# Assess to manage the risk- in the tributaries of Himalayan Mountains

K N Vajpai* and Bhawna Vajpai**

*Manager Water resources, Prakriti- a mountain environment group, 6/1 GMS Road, Dehradun, Uttaranchal India PIN 462 016, knvajpai@hotmail.com
** Public Health and SSHE Specialist, UNICEF, E-7/650 Arera Colony, Bhopal India PIN 462 016, ishubhawna@hotmail.com

**Abstract:**

The paper determines safe water in mountain region cannot only rely on a few factors alone and that greater attention should be paid to assuring microbial and chemical safety through an analysis of risk from principle pathways/hazards to risk assessment and risk management to achieve the objectives MDG. It sets out for further discussion upon the main concepts underlying to water related risks through simplified risk assessment approaches and the possible management through coordinated and efforts throughout water resource and river management programmes.

**Key words:**
Mountain, water, safety, surveillance, river.

## 1. INTRODUCTION:

Professionals around the world are concern about the achievement toward millennium development goals by country governments. Every one is trying to put concrete examples that, how problems of poverty, hunger, disease, illiteracy, environmental degradation and gender inequality can in large measure be solved with water and sanitation as the key entry points. Some 2 million tons of waste per day are disposed of within receiving waters, including industrial wastes and chemicals, human waste and agricultural wastes-fertilizers, pesticides and pesticide residues.

Although reliable data on the extent and severity of pollution is incomplete, one estimate of global wastewater production is about 1,500 km³. Assuming that 1 litre of wastewater pollutes 8 litres of freshwater, the present burden of pollution may be up to 12,000 km³ worldwide. As ever, the poor are the worst affected, almost 50 percent of the population of developing countries exposed to polluted water sources (WWDR 2003). In every 8 seconds a child dies from drinking contaminated water (10,000 in a day). And 500 million people are at risk from trachoma, 146 million are threatened by blindness and 6 million people are visually impaired from this disease (UNESCO 2005).

India is known for its 1 billion plus and-still-growing population, about 70 percent of which lives in villages. India's population has been growing at around 2% per annum from the latter part of the 20th century, although the rate has decreased in the last decade. Most of its rivers are polluted due to indiscriminate outfall of liquid and solid waste into them, whereas the ground water in vast areas is suffering from high level of natural contaminants, like arsenic, fluoride, salinity, iron, nitrate, etc. Access to safe drinking water and proper sanitation facilities remains a challenge in India.

This paper sets out for further discussion upon the main concepts underlying to water related hazards through simplified risk assessment approaches and the possible management through initial

interactive information, education and communication-IEC phase to capacity building phase of different stakeholder groups throughout water resource and river management programmes in the north western mountains of India.

## 2. BACKGROUND:

The awareness about the importance of mountain ecosystems and communities has increased since the adoption of chapter 13 of Agenda 21, entitled -Managing fragile ecosystems: sustainable mountain development, at the UN Conference on environment and development in 1992. There is now increasing recognition that mountains are fragile ecosystems, which are globally important as the source of most of the Earth's freshwater, repositories of rich biological diversity, popular destinations for recreation and tourism and areas of important cultural diversity, knowledge and heritage.

The area lies at the latitude of 28°43' N to 31°27' N, and longitude 77°34' E to 81°02' E, with average annual rain fall 1240 millimeter and temperature ranging between -3.2° to 40.1°C (GoUA-2005). The state has 16828 numbers of villages (GoI∗ 2001) with total population 8.48 million, of which 75% live in rural.

The sacred river Ganga originates from this mountain state and extends over 53483 Sq Km. Originating in the Himalayas, it course eastward towards Bangladesh. As it flows, invigorates the entire Indo-Gangetic plain, providing water to eight Indian states and bridging life to the land around it. About 90% of agriculture land is rain fed, but in comparison to low-lying plain area the agriculture has less than 50% productivity, where as it comprises 30% of total state GDP. Although the region is the major water tower to India but the inhabitants of the state are facing water scarcity.

One of the estimates put the effluents flowing into Ganga at approximately 1.7 billion litres each day out of which 1.4 billion litres is untreated. Its basin is home to over 300 million people, out of which 20 million live in densely populated cities directly along it banks. It is considered to have an intrinsic purity and the capacity to absorb pollution and carry it away (Babb, 1975 quoted by Murray, 1994). Studies conducted during early 90s on water samples taken from the right bank of the Ganga at Patna (Bihar, India) confirmed that Escheria coli (E.Coli.), Fecal streptococci and Vibrio cholerae organisms die two to three times faster in the water of Ganga than the water taken from other rivers in India. In another study where the fecal coli contamination at Gangotri (Uttaranchal) was nil, but, it was 80,000 per ml at Varansi (Uttar Pradesh). Domestic and industrial pollution, combined with deforestation, use of pesticides and fertilizers and a number of factors have proved that now the situation is alarming.

## 3. THE RISK ASSOCIATION:

As per the World Health Report-2000, about 15 lakhs children under 5 years die in India due to water related disease, and diarrhoeal diseases amongst the top three killers. India accounts for one of the largest children diarrhoeal deaths in the world, which is about 6,00,000 annually i.e. at every 30 seconds, one child dies of diarrhoea. The UNCED had indicated that 70 percent of the water is polluted and 80 percent of the diseases are water related and responsible for one-third of the total deaths.

In south Asian region more than 75 percent of the people living in rural areas have no access to good potable water systems. Until, recently, people depended more on surface water which was exposed to microbial contamination resulting in water related disease like gastroenteritis, typhoid, dysentery, cholera, infectious hepatitis, infant diarrhoeas, and skin diseases and so on.

In this mountain state a number of government (local and national) authorities are responsible for water: development, quality surveillance, monitoring and regulations. These include different government departments e.g. State drinking water supply agencies (Jal Nigam, Jal Sansthan and Swajal), Irrigation Department, Central Pollution Control Board, National River Conservation Directorate (NRCD) and Central & State Ground Water Boards, including other national research institutions and non governmental organizations. But, there is no clear-cut division of responsibilities between them. In addition, since year 1985 the Government of India is supporting Ganga Action Plan-GAP (in 1996 it has been renamed as National River Conservation Directorate-NRCD) water quality surveillance, monitoring and management programme to reduce the pollution load from domestic and industrial fronts including increasing pesticide and fertilizer load from agriculture in river Ganga and develop sewage treatment systems in more than 25 bordering cities to its bank.

The GAP intended to work and facilitate the local authorities, research agencies and NGOs in the restoration and protection of increasing load in river Ganga. But, due to non-coordinated and solitary efforts, the programme has been little success. The influx of untreated fecal matter, township garbage, industrial waste has directly been diverted in to its water. There are a number of examples throughout the stretch of Ganga in the mountains of Uttaranchal that the city garbage, animal waste is directly dumped in its rapid water, inclusive of diverted drains.

## 4. RESULTS AND ANALYSIS:

We withdraw 8 percent of the total annual renewable freshwater and appropriate 26 percent of annual evapo-transpiration and 54 percent of accessible runoff. Humankind's control of runoff is now global and we are significant players in the hydrological cycle. Per capita use is increasing with growing population. Thus the percentage of appropriated water is increasing together with spatial and temporal variations in available water quality and quantity further leads to scarcity.

To address the inadequate level of coverage of safe water in developing countries, the United Nations put forth various initiatives including the millennium development goals-MDGs and the development of a global rapid assessment of drinking water quality methodology (WHO/UNICEF 2000). The principle target of the MDGs is to Ensure environmental sustainability by halving the proportion of people without access to safe water by 2015, where safe water is defined as a water supply that is devoid of disease-producing pathogenic bacteria/viruses and highly toxic substances (WHO/UNICEF 2002;Howard et al 2001)

Experience has shown that microbial hazards continue to be the primary concern in both developing and developed countries. It further recommends the value of a systematic approach towards securing microbial safety and the necessity of recognizing the important roles of many different stakeholders in ensuring drinking-water safety from potential hazards. At the World summit on sustainable development, at Johannesburg, South Africa, in 2002, an alliance of national governments, UN agencies and civil society organizations announced that they would work in partnership to achieve the mountain-specific goals of the Summit. These goals focus on reducing

poverty and protecting the world's fragile mountain ecosystems from the various threats posed to their freshwater systems and biodiversity.

The recent drinking water quality guidelines also underline the preference to check and reduce the entry of pathogens in to water sources from the microbial risks associated with possible contamination from multiple sources (WHO-2004) through community management and scientific approaches. This further explains about safety of drinking-water supplies that is based upon multiple barriers and management approach by reducing reliance only on treatment process and assessing the potential hazards. It advocates the preference to check or reduce the entry of pollution in to water sources from the microbial and chemical risks associated with contamination from different possible hazard zones. For an example it has been established that improved water supply reduces diarrhoea morbidity by between 6 and 25 percent, if severe outcomes are included improved sanitation reduces diarrhoea morbidity by 32 percent (UNESCO 2005).

## 5. DISCUSSION AND FUTURE CHALLANGES:

In India heavy investments have been made in rural water supply since 80s, but the resulting health benefits have been severely limited by the poor progress in sanitation. The planning commission at government of India says as large as 0.2 million habitations, out of a total of 1.423 million habitation in the country, are estimated to have one or the other, or combination of more than one, such contamination, and their number is gradually increasing due to indiscriminate, unscientific an over-exploitation of ground water and surface water sources for different uses. Further to it India's urban population was some 280 million in 2000 but will rise to almost 400 million by 2015. Despite increasing allocation of financial resources, there are serious concerns around the sustainability of investments made in the drinking water sector.

The challenge therefore to drinking water authorities is to manage the risk related to chemical and microbial pollution in the tributaries of Ganga. The recent WSP approach of WHO (2004) also add that by assessing and managing the pollution risk associated with quality assurance. Therefore the understanding of the risk associated with ground water and surface water quality is required in this region. In rural areas of mountains there where protected ground water sources, which are dispersed over large area need rapid methods of assessing ground water vulnerability through localized pathways. This is also required due to limited access to the data about prevailing geo hydrological condition, pollution load and possible sources coming at a point of time. So, we have to develop and use simple other measures of water quality assessment.

It has been reported that more than 122 million households in the country are without toilets (UNICEF-2005). Although access to protected sources of drinking water has improved dramatically over the years. But inadequate maintenance and neglect of the environment around water sources has led to increasing levels of ground and surface water pollution.

In 1998, 2.2 million people died because of diarrhoeal diseases, of which the vast majorities were children. In addition poor sanitation has led to the infestation of nearly a billion people - largely children - with a variety of worm infections, with its corresponding costs in health and energy. About 88 percent of diarrhoeal disease is attributed to unsafe water supply, inadequate sanitation and hygiene and 1.8 million people die every year from diarrhoeal diseases (including cholera); 90 percent are children under 5, mostly in developing countries.

There are the facts that poor countries with access to improved water and sanitation services enjoyed an annual average growth of 3.7% GDP; those without grew at just 0.1% (SIWI 2005). The Global water supply and sanitation assessment report stated that 47% of the population of rural areas in Africa, 62% in Latin America and 75% in Asia do not have access to improved water (WHO 2000). It is not hard to see why providing access to safe drinking water and basic sanitation for the world's most deprived populations is moving up the political agenda. With 2.6 billion people recorded as lacking any improved sanitation facilities in 2002 and 1.1 billion of them without access to an improved drinking water source, the resulting squalor, poverty and disease hold back so many development efforts. Focusing efforts on achievement of the MDG drinking water and sanitation target will speed progress towards all eight goals.

Water is a critical, but often overlooked, element in sustainable development. Every day, diarrhoeal diseases from easily preventable causes claim the lives of approximately 5 000 young children throughout the world. Sufficient and better quality drinking water and basic sanitation can cut this toll dramatically, and simple, low-cost household water treatment has the potential to save further lives. This was further discussed that WHO has estimated the burden of water-related diseases, which reveals 88 percent of diarrhoeal disease in the world was attributable to unsafe water, sanitation and hygiene. About 3.1 percent of deaths (1.7 million) and 3.7 percent of Disability Adjusted Life Years-DALYs (54.2 million) worldwide are attributable to unsafe water, sanitation and hygiene.

The international decade for action 2005-15 directly reinforces and urges countries to meet the MDG 7, Target 10. The sanitation coverage in the developing world (49%) is only half that of the developed world (98%). In order to meet the sanitation MDG target, an additional 370,000 people per day up to 2015 should gain access to improved sanitation.

Recent estimates suggest that climate change will account about 20 percent of increase in global water crisis.

## 6. CONCLUSION:

Increasing concern over the safety of water sources has arisen due to the increasing detection of toxic organic and inorganic chemicals and high level of pathogenic micro-organisms in higher reaches and throughout the catchment of river Ganga basin. Therefore, on safe drinking water availability it becomes very important to conduct the analysis and listing of different kinds of hazards and the causes.

In context to the existing water development, management and conservation framework it becomes very important to the agencies to share clear responsibility among themselves and coordinate at local level for the monitoring, surveillance and management of risk in Ganga basin. The agencies include: State drinking water supply agencies, Irrigation Department, Central Pollution Control Board, National River Conservation Directorate (NRCD) and Central & State Ground Water Boards as well as the research institution and NGOs working in the region. It should also be taken care that that the hazard may occur or introduced throughout the water systems or in the catchment, which then reaches to consumer

Therefore, it is recommended that:

1. The risk management in mountain region requires identification and inventorization of all prevailing and upcoming potential hazards, their sources, possible hazard events and assessment of the risk;
2. Planning better risk assessment and management strategy by participating stakeholders group;
3. Throughout the process of assessment and management involve local group or community as much as possible through information, education and communication-IEC means and build their capacities in managing their water locally;
4. Coordinated efforts by different stakeholders by sharing responsibilities.

*********

**7. REFERENCES:**


1. ADB facilitated Roundtable Discussion on Private Sector Participation in Urban Water Supply in India 15-16 June 2005 at Bangalore, India
http://southasia.oneworld.net/article/view/117722/1/1897, Aug 2005.
2. A formal proposal for a new International Partnership for Sustainable Development in Mountain Regions was finalized during the fourth session of the Preparatory Committee for the World Summit on Sustainable Development (Bali, Indonesia, 27 May-June 2002).
3. Government of Uttaranchal (2005) National Information Centre, http://gov.ua.nic.in/uaglance/
4. Howard G, Ince M, Smith M (2001), Rapid assessment of drinking water quality handbook. Water Engineering and Developing Centre (WEDC) WHO/UNICEF, UK.
5. International year of mountains (2002), UN General Assembly resolution, 55/189 (2000) and 57/245 (2002).
6. Murray M Jr., 1994. Status and sacredness: a general theory of status relations and an analysis of Indian Culture. Oxford University Press.
7. Planning Commission (2003), Government of India report..
8. The Sankat Mochan Foundation, Tulsi Ghat, Varansi India.
9. UNESCO (2005) Water facts, http://www.unesco.org/water/news/newsletter/index.shtml
10. Water for people water for life (2003): World water development report, UN World Water Development Report (WWDR).
11. WHO/UNICEF (2000) Global water supply and sanitation assessment 2000 report, Geneva, Switzerland.
12. World Health Organization (WHO) 2004, Guidelines for drinking water quality, 3rd Edition, Vol 1, Recommendations, Geneva, Switzerland.
13. WHO/UNICEF (2000), Global water supply and sanitation assessment 2000 report, Geneva, Switzerland.
14. WHO/UNICEF (2005) Joint Monitoring Programme for Water Supply and Sanitation-15. Water for life: making it happen.
15. WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. Water for life: making it happen. © World Health Organization and UNICEF, 2005
16. Water for people water for life (2003): World water development report UN World Water Development Report (WWDR)