha, 2014). It also provides regulation on borewell drilling in the affected regions (Government of India, 2015).

There had been no specific budgetary allocation for arsenic remediation until the setting of recent National Budget (2017). West Bengal, Jharkhand and Bihar now have specific allocation from the centre to address arsenic mitigation. Most of the budgets come from National Rural Drinking Water Programme (NRDWP) of which up to 67 per cent can be utilised for regions suffering from water quality. CGWB under the budgetary allocation for National Aquifer Management Programme has mapped arsenic affected regions;

Civil society organisations (CSO) including NGOs, academics and media have also encouraged technology development, awareness and implementation. The efforts have ranged from promoting filtration options, reverting to traditional water sources, health related interventions, behaviour change programmes and more. Private agencies are also involved through creating and driving filtration technologies through either private-public partnership for supply of safe water at a cost or utilising open market of water purifiers.

These efforts, despite being deliberate and rigorous have not achieved much success in mitigating the arsenic problem partly because of the sectoral conceptualisation, structural limitations, limited understanding of the issue, but largely also because of the circular nature of the 'wicked' problem of arsenic (Fanaian and Biswas, 2016), resulting in unresolved problems of arsenic mitigation.

Addressing arsenic contamination in water through 'network' mode

Arsenic Knowledge and Action Network (AKAN) was formulated in 2013 as an informal network of organisations and individuals across South Asia to develop a holistic ecosystem for accessing safe drinking water through enhancing drivers, filling gaps and curbing deterrents. The network has since expanded to include Assam, West Bengal, Bihar, Uttar Pradesh and Karnataka. The following section highlights a few of the key elements put forward in this direction.

AKAN has held multi-stakeholder consultation and joint workshops to further enhance the understanding and placing of the problem within local contexts and identifying entry points for interventions. This approach is also mandated under the National Rural Drinking Water Policy (NRDWP) guidelines. Below are the experiences from the states:

Assam: Here, the problem of arsenic contamination was conceptualised as an issue of lack of/ ineffective communication between the solvers and bearers of the problem, as various state and

district level consultations and deliberations showed. Several new areas of concerns such as the exclusion of local communities from quality testing of water were identified leading to their integration by PHED and health department and local Panchayat in various processes.

Bihar: Identifying gaps in addressing arsenic contamination in Bihar were relatively easier. This enabled a diverse group to collaborate and initiate locally contextualised action in three districts, ranging from awareness and communication to the integrating women Self Help Groups (SHGs). An informal platform for engagement and dialogue with *Jal Choupal* has been endorsed by the Bihar government to address water quality.

In Assam, AKAN engaged the community members with the help of a local team in understanding preferences and alternative sources for access to safe water, leading communities in the villages of Titabar sub-division to clean the ponds and using pond water for drinking purposes in addition to having piped water connection to their villages. AKAN's constant endeavour has been to converge its efforts with existing programmes at different levels.

Endnote

Arsenic contamination is assuming grave proportion in states of Bihar, West Bengal, Assam, Punjab, Karnataka, Haryana, Jharkhand, Uttar Pradesh and parts of Manipur and Chhattisgarh. There has been multi-stake efforts of which AKAN has been an important partner to create enduring solutions for living with arsenic. The core approach allows for priorities to be laid out and followed depending on local and regional contexts. Dealing with arsenic contamination requires active participation of the community, government and civil society organisations without undue emphasis on technological interventions only. While this approach is not free from its share of challenges, it is suggestive of a holistic model to address arsenic contamination.

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