Water pollution in Asia: The urgent need for prevention and monitoring

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Discussion Paper 1222 June 2012

This article surveys the state of water pollution in Asia. The authors discuss the various causes of deteriorating water quality, arguing that the pace and scale of the policy response must increase rapidly.

Keywords: Asia; water pollution; water quality; agriculture; sanitation; industry; policy; monitoring; prevention.

Driven by population growth and the need for increased agricultural production, water resources are coming under intense pressure across Asia. Annual water withdrawal and return flows are higher than in any other region. The volume of wastewater generated annually, excluding agricultural drainage, is some 142 km^3.[1] Inadequate provision of sanitation facilities, sewerage and wastewater treatment results in significant quantities of this wastewater reaching water bodies that may service human consumption (Figure 1). Non-point source pollution, predominantly agricultural, is also of concern, especially given the rise in agrochemical consumption. Industrial waste plays its part too as Asia's economies grow and change. The impacts are being felt by nature and people: 42% of the deaths associated with unsafe or inadequate supply of water, sanitation, and hygiene occur in Asia (Figure 2).[2] Asian countries are making concerted efforts to address these problems but the pace and scale of this policy

Suggested Citation: Evans, A. E., Hanjra, M. A., Jiang, Y., Qadir, M. and Drechsel, P. (2012), 'Water pollution in Asia: The urgent need for prevention and monitoring', GWF Discussion Paper 1222, Global Water Forum, Canberra, Australia. Available online at: http://www.globalwaterforum.org/2012/06/09/water-pollution-in-asia-the-urgent-need-for-prevention-and-monitoring/. This article is a summary of an original article: Evans, A. E., Hanjra, M. A., Jiang, Y., Qadir, M. and Drechsel, P. (2012), 'Water Quality: Assessment of the Current Situation in Asia', International Journal of Water Resources Development Vol. 28, No.2, pp. 195-216.

response must increase urgently.[3] In a recently published paper we conducted an extensive survey of these issues[4]; the following provides a summary of the key points.

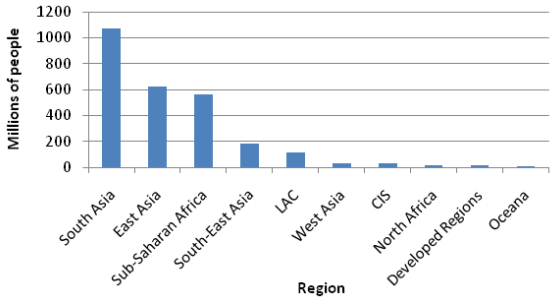

Figure 1. *Regional distribution of the 2.6 billion people without improved sanitation* (LAC, Latin America & Caribbean; CIS, Commonwealth of Independent States) Source: WHO/UNICEF (2010).

Domestic Pollution

Rivers in Asia are highly polluted with domestic waste. Many of the region's rivers contain up to 3 times the world average of human waste derived bacteria (measured in faecal coliforms, or FC).[5]Inadequate access to sanitation infrastructure (such as connections to public sewers and septic systems) is already a contributing factor today; yet, as urban centres grow so too will the need for more of this infrastructure. Based on current trends demand will continue to outstrip supply, worsening pollution. While there are strong efforts to equip exploding cities, a myriad of growing Asian towns remain completely un-served.

Agricultural Pollution

Agricultural production in the region increased 62% from 1990 to 2002 and consumption of mineral fertilizer increased 15%.[6] Exceedingly high levels of nutrients were found in 50% of rivers in the region and moderate levels in 25%.[6] High nutrient levels cause eutrophication, including algal blooms that severely damage freshwater ecosystems and hinder their provision of vital environmental services to people.

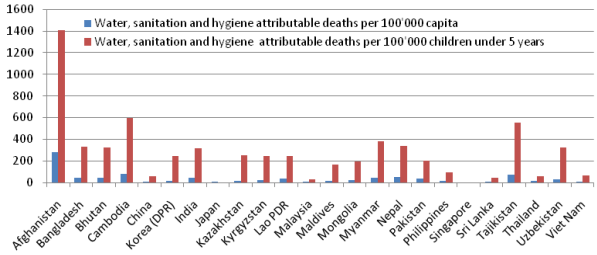

Figure 2. *Water, sanitation and hygiene related deaths in Asia.* Source: WHO (2008)

Pesticides are another problem across the region. In India for example, pesticide use grew by 750% from the mid-1900s to the present day and even prohibited pesticides have been detected in excess of international recommendations in the Ganga River.[7]Pesticide bans have brought improvements in China, but nutrients are still inadequately controlled. In Central Asia, the use of small quantities of unregulated imports is posing a serious risk. Further south, in Sri Lanka the disposal of unused pesticides, equipment washing, and poor storage have

been identified as factors contributing to surface water pollution. [6,8]

Salinity of ground and surface water caused by poor agricultural drainage systems remains a problem in many countries in Central Asia, as well as Pakistan, Iran, and India.

Industrial Pollution

The traditional agriculture-based economies of Asia are giving way to industrial economies. This transformation is having serious environmental side-effects, particularly in the case of pollution. Efforts have been made to improve regulation, but the absence, in most cases, of effective governance makes enforcement very difficult. For example, in Pakistan only 5% of national industries have provided environmental assessments.[9]

Industrial pollution levels, indicated by BOD (biochemical oxygen demand) emissions per USD 1,000 of GDP, are highest in some Central and Northeast Asian countries, followed by South Asian countries. Major sources of pollution are industries producing metals, paper and pulp, textiles, and food and beverages. The mining industry is also a significant contributor.

Trends across the Region

Water quality differs markedly across the region, as does the collection and sharing of data. This complicates analysis of the picture and the ability of countries to implement remedial measures, especially across boundaries. India and China appear to have comprehensive monitoring systems, putting them in a strong position to address the problems. Other countries lack data-sets with which to make informed decisions. In India, for example, 62 parameters are monitored at 1,700 locations and the results are published annually (Figures 3a and 3b).

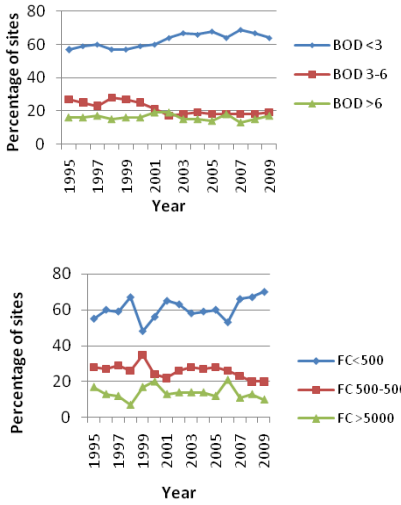

Figure 3a(top). *Trend in BOD (mg/l) in Indian water bodies.* Figure 3b(bottom). *Trend in FC (MPN/100ml) in Indian water bodies.* Source: CPCB (2009)

Monitoring by the State Environmental Protection Administration in China showed that river water quality was lower in the north

because of higher populations and the smaller assimilation capacity of the rivers. In the south, river water quality improved from 1990 to 2008. In the north it declined from 1990 to 2005 but has been improving since. Currently 85% of the sample sites in southern rivers have water suitable for consumption after treatment, compared to 40% in the north.[10]

Managing Water Quality

Two key steps are needed across Asia: prevention and monitoring.

Several countries are implementing ambitious programmes to build wastewater treatment plants and rehabilitate degraded water resources. Examples include China, India, Thailand, the Philippines, Bangladesh, and Indonesia. These and many more have passed water quality acts or laws to prevent pollution and protect receiving waters. Unfortunately enforcement is challenging, especially in emerging economies where institutional capacities cannot keep pace with rapid industrialization, and economic instruments like taxation and removal of fertilizer subsidies clash with development goals. Monitoring is also costly and voluntary compliance unlikely.

Given the transboundary nature of many river basins, and the need for their collaborative management, improved and effective water quality management strategies in Asia require the collection, analysis, and sharing of accurate data. Currently this task is, with some exceptions, generally poorly implemented. In most countries sporadic or patchy data collection prevails, and it is often accompanied by inadequate analysis.[11]

Devolving functions and funds has been one way to address the water quality challenges, for example in the Philippines and the Republic of Korea. Economic instruments, such as user charges and effluent charges, are often considered to hold the key. But implementation is not easy, especially where sewers and treatment facilities simply do not exist. Payment for environmental services is an emerging solution for agricultural pollution but as yet few if any working examples exist.

Conclusions

The Asian region continues to face serious water quality issues that contribute to freshwater scarcity, ill-health, and even deaths. In many places quality is continuing to decline and insufficient efforts are being made to monitor and remedy the situation amid institutional and social challenges. However, there are also robust efforts to correct the situation and cause to be hopeful. Positive

examples exist in the region that must be shared, learnt from, and replicated.

References

1. FAO AQUASTAT (2011), FAO's information system on water and agriculture (Food and Agriculture Organization of the Unit United Nations), Available at http://www.fao.org/nr/water/aquastat/main/index.stm (accessed 7 June 2011).
2. WHO (2008), Global Health Observatory Data Repository, World Health Organization. Available at:http://apps.who.int/ghodata/?vid=10012# (accessed 7 June 2012).
3. Economic and Social Commission for Asia and the Pacific [ESCAP] (2011), Statistical Yearbook for Asia and the Pacific 2011 (Bangkok: United Nations ESCAP), Available at http://www.unescap.org/stat/data/syb2011/II-Environment/Water-availability-and-use.asp (accessed 6 March 2012).
4. Evans, A. E. V., Hanjra, M. A., Jiang, Y., Qadir, M. and Drechsel, P. (2012), 'Water Quality: Assessment of the Current Situation in Asia', International Journal of Water Resources Development Vol. 28, No.2, pp. 195-216.
5. Economic and Social Commission for Asia and the Pacific [ESCAP] (2000), State of the Environment in Asia and the Pacific (Bangkok: United Nations ESCAP).
6. Economic and Social Commission for Asia and the Pacific [ESCAP] (2005), State of the Environment in Asia and the Pacific (Bangkok: United Nations ESCAP).
7. Ministry of Environment and Forest [MoEF] (2009), State of Environment Report, India 2009 (Government of India).
8. Howarth, S., Ismael, A. E., Tharme, R., Abeysekera, T., Clemett, A., Lashin, I., Jinapala, K., Mei, M., Meilhac, C., Murphy, S. E., Someratne, P. G., Terry, G., Turner, S. and Thomas, C. M. (2007), Diffuse Agricultural Pollution: Impacts and Options for Mitigation. Final Report, Department for International Development Knowledge and Research Services Contract R8337, unpublished report.
9. Pakistan Environmental Protection Agency [Pak-EPA] (2005), State of the Environment Report. Commissioned by Pak-EPA, Ministry of Environment, Government of Pakistan. Available at:http://www.environment.gov.pk/Publications.htm%20
10. Ministry of Environmental Protection [MEP] (2009) Report on the State of the Environment in China 2008 (Beijing: MEP).
11. Biswas, A. K. and Seetharam, K. E. (2008), Achieving water security for Asia, International Journal of Water Resources Development, Vol. 24, No.1, pp. 145–176.
12. Central Pollution Control Board [CPCB] (2010), Status of Water Quality in India: 2009, Monitoring of Indian Aquatic Resources Series: MINARS 2009-10 (Ministry of Environment and Forests, Government of India).

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