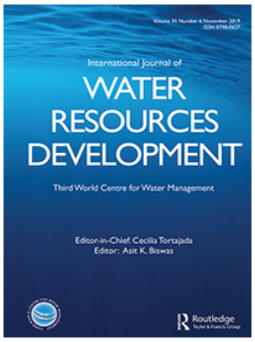


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# Water quality management: a globally neglected issue

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EDITORIAL

# Water quality management: a globally neglected issue

W. H. Auden, the English poet, wrote: 'Thousands have lived without love, not one without water.' Auden died in 1973. A modern-day Auden might have modified this statement to 'Thousands have lived without love, not one without good *quality* of water.'

Signs of deteriorating water quality can be seen all over the world, in both developed and developing countries. The types, magnitudes and extents of water quality problems differ from one country to another, and even from one part of a country to another. Political and social will, essential to solve them, also differs from one part of a country to another. The problems are globally ubiquitous. They are further exacerbated by the fact that reliable and representative water quality data are not available in vast majority of countries of the world. What is indisputable is that in most countries, the current trend has been one of steady deterioration in quality of water bodies, and this has been visible for several decades.

Consider the following facts:

- Globally, at least four billion people do not have access to water that is safe to drink, or that it is perceived as not safe to drink without point-of-use treatment systems.
- In the entire South Asian region of over 1.7 billion people, one will be hard-pressed to find even one city, town or village where the majority of the people think the tap water is safe to drink, without any health concerns. It should be noted that 'nearly drinkable' water is in fact not drinkable.
- This includes developed countries, ranging from France to the United States, where fewer and fewer people are drinking water directly from the tap because of quality concerns and sociocultural conditions.
- While recent global focus has been on water as a human right, discussions have been primarily framed in terms of access to water: quality of water has rarely been a major consideration. This is further reflected in the fact that collection of wastewater and its proper treatment are still not receiving adequate attention. And so in the entire developing world, fewer than 10% of all people have access to wastewater collection and its proper treatment. It is estimated that, globally, one in eight persons are at high risk of water pollution from biochemical oxygen demand; one in six are at high risk from nitrogen pollution, and one in four from phosphorous pollution (International Food Policy Research Institute & Veolia, 2015). Deplorable as these figures are, from our experience in advising 19 countries, including the world's two most populous countries, they appear to be somewhat on the optimistic side. The actual situation is far gloomier.
- The Global Burden of Disease study (GBD 2015 Risk Factors Collaborators, 2016) estimated that, in 2015, 1,800,000 people died from diseases related to water pollution. In contrast, WHO estimated in 2012 a figure less than half this size: 800,000 (Lancet Commission on Pollution and Health, 2018). The difference between the two estimates

is not surprising since WHO considers access to 'improved sources of water', which in reality is a meaningless term that has no direct relation to water quality.

- The number of dead zones in the world's coastal oceans has increased almost exponentially, from 49 in the 1960s to 405 in 2008, covering 245,000 km$^2$ (Diaz & Rosenberg, 2008). These are hypoxic zones where dissolved oxygen levels are so low that aquatic organisms cannot survive. They either die, or if mobile, like fish, leave the area. Dead zones can occur naturally. Nevertheless, they can also be the result of human activities. In this case, they develop because of very high nutrient contents due to continuous discharge of inadequately treated, or even untreated, wastewater and fertilizer runoff from agricultural land into rivers and then into the oceans. These contribute to the growth of algae, which then sinks and decomposes. The process consumes oxygen and depletes its availability to marine life. These biological deserts were initially noted in the coastal areas of developed countries. Now, they are spread all over the world. A noteworthy case is the Mississippi River, which carries nutrients to the Gulf of Mexico. The extent of the dead zone varies from year to year. The largest was observed in 2017, at 8876 square miles.

Even though signs of water quality deterioration are visible all over the world, politicians and the general public have not given enough attention to this issue. Instead, people have progressively adapted to the steadily deteriorating water quality conditions, but at significant economic and environmental costs, including millions of human lives lost. At present all water bodies within and near the urban centres of developing countries are seriously contaminated with known and unknown pollutants. Generally, the situation is getting worse.

Managing water quality is a rather complex task. All the indications are that it is likely to become increasingly more complex in the future. One of the main reasons is that the number of new chemicals that are being introduced globally each year is very large and mostly unknown. It is estimated that in the United States alone, this number exceeds 1000 each year. It is impossible to reliably assess the health and environmental consequences of all the thousands of new chemicals that have been introduced in recent decades and the new ones that are likely to be introduced in the coming years.

It is thus difficult to make evidence-based decisions as to how many water quality parameters should be measured regularly so that a cost-effective management system can be formulated and strictly implemented. Unlike water quantity, monitoring water quality is not a straightforward and simple process. Decisions have to be made on how many and which water quality parameters should be monitored on a regular basis so that human and ecosystem health is not adversely affected. The results of the monitoring then have to be promptly studied to determine whether there are any problems, or signs of any emerging problems. The results of these studies have to be promptly sent to the relevant higher officials so that the necessary countermeasures can be taken in a timely manner.

While at first glance water quality monitoring may appear to be a simple task, it is truly difficult and complex. First, water institutions must have a group of competent and experienced individuals who know what needs to be done. They must have trained professionals who can take samples and then analyze and interpret the results. There must be good functional laboratories, with sophisticated instruments, which sometimes may have to measure minute quantities of pollutants that may be present in the collected samples in parts per million, or even billion.

Most institutions of the developing world have water quality monitoring programmes that can monitor around 10–20 standard water quality parameters on a regular basis. However, they often do not have adequately trained workers who know how to take proper samples and then analyze them promptly, or a good functional laboratory where the samples can be reliably measured. Often absent are trained people who can interpret the monitoring results from the laboratories and prepare actionable reports for the use of policy makers. In addition, for an effective water quality monitoring system, there have to be functional processes to regularly assess what parameters should be monitored, with what frequency, and in which locations.

A good example is Singapore. In 1965, when it became independent, it was a small developing country. Its urban water and wastewater monitoring and management systems were very similar to those of other cities of developing countries, like Delhi, Dhaka, Sao Paulo, Nairobi or Johannesburg. Even as late as 1970, Singapore was monitoring 36 water quality parameters. By 2016, it was monitoring 340 parameters, a 940% increase in 53 years (Biswas, Tortajada, & Rohner, 2018). During this period, it continuously built its human and technical capacity to measure and manage water quality very effectively. With good governance practices, Singapore transformed its urban water and wastewater management practices in only about three decades from those of an average developing country to some of the very best in the world.

Like Singapore, China has recently increased the number of water quality parameters that it measures nationwide to more than 110, nearly three times the earlier number. It has further ensured that it has developed the adequate human and technical capacity to measure them regularly and properly.

What is not appreciated currently is that water quality management is a far more complex process than water quantity management. In most countries, even now, politically, institutionally and academically, water quality considerations are receiving significantly less political attention than water quantity and allocation-related issues (Biswas & Tortajada, 2011). Reversing this trend is likely to be difficult and challenging.

However, recently a few countries, especially China, have realized good water quality management is a prerequisite for further economic and social development, and absolutely critical to a decent quality of life for people. Since 2010, China has heavily invested in sewage and wastewater treatment infrastructure for both domestic and industrial sources. This has started to make a dent in the magnitude and extent of its water pollution problems and their numerous adverse impacts on human and ecosystem health. For example, independent analyses show that median phosphorous concentration across China's 864 freshwater lakes fell from 80 micrograms per litre in 2006 to 51 micrograms per litre in 2014.

President Xi Jinping's strong personal endorsement of a 'war on pollution', and statements like 'green mountains and clear water are equal to mountains of gold and silver', are having remarkable impacts in improving China's water quality, which had steadily deteriorated as the country made stellar economic progress over the past three decades. Unlike other countries, it has not simply used good political rhetoric: it has backed it up through top-level political commitments and expenditure of billions of dollars each year. There is no question that by 2025, China's water quality will show very significant improvement over what it is today.

Unfortunately, similar levels of political and economic commitment are mostly conspicuous by their absence in other developing or even developed countries. In fact, the United States appears to be backpedalling on its highly successful Clean Water Act, which is unquestionably a retrogressive step.

The fact is that we currently have the knowledge, expertise, technology and investment funds to manage water quality problems properly. There are no technical or economic reasons that any urban centre of more than 200,000 people cannot have 24 × 7 clean water supply and proper wastewater collection and treatment systems. The fact that it has not happened is an indictment of the lack of political will to improve water quality management and, with this, the quality of life of the affected populations. Public apathy and lack of trust in water utilities have contributed to people having to develop their own coping systems, which are not always the best for their own well-being.

In this November issue, the last one of 2019, there are two papers that illustrate the complexity of managing water resources in developed countries. These are the contributions by Calatrava and Martínez-Granados (2018) and Kharel, Romsdahl, and Kirilenko (2018). It is worth considering these experiences for the lessons learnt and the challenges ahead.

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