Introduction

Water is an amazing substance—just a simple mix of two fundamental elements found scattered throughout the galaxy. The world was recently mesmerized by the search for water on Mars by smart machines because we understand that the presence of water may mean the presence of life. Here on our own planet, water means far more than simple chemistry. It is infused with cultural, political, environmental, and religious importance. If we understand these complexities, there is hope that we can move forward to solve our water-related problems.

Welcome to the fourth volume of *The World's Water: The Biennial Report on Freshwater Resources*. As with each of the preceding volumes, this book offers information on issues of topical importance and the data and insights into water challenges facing the public, policymakers, and scientists. In the volume, with new authors and new data, we hope to add to the light, rather than the heat, surrounding the world's water problems. Each of the volumes of *The World's Water* builds on and adds to the previous ones. The chapters are an evolving mix of new and updated discussions, information, and raw data. In this volume, for the first time, we include a complete Table of Contents for all four volumes and an integrated index that permits readers to find information across the different books.

Now that we are well into the twenty-first century, concerns about Y2K and the millennium bug are fading into the forgotten past. The importance of water, however, continues to grow. Water continues to dominate the international environmental agenda, together with the related problem of climate change. In 2003, thousands of water experts met at the 3rd World Water Forum in Kyoto, Japan to argue, debate, and discuss water issues. Among the top priorities laid out at that forum is meeting the Millennium Development Goals (MDGs) set by the United Nations to address the woes of the world's poorest populations. Two of these MDGs are aimed at reducing unmet basic water supply and sanitation needs—a regular theme in previous volumes of *The World's Water* and continued here. Progress is being made, but for those of us who work on water every day, it seems excruciatingly—and unnecessarily—slow. Chapter 1 reviews the Millennium Development Goals for water and highlights the inadequate resources devoted to meeting them. Indeed, total overseas development assistance for water and sanitation projects, an important part of the international effort to address

unmet needs, has actually decreased in recent years and remains at an inadequate level.

A new issue addressed in this volume is bottled water. In the past decade, the use of bottled water has grown at an unexpectedly quick rate and in some places little plastic water bottles have become ubiquitous. Looked at in isolation, bottled water may be innocuous; a convenient and reliable source of water. But as Chapter 2 notes, there are some serious public issues raised by growing bottled water use. Among the most important is the cost—bottled water is thousands of time more expensive than reliable, high-quality municipal water. Other issues include the question of commodification of basic drinking water, the challenge of truly understanding water-quality risks and benefits, inadequate and inconsistent bottled water regulations around the world, and even the environmental effects of producing and disposing of plastic bottles. This chapter includes some of the first survey data on bottled water costs from a few diverse places around the world. I worry that the availability of bottled water as an alternative to reliable and clean municipal water will reduce the push to provide clean water for all. I hope that this chapter begins to shed some light on the implications of the rapidly growing use of bottled water. Both the chapter and the Water Data section include new comprehensive data tables on bottled water.

Among the most controversial issues at the Kyoto meeting was water privatization, viewed by some as panacea and by others as serious threat to human rights and economic equity. The previous volume of this series explored water privatization and globalization in detail, offering principles to protect the clear public interests in water, whether publicly or privately managed. In an effort to shed some more light on these principles, Chapter 3 provides a summary of a longer set of case studies published by the Pacific Institute, exploring places around the world where one or more of the PacificInstitute principles are being met. The good news, we believe, is that these principles are appropriate and can successfully be applied. The bad news is that water managers—public or private—rarely adopt all of the principles we think necessary to protect the public interest. No doubt this debate will continue.

The World's Water has never given adequate attention to the vital issue of groundwater until now. Groundwater is often a hidden resource: inadequately monitored, insufficiently regulated, and often overpumped and overused. Chapter 4, by groundwater expert Marcus Moench, lays out these issues with both a global look at groundwater resources and regional insights into groundwater use, abuse, and management. Examples from India, California, and elsewhere are included to both show the similarities in problems facing water users from very different regions and to provide some flavor of the differences.

The volume also continues our exploration of the concept of a soft path for water, looking at various aspects of the changing paradigm for water management, development, and planning. One part that has received inadequate attention from water planners is the potential for improving the efficiency of water use without dramatic changes in technology. As populations grow and water demands increase, water managers are increasingly faced with the option of either developing new supplies at high economic and environmental costs, or figuring out how to improve the efficiency of existing uses. Indeed, in the United States and many other countries, total demand for water has not grown in more than two decades despite dramatic increases in population and gross domestic product. The change is the result of improved efficiency of

water use and fluctuations in the nature of our economies. Both permit our existing supplies to go farther and do more.

But what is the true potential for improving conservation and efficiency? Few water managers, districts, or regions know because the methods for evaluating conservation potential are imperfect or key data are missing. Chapter 5 (co-authored with Dana Haasz and Gary Wolff) and Chapter 6 (co-authored with Veena Srinivasan, Christine Henges-Jeck, and Gary Wolff) report on the results of a new set of analyses of the potential for improving the efficiency of urban uses for the State of California. They conclude that total commercial, industrial, residential, and institutional water use could be cut by as much as 30 percent, cost-effectively, with existing off-the-shelf technologies. And this improvement can be obtained more quickly and cleanly than any new supply project being considered. Similar studies around the world could be very revealing and lead to dramatic changes in water planning for the future.

The connections between climate change and the sustainable management of freshwater resources are strong. The first and third volumes of *The World's Water* looked at the science of these connections and at the potential impacts for one especially vulnerable resource—the fresh water available to island nations. The likelihood that climate change will affect both the natural hydrologic cycle and the infrastructure we build to manage water is greater every day. Indeed, the scientific evidence that global warming is already affecting water resources is increasingly compelling. As a result, water managers around the world are starting to take notice. What changes are most likely? What indicators should water managers start to watch? And what, if anything, should they do to protect their systems and their customers? Chapter 7, by Kiparsky and Gleick, explores these questions in the context of more than a decade of effort in the State of California to understand the climate-water interface and to integrate science and policy in a rational way. While water managers and planners are increasingly paying attention to climate change, this issue still fails to rise to the level of attention and response that many scientists feel is necessary.

One of the fun parts of preparing this biennial report is producing the Water Briefs section, which includes shorter summaries of issues of recent importance or updates of regular features of interest to many readers. In the current volume, we provide both. New briefs have been written to summarize the successes and failures of the Kyoto water conference in March 2003, including both the official ministerial statement together with the statement of non-governmental organizations to show the differences in perceptions and priorities generated by the forum. A new brief has also been written summarizing a new tool available on the Internet for those interested in the connections between water and climate change: The Water and Climate Bibliography—a searchable database of over 3,000 references on this issue (www.pacinst.org/resources).

Another Water Brief in this new report updates progress in the area of the human right to water—covered in a full chapter in the 2000–2001 volume. While some still consider a human right to water to be a debatable legal issue, most in the legal and professional water community have come to accept the arguments made in support of such a right. Indeed, the United Nations General Comment 15 in fall 2002 clearly supports a legal right to water. This brief brings readers up to date on this issue and provides the full text of the United Nations General Comment.

The last Water Brief is an update of the enormously popular Water Conflict Chronology—published regularly since the first *World's Water* was released in 1998. Re-

searchers and readers from around the world have consistently commented on its value as an analytical and educational tool and on its historical interest. Many new entries have been added and we will continue to maintain this as a regular feature. It is also available at www.worldwater.org.

Finally, as always, we are delighted to provide an extensive section of water-related data. Data Tables 1 and 2 on water availability and use by country remain consistently the most sought-after data by researchers, media, and the public, and we update them again here. Other data are also updated from prior volumes, but new data on bottled water use, among others, are also provided. All four volumes now offer unique data sets as well as some consistently updated data (take a look at the comprehensive Table of Contents and Index to get a listing of the data tables from all the volumes).

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