

Disasters and Rural Drinking Water: Some Reflections

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(Working Draft)

Draft Prepared for the Sustainable Drinking Water Services at Scale: Everyone Forever Round Table
India Habitat Centre, New Delhi
13 March 2013

Center of Excellence for Change (CEC)

All India Disaster Mitigation Institute (AIDMI)

International Water and Sanitation Centre (IRC)

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Abbreviations and Acronyms

AIDMI	All India Disaster Mitigation Institute
DDMA	District Disaster Management Authorities
GDP	Gross Domestic Product
GHG	Greenhouse gases
GLAAS	Global Analysis and Assessment of Sanitation and Drinking Water
GoI	Government of India
GP	Gram Panchayats
IDFC	Infrastructure Development Finance Company
IWMI	International Water Management Institute
MDG	Millennium Development Goal
NDRF	National Disaster Response Fund
NRDWP	National Rural Drinking Water Programme
NWP	National Water Policy
O&M	Operation and Maintenance
SDMA	State Disaster Management Authorities
SDRF	State Disaster Response Fund
UNDP	United Nations Development Programme
UNICEF	United Nations Children's fund
WASH	Water, Sanitation and Hygiene
WB	World Bank
WHO	World Health Organisation
WSP	Water and Sanitation Programme

Executive Summary

According to the most recent census data of 2011, only 35% of households have access to a drinking water source within their premises and of the remaining 65%, 42.9% and 22.1% remain dependent on drinking water sources located near the premises and away. On a national basis, the total demand for water resources is expected to exceed the utilisable potential by 2050. In India, 85% of the supply of drinking water is based on ground water sources.

Disasters aggravate existing problems related to drinking water supplies, including slippage in WASH services which thus pose concomitant health risks. Both surface and ground water sources are affected by the impacts of climate change, being extreme flooding and storms, heat waves resulting in droughts, cyclones and earthquakes. The impacts of these calamities render the drinking water resources of the country increasingly vulnerable, particularly where problems already exist.

This paper discusses the fact that India is faced with a three-dimensional challenge of:

i. Rapidly-increasing coverage of WASH facilities, especially in rural areas where the coverage is already low;
ii. Ensuring sustainability of WASH services by minimising slippage; and
iii. Protecting WASH facilities and infrastructure against disaster risks.

While the first two dimensions of the challenge are relatively well understood, the third, being protecting massive investments in WASH, especially rural drinking water from disaster risks, is not given enough thought. Disasters are different to many of the other causes of slippage and thus context-specific measures need to be inbuilt into the planning processes and the provision of WASH services so that it can be maintained and restored quickly after a calamity. This would require institutionalising disaster risk reduction in WASH services and institutions, including policies and plans.

The paper argues that disaster risks are an integral part of rural drinking water supply system development and demand discussion on the topic among national and state disaster management authorities, humanitarian aid agencies, Ministry of Rural Development and rural water supply authorities, including UN agencies. As a way forward, the paper recommends; a) a national round table discussion on protecting rural drinking water from disaster risk with water and natural disaster mitigation experts, including the Government of India; b) study on emergency distribution of alternative water supplies to guide state disaster management authorities and civil society organisations; and c) a nation-wide study on the impact of recent disasters on rural drinking water supply.

Introduction

Although India is off-track to meet the Millennium Development Goal (MDG) target for sanitation (UNDP, n.d.), it has achieved the MDG target of halving the proportion of people without sustainable access to safe drinking water in 2007-2008 (GoI, 2011a, p. 23), well in advance of the 2015 MDG deadline and ahead of the world; which achieved the target at the end of 2010, (UNICEF/WHO, 2012). This suggests a strong possibility of 100% coverage by 2015 considering the proportion of households with access to improved water sources in 2008-2009, which is 93.9% and 90.4% in urban and rural areas respectively (GoI, 2011b, p. 55). However, many feel that these figures do not really present the correct reality of the rural drinking water situation in India. Even the 2011 Census, discussed in this paper, has different figures which are much lower. Thus, there is a need for the IRC and others to debunk the data which portrays a rosy picture about WASH progress in India.

Despite the Eleventh Five Year Plan 2007-2012's focus on ensuring that water availability is sustainable (Ministry of Water Resources, Government of India, 2006), poor water quality and financing of operation and maintenance (O & M) costs, as well as limited national budget allocations to natural calamities (5%) (GoI, n.d.), have left questions concerning slippage in water, sanitation and hygiene (WASH) services during normal and disaster situations, and protecting rural drinking water sources from disaster risks, unanswered. In fact, in October 2011, as a partial modification to the National Rural Drinking Water Programme (NRDWP), the Union Cabinet approved a reduction in the funding allocation for national calamities from 5% to 2 % (GoI, 2011c). Not much system-wide thought has been given to the fact that unprotected drinking water systems can, as a result of disaster risks, reduce sustainability.

It should be recognised that apart from aggravating the consequences of disasters, existing problems related to slippage in WASH services can also pose additional health risks. Systemic failures in the water supply following a disaster often expose rural communities to additional health risks and force thousands of households to migrate every year. Disasters are different to many of the other causes of slippage and thus context-specific measures need to be built into the planning and provision of WASH services so that they can be maintained and restored quickly. This would require institutionalising disaster risk reduction in WASH services, institutions, policies and plans.

90% of rural households will have tapped water systems by 2022 – Jairam

On May 28, 2012, the Government said that by 2022 90% of all rural households in the country will be covered by tapped water systems, as the focus was shifting from a hand-pump approach to surface water supply systems. Briefing the media after a two-day conference of State Ministers in charge of rural drinking water supply and sanitation, Rural Development Minister Shri Jairam Ramesh said that at present only 35% of households in rural India have piped water systems. He stated that in line with the 12th Five Year Plan, every person in rural India will get 55 litres of water per day as compared to the current entitlement of 40 litres, while persons in urban areas will each receive 135 litres per day. The Minister described this as biased.

Source: Punjab Newsline Network, 2012.

The achievements made in water supply coverage neither equate to comprehensive WASH services, nor does they mean that enough water is available at all times. Slippage of water, sanitation and hygiene (WASH) services is now recognised as one of the main challenges facing the WASH Sector (IRC, 2009). The recent 2012 UN-Water's Global Analysis and Assessment of Sanitation and Drinking Water (GLAAS) report warned of a 'significant risk of slipping' in global gains for drinking water and sanitation (WHO/UN-Water, 2012a). It stated that despite achieving the global goal for providing access to safe drinking water systems five years ahead of schedule, many nations were not planning the financial or human resources investments that are necessary to maintain current levels of service (WHO/UN-Water, 2012b). In South Asia and in other parts of the world, highly disaster-prone countries such as India are faced with the additional challenges of maintaining and restoring WASH services in times of disasters. The progress made thus far is both remarkable and impressive but was only achieved by a huge economic investment, involving the Government of India and State governments spending more than US$2 billion per annum to provide adequate and potable water to more than 91% rural people in 1.5 million habitations, and to improve rural sanitation services and infrastructure (WHO/UNICEF, 2012). The Water and Sanitation Programme (WSP) estimates the total amount invested since the 1950s to be more than US$40 billion (WSP, n.d.), but the goal of providing safe and adequate domestic water to every rural person in the country still remains to be fully achieved.

According to the most recent 2011 Census data, out of a total 246,692,667 households in India, only 46.9% have latrine facilities available on its premises and of the remaining 53.1% households, only 3.2% use public toilets and the rest, being 49.8%, defecate in the open. Similarly, only 46.6% have a drinking water source on their premises and of the remaining 53.4%, 35.8% and 17.6% of households depend on drinking water sources located either near their premises or far away. The situation in rural areas is even more difficult. According to the 2011 Census, only 35% of households have a drinking water source within their premises and of the remaining 65%, 42.9% and 22.1% of households again remain dependent on drinking water sources located near the premises and far away.

Thus, India is faced with a three-dimensional challenge of:

i. Rapidly increasing coverage of WASH facilities, especially in rural areas where the coverage is already low;
ii. Ensuring sustainability of WASH services by minimising slippage and;
iii. Protecting WASH facilities and infrastructure against disaster risks.

While the first two dimensions of the challenge are relatively well understood, the third dimension of the challenge, being protecting massive investments in WASH, especially the rural drinking water from disaster risks is not being given enough thought. In addition, the average annual per capita availability of water in the country, taking into consideration the population of the country as per the 2001 Census, was 1,816 cubic meters which was reduced to 1,545 cubic meters as per the 2011 Census (India Sanitation Portal, 2012).

Does this investment translate into reliable and sustainable WASH services in a country that is one of the ten worst-affected disaster-prone countries of the world? (GoI, 2011d). In order to improve and sustain the delivery of WASH services, a combination of preparedness measures, administrative reforms and adequate investments is needed at various levels. The main challenge is to move from a build-and-rebuild approach to a build-and-expand approach where the Gram Panchayats (GPs) maintain their facilities and States invest in expanding systems to meet the needs of the growing population and increasing demand for better and sustainable services (WB, 2011). The notion of building back following a disaster includes both system safety and service sustainability. However, there is hardly any data or discussion on protecting rural drinking water from disaster risk amongst the water sector and natural disaster mitigation experts.

The *2009 Global Risk Assessment* report ranks India second in the world for human exposure to droughts, floods, and cyclones; fourth for cyclones and tsunamis; and eighth for earthquakes (PreventionWeb, n.d.). It also ranks India fourth in the world for economic exposure to floods, ninth for cyclones and landslides, 16th for tsunamis, and 25th for earthquakes. Similarly, the (EM-DAT) OFDA/CRED International Disaster Database states that droughts and floods would affect most people in India, and that flood and earthquakes cause maximum economic damage[1]. One can therefore assume that rural drinking water supply systems in India would be exposed to multiple and high levels of disaster risks, as well as the risk of severe economic damage costs.

Floods, droughts, and other disasters cause water-borne diseases and the loss of adequate sanitation facilities. The lack of access to clean drinking water and hygienic sanitation during a disaster can adversely impact the affected communities, in particular women and children. They are the ones who bear the brunt of disasters – according to UNICEF, between 2000 and 2009, out of the yearly average of 65 million people who are affected by disasters; 3.25 million were pregnant and lactating mothers. Out of the 8.45 million children under five years of age who are affected by disasters each year, 1.25 million children were malnourished (UNICEF, n.d.). No data on the impact of the loss or interruption of drinking water supplies on children is available, nor are there studies on this subject by major UN bodies, India, and other countries. Indeed, the Government of India (GoI) has not analysed this issue from a child welfare point of view. Even the states known for their good performance in disaster recovery and preparedness, such as Gujarat and Tamil Nadu, have not come up with impact studies and have not comprehensively studied the link between WASH and health – a link which is well-known and accepted in the WASH sector.

The health impacts of unsafe water cannot be underestimated. The World Bank estimates that 21% of communicable diseases in India are related to unsafe water, and elsewhere it has been found that diarrhoea alone causes more than 1,600 deaths daily (Water.org, n.d.). Around 37.7 million Indians are affected by water-borne diseases annually, 1.5 million children are estimated to die of diarrhoea, and 73 million working days are lost due to water-borne diseases each year. The resulting economic burden is estimated at US$600 million a year (Khurana and Sen, n.d.).

[1] The database can be accessed from the main EM-DAT website: <http://www.emdat.be/>

Despite these human and economic costs, the interplay of disasters, diarrhoea, and drinking water in India remains an under-researched area not just at the national and state levels but across the global drinking water sector.

Harnessing the rain is difficult, and the current per capita water storage capacity in India is much below that of China and the US (India Reports, n.d.). In India, 85% of the total drinking water supply comes from groundwater sources (GoI, 2011e). Both surface and groundwater sources can be affected by floods, droughts, cyclones and earthquakes. Floods fill wells with polluted water and wash dirt into tanks. Cyclones deposit unclean coastal water or rainwater into wells, adding to the in-flow of contaminated organic and chemical material. These pose additional challenges to the ones already facing drinking water supplies, such as over-extraction, more demand and competition for water resources, deteriorating water quality (arsenic, fluoride and bacterial contamination), poor O & M of water supply systems, and the impacts of climate change (GoI, 2011f). India's hydrology is extremely difficult, but sadly, hardly any research exists to give a clearer picture of how these challenges will affect India's drinking water in villages.

Climate change and increases in water demand need special consideration. Although the predictions are that there will be small changes to India's rainfall levels, it is expected that climatic changes will affect the water balance in various parts of India, bringing more intense localised rainfall to some areas. They will also lead to more floods, droughts, storms, extreme heat waves and cold waves, thus increasing the vulnerability of both irrigation and drinking water resources in the country. A report published by the *India Water Portal* argues that the projection of water demand made by the Ministry of Water Resources suggests that by 2050, India will be able to meet her water requirements by deploying integrated water management plans (GoI, 2011g, p. 22). However, this may be an unrealistic picture as the study had some major methodological issues with its calculations and did not consider the impact of a large number of on-going and future water resources development projects. The report also did not consider the possible impact of climate change and disasters on water resources.

Although India's contribution to historical emissions of greenhouse (GHG) gasses of anthropogenic nature is hardly 4% and its per capita emissions are still amongst the lowest in the world, it is spending around 2.5% of its Gross Domestic Product (GDP) on development-related programmes that help adaptation to climate change (GoI, 2011h, p. 5). While it is expected that the cost of adaptation in India is likely to rise in the coming years, concrete measures are needed to ensure that money spent on adaptation also increases rural communities' access to better quality sources of drinking water. A nation-wide, long-term, rural drinking water adaptation plan needs to be initiated in India.

In light of their repeated exposure to natural disasters, it is relevant and timely to reflect on the sustainability and reliability of India's drinking water sources, especially those in hard-to-reach rural areas. There many households are dependent on only one source of drinking water which is extremely likely to run dry during droughts and become contaminated from floods. Although the majority of the population still relies on multiple drinking water sources, the range is becoming narrower and choices more limited due to increases in population numbers and water-use activities. The choice becomes even narrower when disasters strike.

Recently, the Ministry of Drinking Water Supply and Sanitation prepared its long-term Strategic Plan – 2011- 2022 for ensuring drinking water security to all rural households. The Strategic Plan aims to cover 90% of households with piped water and at least 80% of households with tap connections during this period (GoI, 2011i). Interestingly, it emphasises using a decentralised approach to supplying water, as set out under the guidelines for the NRDWP (GoI, 2011j, Chapter 9). This link is crucial for both drinking water security and disaster risk security, but by and large it has remained unexplored for policy and practical purposes in India's disaster management sector and various levels of government.

The Strategic Plan estimates that the total per capita funding required to cover 90% of the rural population with piped water supply schemes at 70lpcd is Rs 3,40,928 lakh crore. Assuming the NRDWP sharing pattern, the Central Share would be Rs 2,01,898 lakh crore, the State share Rs 1,18,575 lakh crore, and community contributions would form the balance of Rs 20,456 lakh crore (GoI, 2011k, p. 56). The Strategic Plan also suggests that following the NRDWP's guidelines, State Disaster Management Authorities (SDMAs) and District Disaster Management Authorities (DDMAs) should be included in the states' institutional structures for disaster management. The National Disaster Response Fund (NDRF) and State Disaster Response Fund (SDRF) were identified as potential sources of funding in times of calamities (GoI, 2011l, p. 55). However, the specific roles, schedules, timelines and results of these disaster management authorities and the expected financial contributions from the NDRF and SDRF remain unclear and will require further explanation. Since water supply and sanitation is a state responsibility under the Indian Constitution (GoI, n.d.), it becomes even more important to discuss and debate the possible role of these state and district-level disaster management authorities in promoting both disaster risk reduction and designing crisis response mechanisms to ensure safe drinking water supply during emergencies in rural India.

Such discussions should be a part of or an extension of water security planning in India. One way to go about defining and developing the role of disaster management authorities is to carry out initial scoping studies which can then be used to devise actions for the disaster management and drinking water sector. Doing so can also help with developing projects and formulating policies. It is essential that new creative ways of taking evidence-based approaches towards building resilience and responding to drinking water sustainability issues, during and after a disaster, are found.

The All India Disaster Mitigation Institute's (AIDMI) work in the states of Bihar, Odisha, and Jammu and Kashmir to formulate a people-centred process for making District Disaster Management Plans (DDMPs), indicates that decision-makers in the drinking water and disaster management sectors do not have procedures to respond to shocks in their water supply systems. They do not have occasional access to good and usable information about risks to water supplies, and they lack the capacity to design and deliver resilient rural drinking water systems which can withstand the impacts of disasters. This is also demonstrated by AIDMI's on-going training needs assessment in 27 districts of Assam, where it has been found that drinking water and disaster-related institutions have no methods, mechanisms, or processes to internalise the link between drinking water and natural disasters. From AIDMI's recovery work in

Sikkim, undertaken after it was struck by an earthquake in 2011, it was clearly shown that with the exception of dam construction, project planning work tends to overlook and neglect risks to water resources and water supply systems in their hazard, risk and vulnerability assessments. Altogether, these findings show that the link between rural drinking water and disasters needs better explanation and understanding. Practitioners and policy-makers need to comprehend the terms, concepts, terminologies and cycles relating to disaster risks and hydrology. Operational guidelines, budgets, systems, and indicators for measuring the extent to which water risk management practices have been institutionalised, should be developed on the policy level.

As the national demand for water resources is expected to exceed the utilisable potential by 2050 (IDFC, 2011, pp. 7-8), combining natural resource management concepts and principles with those from disaster management (for example disaster preparedness and long-term risk mitigation), can help with conserving and maintaining the quality of finite drinking water resources so that the country is better prepared to face a difficult future. This is especially important for addressing scarcities in rural drinking water supplies and requires moving from a supply augmentation management approach to one which focuses on developing, improving, and promoting safe water resource management practices. Indeed, many have argued that holding groundwater in reserves is becoming socially, politically, and technically more difficult. The utility of dams for water storage is also questionable, for more than 80% of India's approximately 4,700 dams are over 20 years old and suffer from structural and mechanical deficiencies which sometimes result in their complete failure or collapse (Business Standard, 2011). Examples of such incidents are the Machhu dam in Gujarat (1979), the Jamunia dam in Madhya Pradesh (2002), the Lawa-ka-bas dam in Rajasthan (2003), the Kosi embankment near the Indo-Nepal border (2008), and most recently, the embankment breaches in Odisha (2011). The Dam Safety Bill of 2010 was introduced in the Lok Sabha on August 30, 2010 to provide for the surveillance, inspection and operation of all dams to ensure their safe functioning, but its effectiveness remains to be seen (GoI, 2011m). Finally, the traditional approach of 'build-neglect-rebuild' is unsustainable, inefficient, and largely responsible for the poor performance of an estimated US$ 500 billion worth of assets in water resources and irrigation infrastructure (GoI, 2011m, p. 1).

Overall, despite the availability of information on how to mitigate health hazards in WASH interventions at the household and community levels, there is a need to address the near-complete lack of research on reducing disaster risks to drinking water supply systems. This absence may be due to rural water supply systems being primarily managed by government authorities, thus putting them out of the purview of humanitarian actors' damage assessments. Equally lacking are reports of field-level experiences on providing adequate and good quality supplies of rural drinking water before, during, and after disasters. Finally, DDMPs (previously known as Contingency Plans) need to become the basis of operation and planning, and drinking water-related decisions have to be premised less on ad-hoc departmental assessments and estimates.

AIDMI's Experience

Against this discussion, the following section covers the All India Disaster Mitigation Institute's (AIDMI) work over the past ten years in 45 districts across India. They are located in ten states, extend over all of the nation's geo-ago-climatic zones, and have all been previously affected by natural disasters.

Insights

i. Disaster risks are an integral part of rural water development and disaster risk reduction is a challenge for everyone involved in supplying rural drinking water. AIDMI's review of the Cyclone Aila recovery in the coastal North 24 Paraguna and South 24 Paraguna districts of West Bengal, India, clearly showed that despite several remarkable efforts to integrate rural drinking water development and disaster risk reduction practices together, for the most part the districts conceived and implemented them separately from one another. A larger opportunity to provide safe, sustainable, and disaster risk resilient drinking water supplies during recovery efforts was therefore lost.

ii. A consolidated risk management approach is missing in almost all rural drinking water supply projects and systems. Rural water supply schemes assume that the system will perform well and will not be affected by shocks such as droughts and floods. Thus they make hardly any provision for money, people or technology to absorb or manage these shocks. In addition, AIDMI's work in Gujarat's districts of Jamnagar, Anand, Bhavnagar, Patan, and Surednd ranagar found that the impacts of floods and droughts on their water supply schemes were addressed on an ad-hoc basis, and that while a lot of effort and cost was involved there was no systematic, long-term, evolving disaster risk reduction planning for the rural drinking water sector. The preparedness and resilience levels of individual villages with non-piped sources of water in these districts were even less certain.

iii. Most rural drinking water systems are project-based. They struggle to gain financial and ecological sustainability. More importantly, they do not address disaster risks, response preparedness, and how the system will be sustained beyond the immediate impacts of a disaster. After the 2010 cloudburst in Leh and the 2004 tsunami in Cuddalore for example, mitigation mechanisms for disaster risks were not incorporated into the formal and informal drinking water systems. Partnerships and stakeholder involvement were issues, as was the selection of technology to reduce the risks of future impacts and damage. Limited indigenous knowledge and coping strategies were studied and incorporated into the new system during the recovery stage. Even less use was made of opportunities in educating, informing and communicating disaster risks to drinking water users in rural areas. Disasters paralyse the system, and therefore response preparedness is needed so that valuable time is not lost in reinventing the wheel and exploring suitable options in the midst of the crisis.

iv. There is no data available, isolated or comparable, on disasters and drinking water supplies in rural areas which can shed light on how they relate with one another. This gap is especially striking when new policies, regulations and accountability mechanisms are being designed at the national level for disaster risk reduction and providing drinking water in rural areas. The design of economic and financial mechanisms for risk reduction in the drinking water sector cannot be developed without such data and corresponding analysis. None of the ten states where AIDMI has worked have a well-developed case study or a third-party impact study on disasters and drinking water.

v. The information and data available on the human and economic impacts and costs of disasters on drinking water users and suppliers are inadequate. Although some data on damaged drinking water structures following a disaster can be found in damage assessment reports, the information is event-specific and does not fully reflect the human and economic impacts of the damage inflicted. Full comprehensive data is however vital to estimating the costs inflicted upon human life, health, food, livelihoods and education due to the lack of drinking water. It is also essential for developing drinking water assets – private, public, individual and institutional – and financial mechanisms such as insurance, recovery loans and credit stabilisation mechanisms at the national and local level.

vi. It is not only the big headline-grabbing disasters that have an impact on rural drinking water systems. Small, localised disasters can cumulatively have equal if not greater impacts on rural systems, and these impacts can often be aggravated by poor infrastructure and a lack of service providers in the surrounding area. This is especially the case with semi-arid areas which can have very localised, severe water scarcity problems. AIDMI has witnessed examples of such situations. For instance; four years after the 2004 tsunami, the coastal rural areas in the Cuddalore and Nagapattinam districts of Tamil Nadu faced two small floods and one small cyclone. In the Jagatsingpur district of Odisha, recurring heat waves and flooding from heavy rains caused repeated drought, disrupting formal and informal drinking water supplies in the villages. These small local disasters and their impacts have not been studied or documented. However, there is a growing urgency to do so as population growth in India's cities and villages, industrial expansion, and deteriorating quality in groundwater drinking sources and irrigation land, have increased the burdens of sharing water resources.

Governance Frameworks

Governance frameworks and laws for the management of water resources and water supply are not unified across India. If a national law was considered necessary on subjects such as the environment, forests, wildlife, and biological diversity, a national water law is required even more (IWMI, 2007). The explanatory note for the draft *National Water Framework Act* which was prepared by the Sub-Group on a National Water Framework Law, states that the legislation was conceptualised because of the perception that there will be a water crisis in the future, inter-use and inter-State conflicts over water, the threats of water pollution and contamination,

the equity implications of water control, use and distribution mechanisms, and emerging concerns over the impacts and implications of climate change. It assigns several responsibilities for the Government of India but is not intended to intended to centralise water management or to change Centre-State relations in any way. While the draft legislation should be regarded as a positive step, it needs to be recognised that India's predominantly informal water economy, and the low reliance on public institutions for water supplies especially in the urban areas, could limit its effectiveness (GoL, 2011n, p. 1)[2]. Limitations in the nation's existing laws could operate as further impediments to their implementation.

Several states in India have already, or have started to, enact their own laws on water and water-related issues. This creates the potential for significant divergences in water policies and laws. Although these differences may be inevitable, they have to be within the limits established by a broad, national framework which contains basic mutually-agreed upon principles. A *framework law* i.e. an umbrella statement of general principles governing the exercise of legislative and/or executive (or devolved) powers by the Centre, State, and local governance institutions, is therefore required (Manyak Aggarwal, 2012). It has also been argued that existing laws must be amended to achieve proper harmonisation, but some contend that doing so and enacting new legislation may lead to consistency problems. A further approach suggested is that common law concepts of water rights should be discarded – the revised draft National Water Policy (NWP) 2012 discusses treating water as an economic good so as to promote its conservation and efficient use, also proposing that the government's traditional 'service provider' role should end and that the supply of water should be privatised under a public-private-partnership (Manyak Aggarwal, 2012). Regardless of the approach adopted, the questions which have to be raised for everyone, including disaster management experts and agencies, are:

i. To what extent will the approach adopted and legislative steps taken provide a mechanism for addressing rural drinking water supply issues, especially during crisis situations?
ii. Would doing so help the government with protecting the water rights of India's rural and vulnerable communities, not just during 'normal' development situations but also during crisis and disasters?

Conclusion

There is, at present, a widely-held view that disasters such as floods and droughts are temporary interruptions to a linear drinking water development process, and that the task of humanitarian aid is to patch-up, fix, and revive drinking water assets and systems so that an overall improvement in living standards can be achieved. Conventional aid approaches have involved providing emergency water relief, rehabilitating water systems, and renewing drinking water

[2] A nationwide survey covering 78,990 households in 5,110 villages showed that less than 10% of the surveyed households used water from sources owned and managed by the Government. They rely mainly on self-provision, informal exchanges and local community institutions that are not under the direct influence of formal public institutions.

development work, but measures for protecting drinking water supplies from disasters, reducing the risks they face, and mitigating disaster impacts, by-and-large remain rare. Thus much wider discussion and debate on this topic, more reviews of experiences in the overlap between disasters and rural drinking water, are needed. By doing so, more ideas and concrete actions to achieve drinking water security in rural India, especially during emergency situations, will emerge. Doing so may also offer ample scope for turning natural disaster situations from catastrophic calamities into an ideal opportunity for providing sustainable drinking water in rural areas for all persons, for all eternity.

To begin this process the author recommends that the following steps be taken:

i. **International Water and Sanitation Centre**: Organise a national roundtable discussion with water and natural disaster risk mitigation experts, and the Government of India, on protecting rural drinking water from disaster risks.
ii. **National Disaster Management Authority/National Institute of Disaster Management:** Carry out a nation-wide study on the emergency distribution of alternative water supplies to guide SDMAs and civil society organisations.
iii. **Ministry of Rural Development:** Commission a nation-wide study on the impact of recent disasters on rural drinking water supplies.

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