Compendium on Water and Health

Background[1]

This compendium provides a collection of readings covering various aspects related to water and health, which are intricately linked. While the focus is predominantly on South Asia, the compendium also presents a global overview.

There exists a very complex relationship between water and health; the most well accepted being that of water-transmitted diseases. The infectious diseases linked to water are categorized into four categories by Ashbolt (2004)[2] *viz*. water-borne, water-related, water-based and water-washed diseases. In case of water-borne diseases, water acts as a passive carrier for infecting pathogens. Diseases like Cholera, Typhoid, Bacillary Dysentery, Infectious Hepatitis, Leptospirosis, Giardiasis, Gastroenteritis etc. fall under this category. Vectors and insects residing in and around the vicinity of water sources spread Water-related Diseases. Stagnant water probably provides the most suitable breeding ground for disease spreading vectors like mosquitoes, flies and insects. Common diseases spread through these vectors include Yellow Fever, Dengue Fever, Encephalitis, Malaria, Filariasis (all by mosquitoes), Sleeping Sickness (Tsetse fly), Onchocerciasis (Simulium Fly) etc. Infecting agents spread by contact or ingestion of water, causes Water-based Diseases like Schistosomiasis, Dracunculosis, Philariosis, Threadworm and other Helminths. Water essentially supports an integral part in the life cycle of infecting agents, such as aquatic snails. Water-washed diseases are caused due to water scarcity leading to improper maintenance of personal hygiene and also poor sanitation. Scabies, Trachworms, Conjunctivitis, Hookworm and Amoebic Dysentery are examples of common water-washed diseases.

In case of water, apart from microbial contamination, chemical pollution is also a major health risk. Chemical contamination of surface water can create possible health risks, as these waterways are usually used directly for drinking, washing and cleaning, and also for fishing and recreational purposes[3]. Toxic chemicals can get introduced to waterways from point as well as non-point sources. Direct contamination can also take place due to improperly and badly designed hazardous waste or industrial sites. Major pollution-causing industries include paper and pulp mills, sugar mills, textile and dye industries, mining and steel industries. Pollution from non-point sources involves many small sources combining to cause significant pollution. For instance, movement of rain or irrigation water over land attracts pollutants such as fertilisers, herbicides and insecticides which are then carried into rivers, lakes, reservoirs, coastal waters or groundwater. Groundwater, the other major water source along with surface water, often has low concentrations of pathogens as water gets filtered during its transit through underground layers including sand, clay or rocks. However, toxic chemicals of geogenic nature like arsenic and fluoride can seep through soil or rock layers and get dissolved in groundwater. The use of chemically contaminated water during food preparation can lead to food contamination, as even high temperatures during cooking don't seem to affect toxicity of most contaminants[4].

Apart from the aforementioned water-health associations, others include deficiency-related diseases, water injuries and other social disadvantages due to inaccessibility to proper water supply.

Negative externalities have always led to lack of safe and adequate water. It has also posed public health hazards across South Asia as well as the developing world, thus creating hurdles in the process to actually realising sustainable development. The region of South Asia has and is always recognized for increasing population, rapid urbanization, unsustainable agricultural and industrial development and poor waste management regulations which negatively affect the environment, leading subsequently to detrimental effects on food production and human health. Water related diseases contribute to the top 10 causes of death in the South Asia region[5]. In 2002, total death percentages ranged from 1.9 per cent in Sri Lanka to 16.2 per cent in Afghanistan, due to water, sanitation and hygiene issues while Disability Adjusted Life Years (DALYs) which could be attributed to lack of water sanitation and hygiene, ranged from 3.2 per cent in Sri Lanka to 15.8 per cent in Afghanistan[6].

1This note is written by Ms. Jayati Chourey, Senior Fellow, SaciWATERs, Hyderabad, India.

[1]Ashbolt, Nicholas John. 2004. 'Microbial Contamination of Drinking Water and Disease Outcomes in Developing Regions'. *Toxicology*, Vol.198, pp 229–238.

[2]Kjellstrom, Tord, Madhumita Lodh, Tony McMichael, Geetha Ranmuthugala, Rupendra Shrestha, and Sally Kingsland. 2006. 'Air and Water Pollution: Burden and Strategies for Control', in Dean T. Jamison, Joel G Breman, Anthony R Measham, George Alleyne, Mariam Claeson, David B Evans, Prabhat Jha, Anne Mills, and Philip Musgrove. (eds), *Disease Control Priorities in Developing Countries*, pp.817-832. Washington D.C.: World Bank. Available online at http://www.ncbi.nlm.nih.gov/books/NBK11769/ (accessed in June 2011).

[3]Kjellstrom, Tord, Madhumita Lodh, Tony McMichael, Geetha Ranmuthugala, Rupendra Shrestha, and Sally Kingsland. 2006. 'Air and Water Pollution: Burden and Strategies for Control', in Dean T. Jamison, Joel G Breman, Anthony R Measham, George Alleyne, Mariam Claeson, David B Evans, Prabhat Jha, Anne Mills, and Philip Musgrove. (eds), *Disease Control Priorities in Developing Countries*, pp.817-832. Washington D.C.: World Bank. Available online at http://www.ncbi.nlm.nih.gov/books/NBK11769/ (accessed in June 2011).

[4]Mathers, C. D., A. D. Lopez, and C. J. L. Murray. 2006. 'The Burden of Disease and Mortality by Condition: Data, Methods, and Results for 2001', in Alan D Lopez, Colin D Mathers, Majid Ezzati, Dean T Jamison, and Christopher JL Murray (eds), *Global Burden of Disease and Risk Factors*, pp 45–240. New York: Oxford University Press.

[5]Prüss-Üstün Prüss-Üstün, Annette, Robert Bos, Fiona Gore and Jamie Bartram. 2008. 'Safer Water, Better Health: Costs, Benefits and Sustainability of Interventions to Protect and Promote Health'. Geneva: (WHO)World Health Organisation. Available online at http://whqlibdoc.who.int/publications/2008/9789241596435_eng.pdf (accessed in June 2011).

Although mortality in the past decade due to these diseases has decreased, morbidity is on the rise. Diarrhea still remains the primary cause for majority of deaths in South Asia region.

Besides infectious diseases, chemical contamination of surface and ground water additionally create a larger threat. The emerging challenges in public health are contamination of groundwater due to Arsenic and Fluoride. Although progress has been made by countries in controlling water-associated diseases, the achievements have been limited. Despite South Asia region countries having worked on the Millennium Development Goals to create adequate infrastructure concerning water supply and sanitation, it is not yet clear whether these measures have finally led to increased access to adequate safe water and proper sanitation for all (Chourey and Prakash, 2010)[6].

In fact, the relationship between water and health has never been linear and understanding of complex issues between them is limited[7]. There are socio-economic, cultural and political factors, which determine status of water and health. Both sectors play important roles in protecting human health and well being. While the former contributes by ensuring safe and adequate water through better water management, the latter contributes by preventing, controlling and reducing water-associated diseases. This means that reduction in water associated diseases necessarily demands strengthening of both the water and health sectors. Simultaneously, however, need for complementary welfare inputs from other development sectors cannot be ruled out. What it means is, to bring down burden of water associated diseases calls for the confluence of health, water, environment and development policies towards a common goal. Effective governance for water and health requires establishing and strengthening active links between themselves as well as others.

The compendium looks at water and health issues from a multidisciplinary perspective. Readings in the compendium are categorised into nine subsections – (1) Introduction to Water and Health Linkages, (2) Water Pollution and Health, (3) Water Borne diseases, (4) Water Supply, Sanitation, Hygiene and Health, (5) Disasters, Water & Health, (6) Water Resource Management and Health, (7) Water, Health and Equity, (8) Water, Poverty and Health Linkages, (9) Water, Health and Gender.

The format for this compendium has been adapted from the staff training on Water and Health, organised during 16- 23 February, 2009 at Hyderabad, India. Majority of the readings were provided by resource persons who were participants in the training. A brief on the training is provided in the next chapter.

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[6]Chourey, Jayati and Anjal Prakash. 2010. 'Good Evidences, Bad Linkages: A Review of Water and Health in South Asia', *Asian Journal of Water, Environment and Pollution*, Vol. 7, No.1 , pp. 5-17. (accessed in November 2011)

[7]V. S , Saravanan and Peter P. Mollinga. 2011. 'The Environment and Human Health: An Agenda for Research' , Background Paper for the ZEF Environment and Health Research Theme, Working Paper Series 82. Bonn: Centre for Development Research (ZEF), University of Bonn. Available online at http://www.zef.de/fileadmin/webfiles/downloads/zef_wp/wp82.pdf (accessed in September 2011)