

Peter H. Gleick. *The World's Water 2008-2009: The Biennial Report on Freshwater Resources.* Washington DC: Island Pr, 2008. 432 pp. \$35.00 (paper), ISBN 978-1-59726-505-8.



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Sustainability and Freshwater Resources

Peter Gleick's sixth biennial report on the world's freshwater resources is an important and timely addition to this very useful and highly regarded series. Readers familiar with the first five volumes will be pleased to see that volume 6 continues with the well-proven formula of six to seven in-depth studies of critical water issues, several brief but informative reports on more topical water matters, 150-plus pages of the latest data on twenty or more different water trends, and an updated chronology of water conflicts. Like the earlier volumes, the 2008-2009 edition of *The World's Water* will prove to be an indispensable resource for water scholars, policymakers, and activists.

For the purposes of this review, the six substantive chapters merit the greatest attention. In addition to analyzing important environmental concerns (see below), they contribute to Gleick's overall goal of identifying far more sustainable water policies and practices. Promoting sustainability is a complex undertaking. Success rests on (1) carefully determining the long-term environmental impacts of current practices, especially on how they

translate into specific risks, threats, and vulnerabilities; (2) clarifying the concept of sustainability as it relates to water; and (3) providing practical recommendations for improving water use and management, often by drawing on the lessons derived from comparative case studies. The 2008-2009 edition contributes on all three fronts.

Three of the chapters emphasize the importance of identifying long-term environmental impacts and risks. Although the chapters share the same basic goal, they analyze three different facets of the growing water crisis. They also differ in their respective levels of analysis, ranging from the global and continental to studies of particular countries.

Global climate change is a major environmental concern. As Heather Cooley notes in chapter 3 ("Water Management in a Changing Climate"), the long-term effects of climate change on the world's freshwater systems will be substantial. Cooley's assessment builds from two assumptions. First, climate change is well underway and, second, mitigation is not a viable option. Cooley is con-

vinced that by the year 2090 the global mean surface air temperature will rise anywhere between 1.1 and 6.4 degrees Celsius (p. 40). The expected impacts will disrupt every aspect of the hydrologic cycle and all four components of a freshwater system—surface water, groundwater, water quality, hydrologic extreme events, and water demand (p. 43). Global warming will dramatically alter long-standing patterns of precipitation, sharply adjust the timing and the amounts of surface water runoffs, reduce the rates of groundwater recharge in many regions, and intensify the degradation of water quality. In light of these grim projections, water managers have no choice, she concludes, but to focus on identifying the actions or policies that [will] reduce vulnerability or increase resilience to inevitable climate change impacts (p. 39). Cooley surveys the adaptive management options currently available to water managers and as they apply across seven different water-use sectors (municipal water supply, irrigation, industrial and power-station cooling, hydropower generation, navigation, pollution control, and flood management). To facilitate effective policy change, Cooley advocates the use of adaptive assessments. Cooley's chapter includes discussion of two assessment approaches, a scenarios-based approach (where assessments are scaled to various postulated climate outcomes) and the Adaptive Policy Framework, which is tied to current climate variability and extremes (p. 48, emphasis in the original). Either way, adaptation will be difficult and expensive, costing as much as \$50 billion a year (p. 50).

Water crises are not simply a function of global climate change. As the chapters on China and Millennium Development Goals illustrate, current economic, demographic, and political factors have and continue to play a very large role. Gleick's study of China is a powerful and disturbing examination of just how bad matters can get when nations neglect the well-being of their freshwater systems. His chapter is a list of catastrophes in the making: three hundred million Chinese without access to safe drinking water; sixteen of the world's most polluted rivers; massive and largely uncontrolled dumping of chemicals and untreated wastewater into rivers and aquifers; chronic water shortages in over two-thirds of China's cities; excessive groundwater and surface water overdraft; disappearing lakes and wetlands, etc. Gleick attributes these ills to China's large and rapidly growing population, explosive economic growth, and water laws that remain outdated, weak, and inadequately enforced (p. 88). China is already experiencing the social and political strains of an overtaxed and severely abused

freshwater system. Polluted waters compromise human health and economy. The rates for various kinds of illness (including cancers) are unusually high in many areas of China. Reports of cancer villages have appeared more frequently in recent years, with clusters of cancers being linked to the use of heavily polluted water (p. 81). Regional conflicts over water have escalated and turned violent, including the use of mortar attacks (p. 90). Environmental concerns, especially those related to water degradation, have roiled the population and threatened political stability. In 2005, China witnessed fifty thousand environmentally related protests (pp. 79). Correcting these alarming states of affairs, Gleick notes, will be extremely challenging, a matter of rapidly developing an entirely new set of legal, technological, and institutional tools (p. 97).

China may be an extreme case but it is by no means the only nation or region of the world crippled by severe water shortages and pollution. Other countries in Asia, Latin America, and especially sub-Saharan Africa struggle to meet even the most basic water needs. As Meena Palaniappan notes in chapter 4 (Millennium Development Goals: Charting Progress and the Way Forward), Billions of people live without access to safe water and sanitation, and every year millions of children die from preventable water-related diseases (p. 57). Far more so than the water issues related to climate change or China, significantly improving access to safe water and sanitation is an official goal of the United Nations. In 2000 the United Nations established its Millennium Development Goals, an ambitious resolution containing eight overall goals, eighteen specific targets, and forty-eight measurement indicators. Palaniappan focuses on target 10, to cut in half by 2015 the proportion of people without sustainable access to safe drinking water and basic sanitation (p. 59). Her findings are a cautionary tale about the difficulties in measuring and meeting ambitious environmental goals. The results have been mixed. Some regions, sub-Saharan Africa in particular, are not likely to meet target goals and dates. According to Palaniappan, meaningful progress will require far more financial resources; she estimates a total annual expenditure of \$72 billion through 2015 (p. 73).

For Gleick and his contributors, achieving far more sustainable water outcomes is a matter of developing a new water paradigm. They call it the soft path for water, a comprehensive approach that features the smart application of economics ... innovative new technologies, and the strong participation of communities and local water users (p. 13). Where hard path approaches

focus almost exclusively on developing new supplies of water, "the soft path matches water services to the scale of the user's needs, and it takes environmental and social concerns into account to ensure that basic human needs and the needs of the natural world are both met" (p. 13). In keeping with the principles of the new paradigm, two chapters underscore the importance of developing economic incentives for sustainable water practices. One promising approach is through the expanded use of corporate non-financial reports, often referred to as corporate sustainability reports (CSR). In chapter 2 ("Business Reporting on Water"), Gleick and his co-authors (Mari Morikawa and Jason Morrison) make the compelling case that CSRs encourage businesses to recognize how more efficient and sustainable uses of water are "tied to financial performance and company reputation" (p. 17). To that end, they recommend standardizing the kinds of information to be reported as well as the measurement methods and definitions to be used. Efficiency is also the theme of chapter 6, "Urban Water-Use Efficiencies: Lessons from United States Cities." Gleick and Cooley examine the water conservation and efficiency efforts of Las Vegas, Atlanta, and Seattle. Among the more important findings is their conclusion that comprehensively

planning for both outdoor and indoor water uses will lead to significant conservation, especially when joined to "an effective water pricing program" (p. 120).

New paradigms succeed when they change the way people think about their world, in this case, when we fully and meaningfully view freshwater as a fragile and limited resource. As Gleick notes, understanding water's limits is critical. To this end, Gleick and Palaniappan explore the concept of "peak water," an analogue for the much more familiar concept of peak oil. The attraction is clear: insofar as "peak" refers to that point at which "approximately half the existing stock ... has been depleted" (p. 2), the reality of an absolute limitation cannot be ignored. For reasons far too numerous to reproduce here, Gleick and Palaniappan reject the concept of peak water. It is, they conclude, "inaccurate." Unlike oil, water is, precisely speaking, "a renewable resource that is not consumed in its use" (p. 9). They prefer instead the concept of "peak ecological water," that point when water use "causes serious or irreversible ecological damage" (p. 10). The concept is an exciting and promising addition to the literature, one which, if adopted, will guide and support the transition to soft path policies.

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