Ensuring safe water and sanitation during floods in rural communities of Bihar State, India

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Bihar is India's most flood-prone state; 76 per cent of people living under the recurring threat of flooding. A major concern is lack of access to clean drinking water and sanitation during floods, resulting in avoidable morbidity and mortality, especially among children. In partnership with the Ministry of Disaster Management of the Government of Bihar, WaterAid worked in 100 villages across the five worst flood-affected districts, demonstrating emergency preparedness related to water and sanitation, and supporting the government in implementing a comprehensive emergency preparedness plan to effectively support water supply, sanitation and hygiene requirements during floods. In each village, sites relatively safe from flood waters were identified, four single-pit, pour-flush toilets were constructed and a hand pump provided (the toilets and hand pump on raised platforms); and 400 volunteers were trained in preventing waterborne diseases and treating diarrhoea. The technological improvements are being scaled up by the government in the flood-prone areas, and under the Chief Minister's Housing Scheme.

Keywords: Bihar, floods, preparedness, resilient watsan structures

DISASTERS SUCH AS FLOODS cause massive suffering, and the poor suffer the most. Mortality is high; the living often lose their dwellings and means of livelihood. Community-based measures for disaster preparedness either do not exist, or are minimal.

The State of Bihar in India is subject to recurrent floods; most floods occur in the months of September and October. During the last 30 years, the plains of North Bihar have recorded the highest number of floods in India, causing colossal losses in terms of life and property (Kale, 1997). Available data on human and animal lives lost show that the years 1987 and 2004 were the worst. Out of Bihar's total geographical area of 94,160 km^2, an area of 68,800 km^2 is usually flooded on an annual basis. It is reported that the flooding of rivers in Bihar is so regular that it has become a way of life for the people as well as

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for the state government. In fact, floods are often welcome! Seven rivers, namely the Kosi, Gandak, Burhi Gandak, Bagmati, Kamla Balan, Mahananda and Adhwara, flow down from the Himalayas and bring valuable silt with them. However, the flood-affected area has been expanding and now 22 districts of Bihar out of a total 38 districts are flood prone and the flood-affected area of Bihar has nearly tripled, from 25,000 km^2 in 1954 to 68,800 in 1994 (FMIS, Government of Bihar; www.fmis.bih.nic.in). This has been a result of anthropogenic activities: deforestation upstream, bunds on the river embankments with no regular desilting, and dams downstream; all of them contribute to heavy floods and slow down the flow of water. The most vulnerable districts identified by the Government of Bihar include Khagaria, Saharsa, Supaul, Madhubani, Darbhanga, Samastipur, Begusarai, Sitamarhi, Araria and Muzaffarpur. Here floods are reported to have caused epidemics because of contaminated water and poor sanitation facilities, resulting in high morbidity and mortality.

The Kosi floods in Bihar in 2008 revealed that no disaster-preparedness programmes were in place

There is an urgent need to generate awareness for preparedness, among all key stakeholders (including the community), if and when disasters occur. The Kosi Floods in Bihar in 2008 revealed that no disaster preparedness programmes were in place (Kumar, 2008). Communities lacked awareness and were found to be unprepared to face the sudden calamity and to deal with its after effects.

Until recently, a group existed under the Chief Minister to deal with flood-related emergencies, and it was responsible for all flood management issues. A broad-based ministry, the Disaster Management Department, was established in 2008 to deal with disasters, and to take a more serious view of floods and other disasters.

The project was to promote community-based flood preparedness

Realizing the need to promote community-based flood preparedness, WaterAid India launched a project in 25 villages of 5 districts of Bihar State, in May 2008, which was expanded to 100 villages in 2009.

Objectives

The *general objective* was to demonstrate how rural communities could be prepared to meet their water and sanitation needs during floods, and work with the government to scale up the approach across the State of Bihar.

The *specific objectives* were:

- to construct flood resilient water and sanitation structures in 100 worst-affected villages across five districts of Bihar State;
- to train four volunteers per village to educate communities on flood preparedness, prevent incidence of waterborne diseases during floods, and manage cases of diarrhoea; and

- to demonstrate the effectiveness of the model to the Government of Bihar.

Materials and methods

Through a study of available secondary data, 100 villages which were worst affected by floods were selected for the project, across the Districts of Muzaffarpur, Madhubani, Darbhanga, Samastipur, and Sitamarhi. In partnership with local non-governmental organizations (NGOs) and the Government of Bihar, the following interventions were implemented in each of the villages.

Training was provided to NGO staff, government officials, community-based volunteers and local masons

Capacity building. Key project staff of partner NGOs and senior government officials were trained in issues concerning organizational and community-level disaster preparedness. In a subsequent step, four community-based volunteers per village were trained in: accessing safe water and sanitation for the community; preventing waterborne diseases; and managing diarrhoea, especially in infants and children. Local masons were also trained in constructing single-pit, pour-flush toilets and raising platforms for water points.

Awareness generation. Audiovisual messages were designed to generate community-level awareness on preparedness for floods. These consisted of radio and television messages, newspaper articles, village-level meetings and wall paintings. The media was engaged in discussions on how they could contribute to raising community awareness.

Toilets and handpumps were sited at a high point in a village

Infrastructure development. In each project village, four seated community toilets were constructed, with temporary superstructures. The toilets were single-pit, pour-flush toilets, built on a raised platform. Close to this, a hand pump was installed, again on a raised platform. The platforms for the toilets and hand pumps were flood-resilient concrete and brick structures, including the leach pits of the toilets. Sites for these constructions were at a high point in a village, a place where the community mentioned that flood waters do not reach, and where they would usually gather during a flood. Above the roofs of the toilets, or on a nearby building, a water tank with a capacity of 5,000 litres was placed, and a force lift pump was attached to the hand pump. Community volunteers were taught how to fill up the tanks and chlorinate the water, in order to ensure access to safe water during the floods. In addition, each village was provided with a water filter, and communities were taught how to provide filtered water to infants and young children. Volunteers were provided with an emergency kit, containing medicines for primary treatment, chlorine tablets and oral rehydration solution. Altogether, 400 toilet seats and 100 hand pumps have been installed; and 400 community volunteers trained.

Water quality testing. Water from the hand pumps was tested for bacteriological contamination using a field test kit (Manja et al., 1982); and for hardness, fluorides and nitrates, using a portable water testing kit, akin to the Jal Tara Kit of Development Alternatives, India (CLEAN-India Campaign, 2001) . The hand pumps were handed over to the communities only when the water was certified safe.

Results

Communities narrate how the infrastructure was useful during the floods of 2008 and 2009

The communities protect the resources subsequently, and maintain them for use during floods

Two noteworthy results have been documented. Firstly, communities narrate how the infrastructure was useful during the floods of 2008 and 2009. The locations of the toilets and hand pumps were such that people benefited from their use when the flood water entered the villages. It has also been observed that communities protect the resources subsequently, and maintain them for use during floods. The size of the villages varies; on average each village has 400 people, staying in 5–6 hamlets. An estimated 20,000 people benefited from the project. Flood waters completely recede over a period of 10 days to 2 weeks from entire villages; however, most people are able to return to their houses after 7 days. Thus, communities use the infrastructure developed for a maximum of four days at a stretch.

Secondly, the Department of Disaster Management, Government of Bihar has accepted that the model is a scalable and replicable one. The model is now part of the policy document to prepare communities for floods. The media awareness campaign designed by WaterAid has also been appreciated and scaled up by the Government of Bihar.

Discussion and conclusion

The model designed is a simple one, based on existing knowledge and practices. Project communities were generally used to open defecation, and were first educated on the use of toilets. Knowledge of the importance of sanitary behaviour during floods was also imparted. The design of the toilets is similar to the one promoted by the Government of India as part of its Total Sanitation Campaign. This makes the entire model a replicable one by other areas prone to floods.

Ecosan toilets were considered, but these would have required considerable behaviour change, and hence were not adopted. Also, the cost was considered prohibitive, and hence not scalable.

The need to construct toilets above the homestead level, and installed by trained masons, has been recognized in Bangladesh, too (BRAC, 2008); and elsewhere (Alam, 2008).

The model can be applied not only to Bihar, but also to other low-lying, flood-affected areas of India

People need to adapt to situations, as research is carried out to attempt to mitigate the effects of climate change

Rainwater harvesting and use was considered as a suitable alternative source of safe water. However, in the project communities, rainwater is not used for drinking, and people were resistant to its use. Hence, groundwater was tapped through hand pumps, and made safe through the addition of chlorine tablets.

The model can be considered as a success not only in Bihar, but also in other low-lying, flood-affected areas of India. WaterAid India is now planning to introduce the model to the States of Uttar Pradesh and Orissa.

Climate change is an inexact science, but it is acknowledged that disasters such as floods are on the rise. People need to adapt to situations, as research is carried out to attempt to mitigate the effects of climate change. Preparedness for floods is critical in several low-lying areas of India, especially preparedness to meet water and sanitation needs. This project has been a landmark in the efforts to help rural communities adapt to floods.

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