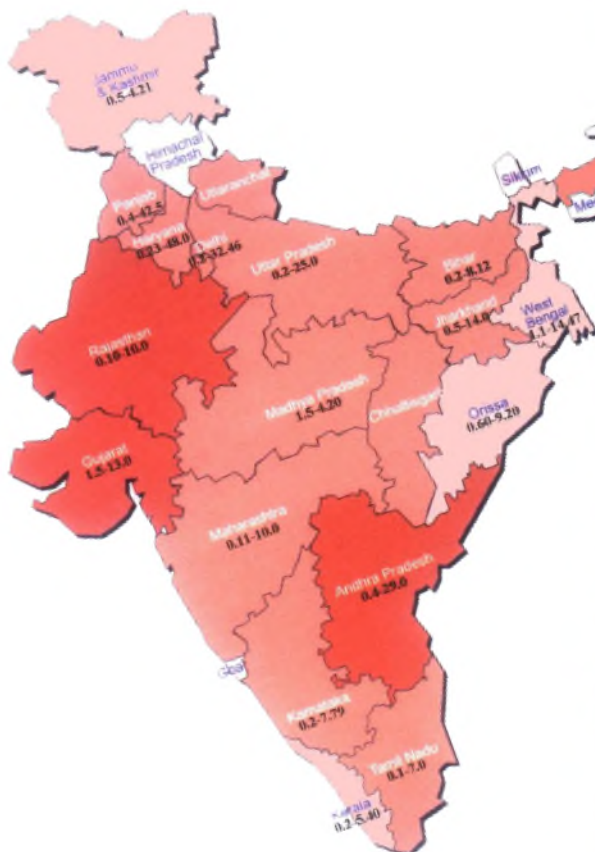
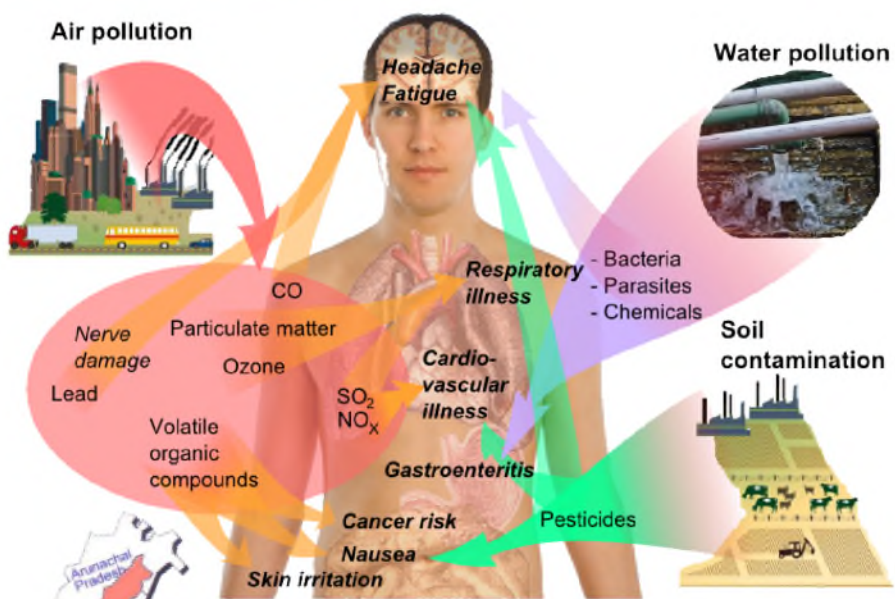




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Contamination of Water Resources and Associated Health Hazards: The Need of a Safe Water Policy and Proper Institutional Response with Special Reference to India

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Abstract

In this research paper the author has discussed the different aspects of water borne diseases, their impact on human health and means for ensuring safe drinking water in the country. Water borne diseases are a big burden on developing countries like India. The availability of safe drinking water would be a grave challenge for the government as the population of our country is rising sharply, and as per some estimates, by 2025 half of the nation's population would be residing in urban areas. The level of different contaminants (including Arsenic, Fluoride, Cadmium, etc) has been rising in different states of our country, and there is an urgent need to take corrective action in this regard. Secondly, the water associated diseases are creating major health hazards for the developing countries as more than 80% of diseases in the developing countries are water associated. Institutional gaps in policy-making and the lack of resources are worsening the situation further. The classic diseases have continued to haunt the developing countries including India, and with them new pathogens of diseases have been developing; these new developing diseases are the most critical challenges as it would take considerable time to develop the medicines and vaccines required for their treatment and

prevention. The author has discussed the primary causes responsible for the emergences of new pathogens, and has divided them into three categories, namely New Environment, Changing Human Behaviour Patterns, and New Technologies. The author has provided a number of suggestions to prevent the emergence of new pathogens and has recommended that elaborate national level surveys must be conducted and comprehensive water standards must be framed for ensuring better health care facilities. The government must also review the National Water Policy, 2002, and pay special attention to the contamination of water and its impact on public health. The author has drawn parallels from the water standards parameters of the USA to frame our own standards. A new water policy must provide for the testing of water resources every two years to check the quality of water and its health impact, and moreover the policy itself should be reviewed every three years. The new policy must take into account the regional characteristics and other specific requirements of different areas. Simultaneously, the government must invest in the research areas related to water contamination and associated diseases. Towards the end of the paper the author recommends a five point strategy to deal with water associated diseases and contamination of water, namely: health based targets, capacity building at institutional and technological levels, maintenance of rural water supply and infrastructure, changing agricultural and industrial practices and adequate legal and policy arrangements.

Introduction

Safe Drinking water is one of the most urgent and sacrosanct commodity consumed by living beings. Although the earth has been bestowed with an enormous quantity of water as more than 70% of it is made up of water, yet, only 2.5% of water is fresh water; and even the percentage of available fresh water for

use is less than one percent¹. The distribution of water on earth is given in the table below:

<u>Source of Water</u>	<u>Percentage of Total Water</u>	<u>Percentage of Fresh Water (2.5% of Total Water)</u>
Ocean, Seas, and Bays	96.5%	0%
Ice caps/Glaciers	1.74%	68.6%
Ground Water	1.7%	30.1%
Lakes	0.013%	0.26%
Other Sources Rivers/Swamps, etc	0.047	1.04%

Clearly, the most important source of usable fresh water for human beings is fresh ground water. However, over a period of time the quality of ground water and other usable water has been deteriorating for a variety of reasons like effluents from manufacturing and other industries seeping into the ground, mismanagement of different types of waste, persistent use of organic chemicals, spray irrigation, urban development, etc. It has been estimated by the World Water Council that there are around 2.4 billion people in the world who lack access to proper sanitation facilities and around 1.1 billion people lack access to safe drinking water². Contaminated water is highly dangerous as it may contain highly injurious elements like Arsenic, Fluoride, Lead, Chromium, Chlorine, etc, apart from pathogens of different diseases.

¹ United States Geological Survey (22 December, 2011), "Where is Earth's Water Located" available at <http://ga.water.usgs.gov/earthwherewater.html>.

² World Water Council (2010), "Water Supply and Sanitation" available at <http://www.worldwatercouncil.org/index.php?id=23>

The UN millennium development goals no. 4 (reducing child mortality), no. 6 (combating HIV/AIDS, Malaria, and Other diseases), and no. 7 (ensuring environmental sustainability) would remain unfulfilled unless the availability of safe drinking water is ensured all over the world. The problem of safe drinking water is both an institutional challenge for policy makers and a health hazard. There is an urgent need to take firm steps to ensure proper management of water resources and to save them from different types of contamination. Till the year 2000 the use of available water resources was around 54% but as per the estimates of United Nations there would be requirement by 2025 to utilize 100% of water resources³. It has been further estimated by United Nations that “water crisis” would take serious form as more than 2.7 billion people would face severe shortage of water⁴. Moreover, as there would be a severe crisis of water in the developing world it is needless to say that agriculture (which is the main source of livelihood in developing countries) would be affected by scarcity of water and the health expenditure would increase considerably.

Contamination of Ground Water in India

The quality of ground water in India is rapidly deteriorating; even today some parts of the country are facing acute shortage of safe drinking water. In the Indian context the water contamination problem is very grave, as majority of the population is poor and lacks sufficient monetary means required for purification of water. Unsustainable industrial policies, seepage of effluents into ground, use of pesticides/chemicals, improper sewage and drainage system, etc have contributed

³ Trudgill, Stephen T., et. al., (1999), *Water Quality Processes and Quality*, Wiley Publication, West Sussex, pg. 13.

⁴ It has been further observed through the research that there would be another 2.5 billion people who would not get sufficient water to meet their requirements; Sub Saharan Africa and Asia would be most severely hit by the scarcity of water. For more info see: BBC (22 March 2002), “UN Warns of Looming Water Crisis” available at <http://news.bbc.co.uk/2/hi/1887451.stm>

to the ever increasing contamination of water. Moreover, the government has been very indifferent towards the industries, which are polluting water resources; no firm steps were taken to create a suitable waste disposal policy, and even the existing regulations have been poorly implemented.

There have been reports about the severe contamination of water by Central Pollution Control Board (CPCB) from as early as 1994 (if not before that); but their reports were not implemented. In 1994 surveys were conducted by the CPCB and it identified 22 places scattered through 16 states, where the ground water was severely contaminated⁵. Since then the quality of water in different urban and rural areas of India has further deteriorated but the authorities' response has not been adequate. The lack of safe water is clear from the fact that around 38 million cases of water associated diseases occur in India every year, and its resultant economic burden is around 600 million dollar⁶.

Water in many parts of our country has been contaminated with different elements which are lethal to human and plant life as like Arsenic, Fluoride, Cadmium, etc. The extent of water contamination has been described very briefly in the following paras:

- In 11 states of India the arsenic⁷ contamination was found beyond the permissible limits of 0.01Mg/liter. In 30 districts of Uttar Pradesh, water was found to be contaminated with large amounts of arsenic⁸.

⁵ Editorial (1999), "What goes down Must Come up", *Down to Earth*, August 15-31, 1999, available at <http://www.downtoearth.org.in/content/what-goes-down-must-come>

⁶ Khurana, Indira and Sen, Romit (2006), *Drinking Water Quality in Rural India: Issues and Approaches*, Background paper, Water Aid Organisation, available at <http://www.waterawards.in/suggested-reading/wateraid-drinking-water-quality.pdf>

⁷ Arsenic in drinking water can cause bladder, lung cancer, kidney cancer, skin cancer, reproductive defects, and may also harm the nervous system.

⁸ UNI (28 November, 2011), "Arsenic Contamination of Well Water in 11 States" available at http://www.waterworld.com/index/display/news_display/1551088175.html

- In 17 states of India the quantity of Fluoride is more than the permissible limit, and around 66 million people are at the risk of different hazards associated with it⁹.
- Iron contamination of water is becoming a big problem in India, as in 26 states its contamination exceeds the permissible limits, and has impacted total 104437 habitations in these states¹⁰.
- Nitrate contamination is increasing in different states including Bihar, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Tamil Nadu and Uttar Pradesh.
- Groundwater near the site of Bhopal Gas Tragedy is highly contaminated by pesticides (40 times more than the permissible limit)¹¹.
- In many parts of India other different types of lethal contaminants have been found namely: Heavy Metals (Cadmium, Zinc, and Mercury) in Gujarat, Andhra Pradesh, Delhi, Haryana, and Kerala; Persistent Organic Pollutants in Delhi, Himachal Pradesh, Jharkhand, and West Bengal; Salinity in 16 states including Andhra Pradesh, Gujarat, Haryana, Madhya Pradesh, Punjab, Tamil Nadu, and Uttar Pradesh¹²; Lead, Nickel, Copper, and Manganese have been found in North-Eastern India¹³.

⁹ Planning Commission of India (2002), *Water Supply and Sanitation: A WHO-UNICEF Sponsored Study*, available at <http://planningcommission.nic.in/reports/genrep/wtrsani.pdf>, pg 08.

¹⁰ Khurana, Indira and Sen, Romit (2006), *Drinking Water Quality in Rural India: Issues and Approaches*, Background paper, Water Aid Organisation, available at <http://www.waterawards.in/suggested-reading/wateraid-drinking-water-quality.pdf>

¹¹ PTI, "CSE Tests Find High Level of Contamination in Bhopal" in The Hindu, 03 December, 2009, available at <http://www.thehindu.com/sci-tech/article59212.ece>

¹² Khurana, Indira and Sen, Romit (2006), *Drinking Water Quality in Rural India: Issues and Approaches*, Background paper, Water Aid Organisation, available at <http://www.waterawards.in/suggested-reading/wateraid-drinking-water-quality.pdf>

¹³ Planning Commission of India (2002), *Water Supply and Sanitation: A WHO-UNICEF Sponsored Study*, available at <http://planningcommission.nic.in/reports/genrep/wtrsani.pdf>, page 33.

Till now, out of the 35 states in India, only seven states have full coverage of rural habitations (Bihar, Chhattisgarh, Madhya Pradesh, Tamil Nadu, Uttar Pradesh, Daman & Diu, Delhi, Lakshadweep, and Chandigarh); moreover out of 393 Class I cities, only 77 cities have 100 percent water supply coverage¹⁴. By 2025 it is estimated that half of the Indian population would live in cities, and as with increasing population and water needs, it would be an extremely difficult task to provide safe water to the population unless appropriate policy is formulated and implemented soon.

The Health Hazards of Contaminated Water

Water contamination has been a cause of great concern to the health and safety of human beings as it leads to morbidity as well as mortality. Contaminated drinking water may lead to different types of deadly diseases as like Diarrhea, Arsenicosis, Cholera, Fluorosis, Guinea Worm Disease, Intestinal Worms, Malaria, Schistosomiasis, Trachoma, Typhoid, etc and different types of other harms as like disorders of nervous system, liver and kidney damage, skin tissues damage, vomiting, etc.

The disease which can be caused by the contaminated water can be divided into four categories, a short description of it is provided by table¹⁵:

<u>Type of Disease</u>	<u>Caused by</u>	<u>Prevention Steps</u>
Waterborne Disease	Drinking of water which has been contaminated by faeces or urine containing pathogens of disease. Ex-Typhoid, Cholera, Amoebic, etc.	Proper sanitation to prevent the contamination of water by faeces/urine.

¹⁴ Ibid, page 31.

¹⁵ Gleick, Peter H. (2002), *Dirty Water: Water Estimated Deaths from Water Related Diseases 2000-2020*, Pacific Institute Research Report, available at http://www.pacinst.org/reports/water_related_deaths/water_related_deaths_report.pdf

		Arrangement of purified water.
Water Washed Diseases	Skin Contact with contaminated water. Ex- Trachoma and Flea, Scabies.	Good Waste Management. Special Safety Measures and Protection to those dealing in such water as special Hand Gloves.
Water Based Diseases	The parasites which are present in organisms that live in water. Ex Guinea Worm Disease, Schistosomiasis, etc.	Safety measures to save skin from the contact of such water.
Water related Diseases	The insects which develop and breed in water (polluted) as mosquitoes. Ex- Dengue, Malaria, Onchocerciasis, etc.	Regular Mosquito/Insect control steps.

The deterioration of the quality of water is not only injurious to human health, but it is also destroying different types of marine species and plants, which in the long run would imbalance the eco-system and prove harmful to human being and other life-forms.

The harmful impact of contaminated water and disease associated with can be shown in the following facts:

- Every years around 4 billion cases of diarrhea are reported mostly from the developing countries, and around 1.8 million deaths are caused (around 1.6 million among them are children under five) by it due to the consumption of contaminated water¹⁶.
- As per WHO estimates every year around 1. 2 million deaths occur due to Malaria¹⁷.

¹⁶ UNICEF (01 April, 2005), “Common Water and Sanitation Related Diseases” available at http://www.unicef.org/wash/index_wes_related.html

¹⁷ WHO (2004), “Facts and Figures: Water, Sanitation and Hygiene Links to Health” available at http://www.who.int/water_sanitation_health/publications/factsfigures04/en/

- Out of the total disease deaths in developing countries it is estimated that around 80% of these are caused by the consumption of contaminated water. Moreover victims of water borne diseases occupy around half of the total number of hospital beds in the world¹⁸.
- It has been observed by the United Nations that more than 5 million deaths are occurred all over the world due to water borne diseases¹⁹.
- It has been observed that even if the explicit millennium development goals, announced by the United Nations, would be achieved (which is virtually impossible given the present scenario) then still the 34 million to 76 million people would perish from the water related diseases²⁰.

The impact of some other diseases related with water can be analysed in terms total cases reported and deaths occurred by the following table²¹:

<u>Disease</u>	<u>Total Cases of Disease</u>	<u>Total Deaths in a Year</u>	<u>Remark</u>
Schistosomiasis	160 million	More than ²² 200,000	Around 700 million people worldwide may be at the risk of infection ²³ . Arrangement of Basic Sanitation Facilities would reduce the disease infection up-to 77%.

¹⁸ Water Savvy Monitor (November, 2009), “Water Pollution and Contamination” available at http://worldsavvy.org/monitor/index.php?option=com_content&view=article&id=709&Itemid=1195

¹⁹ UNDP (2006), “Fast Facts: The Faces of Poverty” available at http://www.unmillenniumproject.org/resources/fastfacts_e.htm

²⁰ Gleick, Peter H. (2002), *Dirty Water: Water Estimated Deaths from Water Related Diseases 2000-2020*, Pacific Institute Research Report, available at http://www.pacinst.org/reports/water_related_deaths/water_related_deaths_report.pdf

²¹ WHO (2004), “Facts and Figures: Water, Sanitation and Hygiene Links to Health” available at http://www.who.int/water_sanitation_health/publications/factsfigures04/en/

²² WHO (2010), “Epidemiological Situation” available at <http://www.who.int/schistosomiasis/epidemiology/en/>

²³ WHO (February, 2010), “Schistosomiasis” available at <http://www.who.int/mediacentre/factsheets/fs115/en/index.html>

Intestinal Helminths	133 million	9400	Access to safe water, basic sanitation, and better hygiene practices can reduce morbidity by Ascariasis ²⁴ up-to 29%.
Trachoma	More than 146 million.	--	Around 6 million people are virtually impaired by Trachoma. Safe Water availability and better hygiene practices can reduce the morbidity by 27%.
Japanese Encephalitis	More than ²⁵ 45,000	Around 10000 to 15000	More than 30% cases of Japanese Encephalitis result in permanent neuropsychiatric sequelae ²⁶ .
Hepatitis A	1.5 million	In thousands	High Drinking Standards of Water and Proper Sanitation would considerably reduce the morbidity.

New Emerging Pathogens in Water: Big Challenge

On the one hand the old water related diseases continued to haunt the world, simultaneously from 1972 more than 35 new viruses of diseases have been discovered namely Crptosporidium, Legionella, Escherichia coli O 157, Rotavirus, Enterovirus 71, etc²⁷. Moreover with the advancement of science and research new pathogens were identified which can be transmitted through water as it was known only in year 2001 that Helicobac pylori can be transmitted through water²⁸. The emergence of new pathogens is a big problem as with new pathogens we are required to invent new medicines and new vaccines for the cure and prevention of

²⁴ Ascariasis is one of the highest prevailing intestinal helminthes.

²⁵ Bill and Melinda Gates Foundation (2009), "Japanese Encephalitis Morbidity, Mortality, and Disability" available at www.path.org/.../files/JE_Reduction_and_Control_by_2015.pdf

²⁶ WHO (November, 2011), "Japanese Encephalitis" available at <http://www.who.int/nuvi/je/en/>

²⁷ WHO (2003), "Emerging Issues in Water and Infectious Disease" available at http://www.who.int/water_sanitation_health/emerging/emerging.pdf

²⁸ Baker, Katherine H. and Hegarty, John P. (2001), "Presence of Helicobacter Pylori in Drinking Water is Associated with Clinical Infection", Scandinavian Journal of Infectious Diseases, Vol. 33, pg. 744-746, available at <http://www.personal.psu.edu/jph10/SJID.pdf>

the disease which these pathogens carry with them. But until the scientists create these new medicines/vaccines the disease has already done a considerable damage.

There is a great need of investment, both at national and international level, in research areas to detect different types of pathogens in the water, so that water can be purified and appropriate action can be taken to cure and prevent the disease associated with the pathogen. The current techniques associated with the identification of different pathogens are highly insufficient as it was known that in United States of America the agent of 40% outbreaks could not be known which occurred from 1991 to 2000²⁹. Although there is no such data with regard to India, but it is clear from our abysmal healthcare system that the situation is even worse. Although there might be many reasons for the emergence and re-emergence of different types of pathogen in water, but these can be categorized basically in three categories, namely:

1). Change in Environment: When there is change of environment then to exploit the new environment, the pathogen would modify its characteristics to adapt to it as a result of which new strains of pathogen would emerge in water resources. In the long term, with radical changes in environment these new strains would convert themselves to new species of pathogens, which are capable of causing different disease & symptoms³⁰. Some examples of the environmental changes could be due to creation of dams, Water Development Projects, deforestation, etc.

²⁹ WHO (2003), "Emerging Issues in Water and Infectious Disease" available at http://www.who.int/water_sanitation_health/emerging/emerging.pdf

³⁰ Due to the changing environmental conditions (mostly due to global warming) many pathogens of diseases have re-emerged in many parts of world, and incidences of several diseases (not only water-associated diseases but even other diseases) have increased due to it namely Dengue, Cholera, Malaria, Plague, etc. For more info see: UNEP (2011), "Environmental Change and New Infectious Diseases" available at <http://www.grida.no/publications/et/ep4/page.aspx>

2). Patterns of Human Behaviour: The patterns of human behavior or change in it may create conditions favourable for the emergence of pathogens in water. Here management of water resources and the habits of the inhabitants would specially be relevant as they have obvious impact on the emergence of pathogens. Some examples could be changes in the sanitation habits/arrangement; use of different pesticides by the farmers of an area, etc.

3). Technological and Scientific Advancements: As new technology comes or some scientific advance takes place it might carry with it some inherent dangers. There are many new developing technologies and scientific practices which might foster the emergence of new pathogens in water bodies. For instance, water-cooled air conditioning plants; changing industrial practices; antibiotics & anti-parasite drugs; new insecticides, etc.

An adequate policy related to the management of water resources must take into account the preventive measures to stop the emergence of pathogens in water; in this regard following steps must be taken into account:

- **Regular Inspection and Safety Standards at Water Development Projects:** Dams and other water reservoir are the most convenient habitat for the emergence of new pathogens as large quantity of water is concentrated at one place. Therefore regular inspection must be done and samples of water must be taken from the dams/reservoirs at every 2-3 years; moreover appropriate measures must be taken to purify the water in case of contamination by suitable techniques like slow sand filtering.
- **Special Measures for Areas of Changing Environment:** When the environmental conditions of a place change as like in case of deforestation,

the water sources of the region must be continuously monitored and inspected for taking safety measures against the emergence of pathogens and other harmful insects.

- **More Research Centres, Funding and Surveillance:** It is a difficult task to identify the new emerging pathogens (as around half of the cases remain unknown even in developed countries), hence there is need of comprehensive international cooperation at global level, and more resources must be devoted in India towards the water associated diseases.
- **Planned Urbanisation:** Dense settlements and slum dwellings in urban areas (which lack basic sanitation and proper drainage) create favourable conditions for the contamination of water and emergence of pathogens. Planned urbanization and development would provide better sanitation and sewage facilities, and considerably reduce the possibilities of emergence of diseases.
- **Better Safety Standards for Pesticides and Chemical Use:** Better safety standards must be prescribed for the pesticides and chemicals; they must be properly tested by authorities to ascertain their harmful affects including impact on emergence of pathogens.
- **Better Safety Norms of Air Cooling Plants:** Better safety norms must be provided with regard to cleaning and management for the water cooling plants and other such faculties.

Safe Drinking Water Standards

There is an immediate need for new research and monitoring of the water resources in India. Although the government provided the permissible limits of the different

contaminants in water, and has provided many other guidelines under the National Water Policy 2002, but unfortunately the government failed to create awareness about the hazards associated with unsafe water. The Government should frame new standards for safe drinking water, which must provide comprehensive guidelines with regard to quality of water, methods of conservation of water resources, and methods of purification.

India must frame the standards of water in consonance with the international guidelines (issued by World Health Organisation), and inspiration can be taken from the “Drinking Water Standards” of United States of America (USA). In USA the US Environmental Protection Agency has framed the “Drinking Water Standards” very elaborately, and has divided these guidelines into two categories on the basis of the risk associated from different contaminants:

- 1). **Primary Drinking Water Standards:** These norms are legally enforceable norms and are applicable on all water providers. These guidelines list the contaminants which are highly injurious to health, and provide those guidelines which are highly essential for the maintenance of good health levels. They provide the permissible limits of lethal inorganic chemicals (Antimony, Arsenic, Asbestos, Barium, Cadmium, Lead, Thallium, etc); organic chemicals (Acrylamide, Benzene, Carbofuran, Dalapan, etc); Micro-organism (Cryptosporidium, Giardia lamblia, Legionella, etc); and disinfectants (Chlorine)³¹.
- 2). **Secondary Drinking Water Standards:** These norms are only provided as guidelines, and are not enforceable because they are related to those

³¹ EPA (2011), “Drinking Water Contaminants” available at <http://water.epa.gov/drink/contaminants/index.cfm>

contaminants which do not pose serious harms to health (as Aluminum, Chloride, Copper, Silver, etc)³².

India must also frame its guidelines in two categories mandatory and suggestive. Indian government must also reduce the permissible limits of several contaminants as per the WHO norms. Limits for three main contaminants are given below:

Contaminant	Permissible Limit as Per Indian Standards ³³	WHO Permissible Limits ³⁴
Arsenic	0.05 mg/litre	0.01 mg/litre
Cadmium	0.01 mg/litre	0.003 mg/litre
Lead	0.1 mg/litre	0.01 mg/litre

Moreover, before framing the water standards, wide-surveys must be conducted all over the country, and specific suggestions must be provided for regions on the basis of the level of contamination and other characteristics associated with water and water resources. Once the government has formed the safety standards for water; awareness must be created about them through newspapers, electric media, and civil society organisations especially in rural areas. The safety standards must include among other things:

- Permissible limits of different contaminants and their health hazards.
- Data about the water quality in different regions.

³² Ibid.

³³ CPCB, "Indian Standard Specifications for Drinking Water IS: 10500", available at <http://hppcb.gov.in/EIASorang/Spec.pdf>

³⁴ Web Health Centre (2009), "Potability of Ground Water" availability at <http://www.webhealthcentre.com/communityservices/potability.aspx#Cadmium>

- Purification Methods (in case it can be carried out by people at large as boiling of water).
- Practices which contaminate water (so that they can be changed by people).

The Need for a Safe Water Policy

There is need for framing a new water policy, which must specifically focus on the deteriorating quality of water, lethal contaminants, and the impact of contaminated water. Although the National Water Policy, 1987 was reviewed in 2002 yet it did not deal comprehensively with the health impact of contaminated water. This policy must again be renewed to contain specific provisions to remove the contamination of water and deal with the ever increasing problem of water borne diseases. It has been observed by Centre for Science and Environment recently that only 10% of the sewage (generated from different types of industrial and agricultural activities) is treated before being dumped into rivers³⁵. 498 Class I cities in India generate 35558.12 Million Litre Sewage³⁶, and most of it goes untreated either into the rivers or infiltrates into the ground water.

The new policy must provide active participation and cooperation from different actors, namely Central and State Governments, Media, Panchayats, and Civil Society. Moreover, different ministries, namely Ministry of Water Resources, Ministry of Health and Family Welfare, Ministry of Urban Development, and Ministry of Environment and Forest, must act in unison to bring down cost and maximise results.

³⁵ India Water Review (06 January, 2012), "Indian Rivers Turning into Drains as Sewage System Collapse: CSE" available at <http://www.indiawaterreview.in/Story/Environment/indian-rivers-turning-into-drains-as-sewage-systems-collapse-cse/500/20>

³⁶ CPCB (2009), "Status of Water Supply, Waste water generation and Treatment in Class I Cities, and Class II Towns of India" available at www.cpcb.nic.in/upload/NewItems/NewItem_153_Foreword.pdf

Actor involved in Water Governance	Functions
Central Govt	<ul style="list-style-type: none"> ▪ Creation of National Level Water Policy (NLWP). ▪ Monitoring of the Policy
State Govt	<ul style="list-style-type: none"> ▪ Elaboration of Policy at State Level. ▪ Support in terms of infrastructure and personnel.
Media	<ul style="list-style-type: none"> ▪ Reporting of the policy to layman. ▪ To make government aware about persisting contamination of water and its impact on public health.
Panchayats ³⁷	<ul style="list-style-type: none"> ▪ Suggesting appropriate measures for water resource conservation at local levels. ▪ To work as a bridge between the rural people and governments
Civil Society	<ul style="list-style-type: none"> ▪ To play a role in implementation of policy, and dissemination of information about the policy to the people.
Municipalities	<ul style="list-style-type: none"> ▪ To implement those norms of policy related to water supply, sanitation, drainage, water resource conservation and waste management

The New Water Policy must also contain a wide variety of provisions namely:-

- A common water policy for all purposes for all regions of the country would not be feasible, but rather special provisions must be added for the regions which are severely affected by water associated diseases; moreover the quality of water must be tested, and proper steps must be taken for the prevention of such diseases including vaccination, arrangement, etc.
- In every two years the water samples must be collected all over the country to check the contamination levels and immediate steps must be taken in case the contamination levels exceed the permissible limits to save the people

³⁷ Panchayats are special institutions of people in Indian villages which are concerned with several tasks relating with the rural development.

from their adverse impact. Even the water policy itself must be reviewed on the basis of its success.

- A task force must be created to undertake emergency response measures in case of outbreak of any water related epidemic. Sufficient medical facilities and infrastructure must be developed for this purpose.
- More research should be conducted and new technologies must be developed for the detection and purification of water from different pathogens and other harmful contaminants.
- Different authorities who are associated with drinking water supply must be provided (including municipalities) periodical guidelines with regard to cleaning, purification, and related issues involved in water supply

Conclusion

The increasing contamination levels of water coupled with the ever-increasing population are affecting the public health all over the world especially in the developing world. To deal with the deterioration of water quality and associated health hazards, the government must focus on the effective use of resources, creation of coherent policy and suitable institutional framework. The government has to continuously monitor the water resources of the country, and has to develop sufficient medical capacities in the areas of water contaminated diseases. As already stated, out of the diseases which occur in developing countries around 80% of them are associated with contaminated/polluted water³⁸. Therefore, availability of safe drinking water would not only considerably improve the health conditions of people in our country, but would also substantially reduce our health expenditure.

³⁸ Water Savvy Monitor (November, 2009), "Water Pollution and Contamination" available at http://worldsavvy.org/monitor/index.php?option=com_content&view=article&id=709&Itemid=1195

To create awareness among the public about the deteriorating quality of water and its health implications is a challenge before the government. Simultaneously, the government must disseminate information regarding improved hygienic practices and resource management among the people. The government must also create a reporting mechanism at the national level, under which the citizens, media, and civil society organisation may report any incident of contamination of water or adverse effect of consumption of water; and on the basis of which necessary corrective action can be taken in a short time frame.

The following measures may be considered for ensuring availability of safe drinking water in the country:-

- **Health Based Targets:** The government must frame some health based targets to reduce the cases of water associated diseases to a certain percentage in every three years. In this task the government must focus on development of medical facilities and preventive measures like vaccination.
- **Capacity Building at Institutional and Technological Levels:** Capacity building at the institutional level refers to the extensive training of personnel related with the governance of water, and medical personnel treating water associated diseases. A “safe water policy and water associated diseases control policy” must be framed and guided by the eminent scientists and researcher³⁹. More investment must be devoted towards the development of new technologies and capabilities in medical science to deal with the health hazards of contaminated water. At the technical level, there is need for creating more research centres/laboratories, newly developed tools for pathogen identification, screening & diagnosis. A well regularised

³⁹ There must also be client orientation programmes related water resources management.

information system is the key to reduce the health hazards of contaminated water.

- **Maintenance of Rural Water Supply and Infrastructure:** In rural areas the accessibility of safe water is a big problem, as generally they are out of reach of our water authorities and lack sufficient resources for the purification of water. Therefore, the government must take specific steps to supply safe water to rural areas, and must actively engage in other related infrastructure development.
- **Changing Agricultural and Industrial Practices:** A safe water policy can never succeed unless it is equipped with radical changes in the agricultural and industrial practices including waste management. In case of agriculture, proper norms must be established with regard to use of pesticides (including prohibition if required), chemical, and other good agricultural practices. Industries must not be allowed to dispose of their effluent and waste untreated; proper directions must be issues towards the management of different types of wastes, their disposal (including drainage linkage), and sanitation system.
- **Adequate Legal and Policy Arrangements:** A national surveillance agency must be created along with its regional branches at different places in different states. Proper legal and regulatory norms must be created and more importantly they must be implemented along with the help of the surveillance authority.

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