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It's the Water, Stupid!

DAVID M. LODGE

In the halls of academia, government, and business, the conviction is growing that, to paraphrase a line made famous by Bill Clinton's successful 1992 presidential campaign, "It's the water, stupid!" The view that ensuring adequate water resources will be of paramount importance to humanity's future well-being is supported by years of data, analysis, and interpretation, but is only now reaching the headlines. Assessing trends over the next two decades, the US National Intelligence Council is echoing many others in concluding that "clean water is set to become the world's scarcest but most-needed natural resource" (NIC 2008).

To a remarkable degree, this message is consistent, whether it is coming from those advocating for the environment, public health and social justice, or water resource infrastructure. The emphases, however, often differ among these three sectors. Despite a welcome increase in communication among groups with divergent water-related interests over the past 15 years, the torrent of recent water-related workshops and publications still largely reflects the balkanized interest groups of yesteryear.

For example, nongovernmental organizations and government agencies worried about the environment often lean on the Convention on Biological Diversity; the United Nation's 2005–2015 International Decade for Action, "Water for Life"; and other aspirational international agreements to implore greater protection for freshwater biodiversity and ecosystems. Their concerns are well founded (Dudgeon et al. 2006). Although freshwater species—even large fishes—are still being discovered at a rapid rate, the trends in abundance for already-described species are sobering. In North America, the rate of extinction of freshwater species is five times higher than that for terrestrial species, and freshwater species seem to be suffering disproportionately worldwide. Globally, extinct and imperiled species include river dolphins, amphibians, fishes, mollusks, and crayfishes. And it should be remembered that long before species go extinct, their populations are generally so small that the role they played in their ecosystem's functioning has vanished, together with the corresponding goods and services provided to humans.

The major drivers of these losses of species and ecosystem services include water pollution, invasive species, overexploitation, damming and other alterations in water flow, and habitat destruction (Dudgeon et al. 2006). Many of these drivers, however, also provide direct or indirect benefits to humans. That is, the impacts on ecosystems are trade-offs for goods and services derived by using water in other ways, such as irrigation and production of hydroelectricity. The trade-offs are the reason these problems persist, and why different interest groups and sectors concerned with water have had different agendas for so long.

In contrast to those concerned about the environment, public health and social justice advocates often appeal to the Millennium Development Goals (MDG) established by the United Nations in 2000 (Coussens et al. 2009). The seventh of the eight MDGs attempts to bridge the traditional concerns of environmentalists and those concerned with equitably providing water to meet basic human needs. It seeks to "ensure environmental sustainability," and includes a target to "halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation." Yet because in many countries, water supply improvements outpace progress toward sanitation, and because sanitation systems in the developing world very rarely include sewage treatment, public health goals are being achieved partly at the expense of environmental goals.

The public health goals are certainly warranted. In 2000, drinking water availability was an affront to sensibilities. Development efforts since then have resulted in substantial progress toward the MDG7 target for provision of drinking water, especially in eastern Asia. Still, in 2006, about 46 percent of the world's population lacked access to drinking water in their dwelling plot. At the current lower rate of progress on sanitation, efforts to meet the MDG sanitation target by 2015 will fall miserably short. About 30 percent of humans will still be living with little or no separation of human waste from human contact (WWAP 2009). The failure to provide sanitation, and especially the failure to provide sewage treatment for booming urban populations, does not only have immediate consequences for human health but it is also a major cause of water pollution that destroys other ecosystem services, including fisheries, for many people downstream who already have unacceptably low standards of living. These losses contribute to a downward spiral of positive feedbacks among poverty, disease, and environmental degradation. The mismatch between good progress toward water supply, poor progress toward sanitation, and even worse progress toward sewage treatment is highly detrimental to the overall goal of environmental sustainability.

In contrast to environmentalists and public health advocates, those concerned primarily with water infrastructure—including some government agencies, water resource engineers, and the private sector—focus primarily on providing energy needs, navigation, irrigation water for agriculture (which accounts for about 70 percent of global water consumption), and drinking water to support emerging urban centers. Sewage

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treatment and maintaining water flows needed to support other ecosystem services provided by natural waterways have traditionally been secondary concerns. Energy and water supply provide immediate economic growth, but the trade-offs made by not providing sewage treatment and not protecting other ecosystem services are hard to quantify, and become apparent only after a lag. Rapid decentralization of political authority and decreased government control over water supply and sanitation in many parts of the world tend to reinforce these priorities.

A preoccupation with large water infrastructure projects ensures that many developing countries are treading the short-sighted path trod by most of the developed world in previous centuries: construction of large dams and other "hard" engineering solutions aimed at supplying energy and water to fuel economic growth in large cities. China's iconic Three Gorges Dam symbolizes the aspirations of many governments. Yet without adequately considering environmental and public health goals, the net societal benefits of this approach are reduced in at least three ways. First, the approach ignores the basic needs of the many people in rural areas and small cities, especially women, who spend hours each day obtaining water. A mere 50 liters of clean water per day would free them for productive work. Second, the Three Gorges approach distracts from the potential of reducing demand for water by increasing efficiency of water use, through technological improvements and changes in consumer behavior. For example, in the United States, per capita water use has decreased while productivity per liter used has increased since 1980 (Gleick 2009). Third, neglecting the other end of the pipe—sanitation and sewage treatment—reduces the productivity gains that water provision might otherwise provide, because it increases the risk of disease and reduces fisheries and other ecosystem services provided by unpolluted waterways.

Environmental, public health, and water infrastructure advocates all recognize that water is central both to environmental sustainability and to human health. They do not always recognize the trade-offs implied by the traditional approaches taken by all three sectors. Recent conceptual and technological advances suggest, however, that with a unified vision, win-win-win situations are often possible.

Some important, overlapping components of such a unified vision should be (a) a decision framework that simultaneously incorporates benefits and costs from all sectors; (b) simultaneous consideration of the impact of management on water quantity and water quality; (c) broadening of the spatial scale considered to include whole watersheds and the linkages between upstream and downstream regions, and between humans and ecosystems; (d) lengthening of the temporal scale considered to include lagging effects on society and ecosystem services; and (e) creative government and market incentives that both encourage these considerations and deliver services more efficiently.

A rigorous implementation of the conceptual approach of the Millennium Ecosystem Assessment (*www.millenniumassessment.org*), in which fisheries, sanitation, and hydropower, for example, were all recognized as ecosystem goods and services, would embody much of what is needed. Adequately considering the broad range of ecosystem goods and services in development decisions will increase the net, long-term benefit of water projects. Furthermore, such holistic planning need not harm water supplies and economic development: win-win situations are often possible (Kareiva et al. 2008). New York City's avoidance of the construction of a multibillion-dollar water treatment plant by spending much less to purchase or incentivize the improved management of its watersheds illustrates a win-win solution. This outcome would look much like the "soft" path to water development advocated by Gleick (2009) and others.

Water is a complicated natural resource for which some uses are substitutable (for example, flushing toilets) and others are not (drinking); some sources are renewable (surface flows) and others are not (fossil groundwater); and some uses reflect public goods (aesthetic benefits) and others reflect private goods (a supply for drinking). As human populations increase, as diets in the developing world shift to include more meat (which requires more water to produce), as increased biofuel production increases agricultural water use, and as climate change exacerbates all these tensions, water management will become more contentious globally. The poorest of the poor will be most at risk (Costello et al. 2009). Yet more common ground among diverse sectors exists than ever before, and we know how to manage better. Let the search for win-win solutions accelerate!

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