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**Commission Report**

# world WATER

## vision

**Commission Report**

# **A Water Secure World**

**Vision for Water, Life,  
and the Environment**



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HE Dr. Mahmoud Abu-Zeid  
President, World Water Council  
Cairo, Egypt  
February 15, 2000

Dear Dr. Abu-Zeid,

I am most honored to transmit herewith the report of the independent World Commission for Water in the 21<sup>st</sup> Century.

In accepting your mandate in August of 1998, we committed ourselves to two objectives:

- To complete the task in time for the meetings in The Hague in March 2000.
- To undertake the exercise in a participatory manner that would involve all the stakeholders, especially women.

I am happy to note that these two objectives are being met.

This report is but one of the many outputs of the major effort to involve literally thousands of people and hundreds of organizations in the preparation of thematic, sectoral, national, and regional perspectives on the long-term issues of water. We sincerely hope that these efforts will continue. We see the meetings at The Hague, where our report will be presented to the world, as the capstone of one phase of the work and the launching pad for the next, broader phase, where Vision gets translated into action on the ground.

We are most pleased that the theme retained by the World Water Forum this year is going to be “from vision to action” and that the Global Water Partnership is actively involved in developing the Framework for Action to follow-up with coordinated action on the messages of The Hague. It will be an important complement to the World Water Council’s work in preparing for subsequent World Water Forums and in your cooperation with the international agencies on the preparation of a periodic report on the global water situation.

While individual members of the Commission would have preferred different wording in certain sections, they all felt that the broad thrust of the report and its recommendations was one that they could agree with and support. These messages are spelled out in the opening section of our report and could perhaps be summarized as promoting:

- Holistic, systemic approaches based on integrated water resource management.
- Participatory institutional mechanisms.
- Full-cost pricing of water services, with targeted subsidies for the poor.

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- Institutional, technological, and financial innovation.
- Governments as enablers, providing effective and transparent regulatory frameworks for private action.

This will not happen unless attitudinal shifts occur, resulting in:

- The mobilization of political will.
- Behavioral change by all.

All of the members of the Commission recognize that much more work will be needed to mobilize the requisite political will and to make possible the channeling of the enormous potential of community action and private sector investment to the sector. Indeed, despite the laudable efforts undertaken by many groups in the preparation of this Vision, more needs to be done at the country and basin level to:

- Get more precise figures for water quantity and quality.
- Identify financial resources and investment needs.
- Install the adequate incentives to make this investment happen.

All this will also lead to a better understanding of the changes required in the regulatory regimes that would enable basin-level management of water, protect the environment and serve the public interest in terms of water quality and sustainable development patterns, while empowering women and the poor to participate in decisionmaking and inciting the private sector to invest.

My colleagues and I who served on this Commission stand ready to help with these important tasks.

I look forward to staying in touch with you for the preparation for The Hague meetings, and beyond.

With all best wishes,

Sincerely,

Ismail Serageldin  
Chairman  
World Commission for Water  
in the 21<sup>st</sup> Century

# Acknowledgements

The work of the World Water Commission is founded on the efforts of thousands of individuals around the world who took the time to reflect on the state of water resources and the need to manage them better for the security of humans and of all life on the planet we share. We gratefully acknowledge the contributions that have produced the many documents serving as the basis for our reflections, which we hope will help us move to a more water secure world for our children. To them we dedicate this Report.

While we cannot name all who have contributed, we would like to express our special appreciation to a few. First, to the WWC and its President Dr. Mahmoud Abu-Zeid, who had the inspiration to launch the Vision exercise and convene the independent Commission and give it unstinting support. Second, to all the international agencies that co-sponsored the Commission and its work on the participatory Vision exercise. Third, to all the governments and agencies whose generous funding made this exercise possible. For the content of our work, we express our appreciation to the senior advisers. This group includes senior specialists in the fields of water and the environment drawn from some of the organizations that sponsored the Vision exercise, as well as others well-known in the field. They include Mohamed Ait-Kadi, President General Council of Agricultural Development, Rabat, Morocco; Arthur Askew, Director, Hydrology and Water Resources Department, WMO, Switzerland; John Briscoe, Senior Water Adviser, World Bank, Washington D.C., United States; Roger de Loose, General Coordinator, Poverty and Hunger Alleviation Task Force, Rotary International, Antwerp, Belgium; Bert Diphooorn, Senior Water Adviser, Ministry of Foreign Affairs, The Netherlands; Farouk El-Baz, Director, Center for Remote Sensing, Boston University, Boston, Massachusetts, United States; Walter Falcon, Director, Institute for International Studies, Stanford University, Stanford, California, United States; Malin Falkenmark, Senior Scientist, Stockholm International Water Institute; Gourisankar Ghosh, Chief, Water, Environment, and Sanitation Department, UNICEF; Henry J. Hatch, Chief Executive Officer, American Society of Civil Engineers, Reston, Virginia, United States; Richard Helmer, Director, Division of Operational Support in Environmental Health, WHO; Torkil Jonch-Clausen, Director VKI Institute for the Water Environment, Horsholm, Denmark; Guy Le Moigne, Senior Advisor, World Water Council; Roberto Lenton, Director Sustainable Energy and Development Division, United Nations Development Programme, New York, United States; Richard Meganck, Director, Unit of Sustainable Development and Environment, Organization of American States; Aly Shady, Senior Policy Advisor, Canadian International Development Agency, Ottawa, Canada; Motoyuki Suzuki, Vice Rector, The United Nations University; Andras Szöllösi-Nagy, Director, Division of Water Sciences, UNESCO, Paris, France; Sandra Postel, Global Water Policy Project, Amherst, Massachusetts, United States; and Pierre-Frederic Tenière-Buchot, Senior Water Policy Advisor, UNEP. To these people we express

our appreciation for their reviews of numerous drafts of various documents prepared during the Vision exercise (including the first draft of this document) to provide professional judgement and to advise on priority issues. The Commission alone is responsible for any remaining errors and for the views expressed.

We express our thanks for their tireless efforts to the staff of the World Water Vision Unit of the World Water Council and others who supported them in their service as Secretariat to the Commission. These include William Cosgrove, Director, World Water Vision Unit, World Water Council; Frank Rijsberman, Deputy Director, World Water Vision Unit, World Water Council; and Anne Baer, Bozena Blix, Malia Bouayad-Agha, Bongwiwe Cele, Inas Elleham, Subhrendu Gangopadhyay, Constance Hunt, Ariana Morris, Arienne Naber, Toshio Okazumi, Delbra Rivers, and Ruud van der Helm all with the World Water Vision Unit, World Water Commission.

Finally, we express our thanks to all of those agencies and governments who have supported our efforts, particularly the Ministry of Public Works and Irrigation of Egypt, the Stockholm Environment Institute, and the government of The Netherlands, who hosted the meetings of the Commission.

Once again, our heart-felt thanks to the many thousands unnamed here who have made the Vision process a success and contributed to the launching of a movement to ensure a water secure world for future generations.







**For a Water Secure  
World: Directions  
for Action**

*Water is life. Every human being, now and in the future, should have access to safe water for drinking, appropriate sanitation, and enough food and energy at reasonable cost. Providing adequate water to meet these basic needs must be done in an equitable manner that works in harmony with nature. For water is the basis for all living ecosystems and habitats and part of an immutable hydrological cycle that must be respected if the development of human activity and well being is to be sustainable.*

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**We are not achieving these goals today, and we are on a path leading to crisis and to future problems for a large part of humanity and many parts of the planet's ecosystems. Business as usual leads us on an unsustainable and inequitable path.**

**Achieving these goals requires drastic changes in the manner in which water is managed.**

**A holistic, systemic approach relying on integrated water resource management must replace the current fragmentation in managing water**

**There are those who see water only by use: water for municipalities, for industry, for irrigation, for the environment, as if the last were a competing use, not an inherent part of maintaining the entire ecological system on which all water services depend. Or those who look at political and administrative boundaries as the basis of decisionmaking when these seldom conform to the catchment and basin areas that nature prescribes as the management units for water.**

## For a Water Secure World

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But it is as much by activities on land that we affect the quality and availability of useable freshwater as by the direct withdrawals that humans make. A holistic approach means taking these issues into account—and linking the quality and quantity aspects of water management. Water is affected by everything, and water affects everything and everyone.

### **Participatory institutional mechanisms must be put in place to involve all sectors of society in decisionmaking**

The old model of “this is government’s business” must be replaced by a model in which stakeholders participate at all levels. At the local level community groups and user associations have a major role—sometimes in providing and managing local sewerage or irrigation works, sometimes in monitoring the performance of public and private service providers, sometimes in managing land use in local watersheds. At more aggregate levels, water users have a major role in “user parliaments”, which work with government to manage aquifers and river basins. Experience shows that this participation must be real and not symbolic, and it shows that these users associations and parliaments must have a decisive role in deciding what is done, how it is done, and who pays for it. Experience also shows that what works is partnerships between governments and stakeholders, with governments playing a vital role in creating the enabling environment and in providing technical and enforcement support. Empowering women’s groups, the poor, youth, and community-based groups to have an adequate voice in participatory decisionmaking is a necessary pillar of this approach.

## **Fresh water must be recognized as a scarce commodity and managed accordingly**

Full-cost pricing of water services with equity will be needed to promote conservation and to attract the very large investments that are needed. Polluter pays and user pays principles must be enforced. And mechanisms must be found whereby those who use water inefficiently have incentives to desist and transfer that water to higher-valued uses, including environmental purposes.

## **Fresh water must be recognized as a basic need, with adequate access ensured for the poor**

Water is a fundamental need. All human beings, including the poor and the marginalized, must have access to water. To ensure access for all with full-cost pricing of water will often require financial assistance to help poor communities develop and manage their own water supply. The level and breadth of subsidies will obviously need to take account of the overall level of resource availability to governments in different settings. Subsidies should be delivered directly to people, not to service organizations, in a manner that is transparent and well targeted. It is essential to separate the welfare task (the task of government) from the business task (which service organizations should be asked to do).

The public goods nature of the needs of future generations, of nature, and of people outside of the political and administrative units where decisions are being made must be recognized. Governments must not shirk their responsibilities to protect the public goods nature

## For a Water Secure World

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of wetlands and groundwater or to ensure the water-related services necessary for the health needs of all people at all times.

### **Incentives for resource mobilization and technology change are needed**

Incentives must be found to mobilize resources for water-related investments, promote new science and technology to address water issues, and harness the traditional wisdom of the people who have lived with nature for centuries—and to promote the deployment of new environmentally friendly technologies. Existing knowledge and technology is often not applied but it needs to be used more extensively. From rainwater harvesting to biotechnology, traditional wisdom should be tapped along with the newest cutting edge of science and technology.

Resources will be required to provide greater protection of the environment, to undertake the needed investments, and to ensure that the interests of the poor are addressed. These resources will be partly financial, coming from government funds, international agencies, and private sources. They will come partly from community-based labor and energy, which can greatly reduce investment costs. They will come partly from scientific and technological ingenuity. The financial demands far outstrip the limited capacity of government budgets. Scarce public funds must increasingly be targeted to ensure that public responsibilities—the needs of the poor and the environment—are adequately funded. Investment for services must come increasingly from the private sector.

Experience over the past decade has given a glimpse of the potential of the private sector in mobilizing the huge resources that are required, and has shown that a transparent, predictable regulatory regime is essential to protect the interests of consumers and investors. Experience has also shown that the insertion of the private sector means new and highly productive pressures on public service providers, which often operate without competition, regulation, or accountability.

### **Political will is needed**

Difficult decisions and complex tradeoffs can be minimized by seeking win-win solutions, but they will not be eliminated. A technically and scientifically informed, participatory, transparent process of decisionmaking at all levels (from the community to the river basin) must be put in place as the action arm of integrated water resources management.

### **Governments are key actors**

Governments, both national and local, are the sovereign and legitimate decisionmaking bodies. They will be the key actors to make all this happen—not by undertaking the tasks themselves (although they must act responsibly in the budget decisions that are made for investments), but by setting the enabling framework for local community-based action and for a properly motivated and regulated private sector. Such a framework would promote the adoption of environmentally friendly and socially responsible technologies and investments. Government agencies must also be involved in protecting the long-term interest of all by acting as the custo-

## For a Water Secure World

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dians for—and champions of—the environmental and social dimensions of water management, even when it goes beyond their borders. Cooperative mechanisms and consultative processes for the settlement of competing claims across administrative and sovereign borders are part of this overall framework.

### **Behavioral change is needed by all**

We are all involved in the management of water, by what we choose to do or not to do. Unless human behavior changes dramatically, technological solutions will be for naught. Public awareness, education, identification and dissemination of best practices, and incentives for action are all part of realizing this vision of a sustainable, equitable future where all human beings have access to enough clean water, sanitation, food, and energy. A sustainable future where not only equity for humans in the use of water is assured, but one where all species and habitats shall flourish, and humans treat the earth not as something that we inherited from our parents, but as something that we borrowed from our children.

### **Going beyond Dublin and Rio de Janeiro**

Many parts of the world are already experiencing water stress. In Dublin and Rio de Janeiro the international community adopted sound principles for dealing with this challenge. These “holistic,” “institutional,” “gender,” and “economic” principles have been part of a broad global consensus on how water should be managed, at least since the Dublin Conference on Water and the Environment in 1992 and the Rio Earth Summit



of 1992, which devoted Chapter 18 of Agenda 21 to water. The goal of the World Water Commission is to build on the Dublin and Rio principles and identify critical priority actions that will result in more effective and rapid progress. This report extends Dublin and Rio in three critical ways. First, it shows that the arithmetic of water in coming decades does not add up. To ensure that environmental quality is improved and people's needs are met, there must be a redoubled effort at technological, financial, and institutional innovation. With regard to technological innovation this means mobilizing the knowledge and investment capacity of the private sector and supplementing it with strategic public investments. With regard to institutional innovation, the core challenges are stimulating new forms for the involvement of citizens in managing water and providing incentives for private sector involvement. The Commission emphasizes that unless full-cost pricing for water services becomes accepted practice, none of these will succeed.

### **No more business as usual**

Considerable progress has been made in many countries, and yet at a macro level the arithmetic of water still does not add up. In the next two decades it is estimated that water use by humans will increase by about 40%, and that 17% more water will be needed to grow food for a growing population. In addition, the water demands for industry and energy will increase rapidly. And we know that aquatic ecosystems throughout the world have been degraded and will need greater protection and that water quality is deteriorating in poor countries. In short, with current institutional

## For a Water Secure World

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arrangements and current technologies, the arithmetic of water simply does not add up. Rapid and imaginative institutional and technological innovation are required. “Business as usual” will not do. With the commitment of all, however, the problems can be overcome. A water-secure world is possible, but we must change the way we manage water, starting now!

\* \* \*

These are the messages that the World Commission for Water in the 21<sup>st</sup> Century has tried to encapsulate on the occasion of the Millennial World Forum on Water being held at The Hague in March 2000. The forum is but a part of an unprecedented participatory effort that has involved thousands of people and hundreds of organizations from all over the world in preparing a Vision for the future.

This enormous participatory exercise has produced many sector visions—for water and sanitation, for food and agriculture, for water and nature. It has also explored many themes, from institutions to biotechnology, from the information revolution to the energy future. Many sources of data, models, and forecasts were woven together in various scenarios for discussion. All these were confronted with the local realities, as national and regional vision exercises were launched in more than 30 regions and nations. More than 100 meetings were held.

The results of all these efforts are being published, with each group signing its own effort. The synthesis of many of these findings is given in a separate staff report prepared by the Secretariat to the Commission, with the support and guidance of the Chairman of the Commission. While the Commission

has carefully reviewed and considered these findings and exercises, this report does not constitute a summary of these efforts. It is the independent view of the Commission.

The Commission sees the launch of the World Water Council-led Vision as a continuing process. The Hague 2000 meeting is only one milestone in the ongoing journey from Vision to action. The Global Water Partnership-led effort, entitled Framework for Action, is intended to help lay out a path for bringing some measure of cooperation and coordination to the implementation of the vision.

The Hague 2000 events are both a capstone of one stage and a launching pad for another greater effort. This is a broad-based, inclusive movement to bring the issues of water management to the fore, and to ensure that the Vision—and all the other exercises it has given birth to—are implemented in this participatory, technically and scientifically informed, and consistent manner.





**The Water Crisis:  
Where We Are Today  
and  
How We Got There**

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## The setting

**In a world beset by financial and political challenges, the fragility of the key ingredient in our ecosystem is not getting enough attention. At risk is the water system that we depend on for our survival.**

**Fresh water is a precious resource. Only 2.5% of the world's water is not salty, and of that two-thirds is locked up in ice-caps and glaciers. Of the remaining amount, subject to the continuous hydrological cycle, some 20% is in areas too remote for human access, and of the remaining 80% about three-quarters comes at the wrong time and place—in monsoons and floods—and is not captured for use by people. The remainder is less than 0.08 of 1% of the total water on the planet. It is precious indeed.**

**About 70% of this water is used in agriculture to grow the food and fibre on which human society depends. About 30% is used for municipal water supplies, for households, and for industry. Water is also used to generate electricity (hydropower**


## The Water Crisis

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and cooling for thermal power), for navigation, and for leisure. Finally, water is also required to sustain rivers and wetlands, to dilute pollution, and to wash away salts that would otherwise destroy farmlands.

These figures are global estimates. The lack of consistent and reliable data on both the supply and use of freshwater presents serious problems in efforts to manage this precious resource.

*The world is now beginning to feel the first pangs of a more chronic and systemic water crisis*



### **What has been achieved—and what problems loom**

In many ways there have been striking gains from water management in recent decades. More than a generation ago the world was haunted by the possibility of widespread famine. Not only has this not materialized, but the opposite has happened: food has been produced in such abundance that food-grain prices have been cut in half. This brings incalculable benefits to consumers, especially the poor. The principal driving force behind this abundance has been a huge expansion in irrigated area, the use of high-yielding varieties of crops, the application of fertilizers and pesticides, and improved management practices. In terms of water and sanitation, too, there have been impressive gains. Over the past 20 years, more than 2.4 billion people have gained access to water supply and 600 million to sanitation. The glass is indeed half full.

Despite these achievements, there is growing recognition that the world is now beginning to feel the first pangs of a more chronic and systemic water crisis.

First, there are the unsolved “old problems”: more than a billion people do not have access to water supply and three billion do not have adequate sanitation. And there is evidence of a slowdown in both the growth of irrigated land and the productivity of that land. Then there are the “new problems” of environmental degradation, for example:

- Aquifers are being mined at an unprecedented rate—10% of the world’s agricultural food production depends on using mined groundwater. Water tables are dropping in fossil aquifers, including in the western United States, and water tables are falling as much as a metre per year in many parts of China, India, Mexico, Yemen, and elsewhere.
- Water diversions for irrigation have had devastating effects in Central Asia, with the Aral Sea shrinking to a fraction of its original size.
- Urbanization and agricultural practices have reduced the Florida Everglades to less than a half of its original size, with corresponding losses in environmental functions.
- Lack of attention to maintenance of vegetation in catchments has contributed to flooding, as in the Chang Jiang (Yangtze River) in 1998.
- The Huang He (Yellow River) did not run into the sea for more than 220 days in 1997.
- The water quality of rivers and lakes is poor.

*There is evidence of a slowdown in both the growth of irrigated land and the productivity of that land*



## The Water Crisis

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- The rate of freshwater fish species extinction is five times that of salt water species.
- Deforestation and land degradation (impacts on flooding and siltation of reservoirs), salinization and water logging, and water contamination by chemicals, fertilizers, and human waste are all serious issues in many parts of the world.

The United Nations Water Conference in Mar del Plata in 1977, the International Conference on Water and the Environment in Dublin in 1992, and the Earth Summit in Rio de Janeiro in 1992 articulated and subsequently affirmed a set of principles for good water resource management. These are often referred to as the Dublin Principles. The first of these principles is the “ecological principle”, which requires that water be treated as a unitary resource within river basins, with particular attention to ecosystems. The second is the “institutional principle”, which recognizes that water management requires the involvement of government, civil society, and the private sector, and that the principle of subsidiarity must be respected. It also gives special emphasis to the role of women in water management. The third principle is the “instrument principle”, which requires that water be recognized as a scarce economic good and that greater use be made of user pays, polluter pays, and other market-friendly instruments.

In short, the water experts have stressed that the combination of demand management, reduced waste, and proper management of claims against water supplies would make a major contribution to the sustainability of the resource.

***Demand management, reduced waste, and proper management of claims against water supplies would make a major contribution***

## The gloomy arithmetic of water

It is useful to examine the aggregate balances of supply and demand, with due recognition of the fact that the issues of water are specific to time and place.

First, on the demand side of the equation, assume close to 2 billion more people on the planet, mostly in developing countries. Assume further that food consumption per person does not increase—a very conservative assumption, as all models forecast a growth in consumption with rising income and changes in diets. Assume further that the contribution of irrigation to that increment in food production is equivalent to the contribution of irrigation to all food production (about 40%)—another very conservative assumption since in the last spurt of agricultural production, the green revolution, irrigation accounted for about 80% of the increment. Assume further that all irrigation systems achieve water use efficiency of 70% at the basin level—a remarkable achievement if it were to come to pass. Then the International Water Management Institute (IWMI) shows in 2025 an increase of 17% in the demand for water for irrigation. (Relaxing any of those assumptions results in concomitant increases in the size of the deficit forecast.)

If this additional water for irrigation is not forthcoming, then the increases in rain-fed agriculture to meet the demand for food for nearly 8 billion people will be enormous and would have detrimental environmental impacts. It would require that far more land be cleared for agriculture, resulting in losses of forests and habitats and biodiversity on a massive scale.

*The increases in water used in agriculture to meet the demand for food for nearly 8 billion people will be enormous*

## The Water Crisis

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These increases in the demand for irrigation water are likely to be matched by increases of 20% and 70% in the demand for water for industry and municipal use.

What of the supply side? Our supplies of freshwater are not evenly distributed in space or time. Our ability to use these supplies depends, in part, on the frequency and magnitude of floods and droughts—both, according to the Intergovernmental Panel on Climate Change, likely to become more severe. What are the possibilities of increasing the proportion of rainfall that is captured? The traditional approach has been to build more dams or tap groundwater. As with all other aspects of water management, local circumstances vary widely. For example, while about 70% of hydroelectric potential is tapped in developed countries, the figure is less than 20% in developing countries.

Dam construction may continue to play an important role in some developing countries, but only if there is much greater attention to options assessment, social and environmental impacts, and the participatory decisionmaking processes. About 300 new large dams (higher than 15 metres) are being added each year to the more than 45,000 in existence. The recommendations of the World Commission on Dams, due in November 2000, are expected to provide clearer guidelines on when dams are appropriate and on how they should be planned, designed, built, and operated.

In many settings there is also scope for increasing rainfall capture through traditional water harvesting methods and groundwater storage. These environmentally friendly approaches need to be better known and more widely used.

*There is scope for increasing rainfall capture through traditional water harvesting methods and groundwater storage*



But there are also losses on the supply side—an estimated 1% of dam capacity is lost annually due to silting.

Desalination is sometimes seen as the supply-side solution. In recent years, the cost of desalination has declined sharply, driven by technological advances and declining energy prices and better management. All indications are that this technology will play a major role in providing water to coastal cities and industries, but it is unlikely that it will be cheap enough to provide water for the cultivation of most food crops. Treated wastewater can be used for agricultural purposes, and new technologies can reduce the cost of this treatment, but the bulk of water for agriculture will come from elsewhere.

In short, it is obvious that under current trends the arithmetic of water does not add up. Already our aquatic ecosystems are severely stressed: witness the Aral Sea and the Florida Everglades. Increasing withdrawals by the amounts described above would impose intolerable stresses on the environment, leading not only to loss of biodiversity but to a vicious circle in which the stressed ecosystems could no longer provide services for plants and for people. Unfortunately, only in very limited regions do we have precise figures of how much freshwater is available and a good knowledge of its quality. Systematically obtaining and updating such information is a necessity for sound water management decisions in the future.

### **Building on past efforts—but going beyond**

Experience also shows that major improvements can and have been made in the way in which water is managed.

*Under current trends the arithmetic of water does not add up*



## The Water Crisis


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In recent decades many industrialized countries have made tremendous progress. Water quality has improved, as evidenced by such showcases as salmon returning to the Rhine River. Participatory river basin management has become a reality in France and elsewhere, and the quantity of water used, in both absolute and per capita terms, has actually declined in the United States over the past decade. While serious water problems persist in rich countries, the situation is far more challenging in developing countries. On almost all counts—service coverage, scarcity, and water quality—poor countries have much worse starting conditions, and they have rapid growth in demand for water for people, for food, for industry, and for the generation of electricity. And since 3 billion people in developing countries still live on less than two dollars a day, these countries have only a fraction of the financial resources available to industrialized countries.

What is obvious is that progress, especially in developing countries, is much too slow, and that unless there are drastic changes, water shortages and environmental degradation will become the norm. More people than ever will be added to some of the areas of the planet that are already most vulnerable socially, economically, and environmentally.

This Commission has pinpointed two areas that need to be given immediate and high priority if the world is to escape the doom of the current water arithmetic. These are full-cost pricing of water, coupled with innovative approaches to subsidies, and technological innovation. We believe that these will be the instruments that make the overall approach of holistic integrated water resource management (IWRM) and participatory gover-

***Unless there are drastic changes, water shortages and environmental degradation will become the norm***



nance yield their hoped-for results. Implementing these measures will require political will and implies changes from current practices. But if more people are to achieve higher standards of living, we need to make some hard choices. The future is not for more of the same. It cannot be. The future can be bright only if we are ready to act. And act we must.



A large, stylized white number '3' with a white dot to its right, positioned above a horizontal white line. The number has a classic, calligraphic feel with rounded, flowing lines.

**A Holistic Vision:  
Articulating the  
Vision as Seen by  
the Commission**



*Every human being should have access to safe water for drinking, appropriate sanitation, and enough food and energy at reasonable cost. Providing adequate water to meet these basic needs must be done in a manner that works in harmony with nature.*

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### **Inspiring but difficult goals**

**Such is the Vision. What will it mean in terms of technology, institutions, incentives, behavior change, and investments to bring this Vision about in the next 25 years?**

**Four key points have to be made. First, it is essential to take a holistic approach to integrated water resources management (IWRM). Decisions must be participatory, technically and scientifically informed, and taken at the lowest appropriate level—but within a framework at the catchment, basin, and aquifer level, which are the natural units by which nature manages water.**

**Second, technology can and must change radically in order to adapt to the needs of the more water-conscious world. Less wasteful, more sensitive of the environmental and social dimensions of decisions, these technologies will draw on traditional wisdom as much as harness the revolutionary changes taking place in the biological, information, and energy fields. But technology alone will not bring**

## A Holistic Vision

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about the more desirable future. This requires behavioral changes at all levels of society—and everywhere. Indeed, technological change is not exogenous, but it will happen only if society provides stimulation and incentives for this innovation.

It is important to underline that this Commission does not believe that technological changes alone are enough. Nor does it believe that just by changing institutional arrangements we can achieve the desired outcomes. The future of hope that we sketched out in that Vision can come about only if there is wide adoption of the best existing technologies and practices, and rapid innovation and adoption of both institutional arrangements and new technologies.

Third, these institutional and technological innovations and changes will not come about unless water's economic, social, environmental, and political dimensions are adequately taken into account. This means full-cost pricing complemented by targeted subsidies, thus freeing the public sector to focus on what only it can do better—make decisions on welfare and the provision of public goods—and freeing the private sector to do what it does better—provide cost-effective services in an accountable and transparent way and mobilize investment.

Fourth, to bring about changes of the magnitude needed will require enormous funding, appropriately mobilized and targeted (table 3.1). The Commission has estimated that in order to reduce the number of people without water and sanitation services to about 330 million (reductions of 75% and 87%, respectively) and to

***The future of hope can come about only if there is wide adoption of the best existing technologies and practices, and rapid innovation and adoption of both institutional arrangements and new technologies***



**Table 3.1 The Vision—and what it will take to get there**

Country or region	1995	2025 Vision
<b>China</b>		
Population (billions of people)	1.20	1.52
Lacking access to safe water (billions of people)	0.40	0.08
Lacking access to sanitation (billions of people)	0.93	0.08
Average calorie consumption (calories per person per day)	2800	> 2750
<b>India</b>		
Population (billions of people)	0.93	1.30
Lacking access to safe water (billions of people)	0.18	0.07
Lacking access to sanitation (billions of people)	0.72	0.07
Average calorie consumption (calories per person per day)	2400	> 2750
<b>Sub-Saharan Africa</b>		
Population (billions of people)	0.58	1.13
Lacking access to safe water (billions of people)	0.29	0.06
Lacking access to sanitation (billions of people)	0.33	0.06
Average calorie consumption (calories per person per day)	2200	> 2750
<b>OECD countries</b>		
Population (billions of people)	0.87	0.93
Average calorie consumption (calories per person per day)	3300	3550
<b>Total developing countries</b>		
Population (billions of people)	4.76	6.53
Lacking access to safe water (billions of people)	1.30	0.33
Lacking access to sanitation (billions of people)	2.60	0.33
Average calorie consumption (calories per person per day)	2600	> 2750
Annual investment in water (billions \$)	70–80	180

Source: Vision Secretariat estimates.

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increase average caloric intake in developing countries from the current levels to no less than 2,750 calories per person per day—and where possible to 3,000 calories per person per day, or better—will require more than doubling investment from the current level of about \$70–80 billion a year to about \$180 billion a year. This will not come about without the systematic adoption of integrated water resources management, full-cost pricing, targeted subsidies to the poor and marginalized, and mobilization of the vast labor inputs available in poor rural communities. This will require an unremitting effort at public awareness and at engaging all parties everywhere on water issues and ensuring that the institutional fragmentation that has hampered past endeavors at holistic approaches to water management shall be overcome.

Even if the changes brought about are not sufficient to meet the desired targets set out in consonance with the goals of the Vision, the processes for meeting them are indicated here. If the processes are followed we can be sure that most of the poorest people will be able to meet their water needs by 2025. But we need to get started now. And we need to launch these new approaches so that the best practices of the few will become the standard practices of all. This will generate the necessary investments from the private sector and community resources. But we also must ensure that governments will provide the enabling environment and the requisite targeted and transparent subsidies, which would run in the tens of billions of dollars, to ensure adequate access for the poor. This would be far less than public spending in the conventional mode, which would simply perpetuate “business as usual” approaches.

***We need to get started now. And we need to launch these new approaches so that the best practices of the few will become the standard practices of all***



In the following sections we spell out in more detail these various recommendations. We consider them all to be mutually reinforcing and certainly needed. If we have devoted less space to some (such as participation) than to others (such as pricing), it is because we believe the former is better known and understood, not that it is less important.

### **Why integrated water resource management?**

Arguably the largest task is going to be managing the allocation of water for direct use to meet human needs and protect the environment. Arbitration of claims among competing users is needed, and it cannot be done in a vacuum. It requires that we shift the framework of analysis from the narrow views of sector users or the artificial boundaries of administrative and political units to the natural boundaries of the catchments, basins, and aquifers. Only then will the quantity and quality issues be adequately addressed in a coherent framework. This framework incorporates the intersection of three complex and rapidly changing systems: the environment, of which water is a vital part for all living things; the hydrological cycle, which governs the flow and regeneration of water; and the human socioeconomic system of activities.

In an increasing number of river basins and aquifers around the world, water is already fully or over allocated. A vital task is that of simultaneously reducing (or capping) abstractions and allowing new, high-valued claimants access to water while protecting the needs of the poor and the environment. This problem is, of course, most acute in arid areas of the world. In many


*The largest task is going to be managing the allocation of water for direct use to meet human needs and protect the environment*

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of arid countries—including Australia, Brazil, Mexico, and the Western United States—the phenomenon of formal water markets is being established and maturing. Formal water markets are a central part of a solution to the classic common property resource problem. This solution involves restricting access by potential new claimants and creating incentives for existing claimants to manage the resource instead of overexploiting it, usually by assigning rights to the resource. Government plays several vital roles in this, namely in facilitating and sanctioning the organization of users into basin and aquifer associations, protecting the legitimate interests of third parties, acting as partners by providing information, and helping monitor and enforce agreements.


*Water markets provide incentives for water to be voluntarily transferred from low-value uses to high-value uses*



The great benefit of water markets is that they provide users with clear signals on the opportunity cost of the resource and incentives for water to be voluntarily transferred from low-value (often environmentally destructive) uses to high-value (often more environmentally responsible) uses. And in so doing water markets often negate the need for further construction of dams and other water control structures. Water markets have spread rapidly in the past decade and will undoubtedly play a major role in the future. They require the establishment of property or sharing rights for water. These rights must be established at the surface or groundwater basin level and must take into account traditional rights. This process is complex and requires careful management of basins within a single sovereign country. Water markets are even more difficult to manage in the case of international waters.

Is the environment as a claimant for water competing with human uses? Clearly not. The environment (broadly defined) is the foundation on which the entire ecological and hydrological systems function and thus must be seen as part of the reality we are dealing with. Human uses are the ones to be arbitrated, but in a context that ensures the robustness of the underlying ecological and hydrological systems—and their ability to regenerate from the vagaries of seasonal or long-cycle fluctuations and continue to sustain the growing human and biological populations that will rely on these systems for their existence.

*Every river basin system should be managed holistically*



To understand the boundaries of the acceptable levels of human interference with the environment will require both more data and research than is now available, and data that are publicly available in forms that can create awareness and guide decisionmaking. This requires priority research. But ensuring attention to environmental concerns can be helped by making decisions at the basin level.

So what can be done to increase the adoption of basin-level and aquifer-level management?

**How to achieve integrated water resource management:  
Basin- and aquifer-level associations**

If the IWRM principle is adopted, then basin-level systemic management is clearly needed. Every river basin system should be managed holistically. Accordingly, governments should set up management agencies at the basin and aquifer levels, and international funding

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agencies should be willing to support and help finance the setting up and strengthening of such agencies.

For this recommendation to be operational, in each case some clarifications are needed. There is clearly a hierarchy in space: catchment, basin, sub-basin, and so on, each nested within the larger one. They are part of an organic whole. The functions of the basin agencies must also reflect that hierarchy, with decisionmaking pushed down to the lowest appropriate level, known as the principle of subsidiarity. But clarification is needed for how a geographic-based agency relates to the mandate of the sectoral agencies and the administrative and political units which do not generally correspond to the basin boundaries. This clarification will be needed and codified in each case so that effective action can flow from the institutional arrangements and to avoid having these new agencies become just another bureaucratic layer that contributes to the current and ongoing fragmentation of decisionmaking in water.

There must also be clarification of the decisionmaking processes within the basin organization and accountability arrangements for those making the decisions. The experience of water user parliaments needs to be generalized so that all stakeholders have a voice in the decisionmaking.

The creation of such agencies is consistent with two global trends: the demand from stakeholders for a role in managing their resources and the related trend towards greater devolution in all countries. Going back to the historic experience in the Ruhr Basin in Germany at the beginning of the 20<sup>th</sup> century, a model for par-

***The experience of water user parliaments needs to be generalized so that all stakeholders have a voice in the decisionmaking***





ticipatory basin management has developed. The German model was adapted and scaled up by France in the 1960s. In recent years many countries, including Brazil, Mexico, South Africa, and Zimbabwe, have adopted similar approaches to basin management. A central feature is the integration of participation and the use of economic instruments. It is not by accident that the French basins are governed by parliaments and are known as river basin financing agencies. Money is the lubricant of accountability in these systems, with most of their revenues raised from user fees and polluter fees and applied to priority public works—many for environmental improvement in the basins.

*It is equally imperative that decisionmaking be informed and scientifically and technically sound*



It is equally imperative that decisionmaking be informed and scientifically and technically sound. Effective river basin management thus walks on two legs: parliaments, where users make policies and decide on the raising and spending of money, and excellent technical agencies, which provide the parliaments and users with the raw and processed information necessary for management.

### **International waters and national sovereignty**

If we accept the principles of integrated water resource management, we must recognize that some 260 rivers are shared by two or more countries and that we need to promote ways of minimizing conflicts between riparians and advocating best use of the water at the basin level. Actually, many of these rivers have brought countries together and promoted collaboration between them, though not always on issues of water. Transport, trade, and other issues have been actively managed by

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various mechanisms and the experiences of the United States and Canada and the riparians of the Rhine and the Southern African countries shows that riparian states do not have to define their relationships exclusively around the sharing of water. In fact, the effective management of water could become a vehicle for collaboration as much as its absence could be a source of conflict.

A distinguished group of statesmen—honorary members of this Commission—have looked at the issues of national sovereignty and international waters and produced an independent report as part of this overall Vision exercise. It is published separately, but many of its recommendations deserve the attention of decision-makers in riparian states.

Among the helpful ways of thinking about this problem is to note that issues of water quantity and the sharing of total resources can be a cause of competing claims and conflict. Thus dealing with conflict avoidance and the possible use of an ombudsman or a mediation panel should be considered in mature relationships between riparians—relationships that usually involve many other facets beyond water sharing. In limited relationships it may be necessary to conceive of confidence-building measures and postpone any firm decisions on the long-term issues until the relationship matures.

However, quality issues can more readily be the basis of collaboration, if only at the level of getting the parties together to share information and develop action plans. There is valuable experience gained by the Global Environment Facility (GEF), the sole existing global mecha-

***The effective management of water could become a vehicle for collaboration as much as its absence could be a source of conflict***



nism to help with international waters issues (box 3.1). The GEF can help finance the actions and promote cooperation.

International law on shared waters is rather weak at present. It is remarkable that even the limited and relatively weak United Nations Convention on the Law of the Non-Navigational Uses of International Waters has taken 20 years to negotiate and is still at risk of not being ratified.

**Box 3.1 Cooperation in managing transboundary waters: the role of GEF**

With 50% of the earth's land surface made up of transboundary basins and 70% of the total surface oceans, the majority of the world's water resources must be managed internationally as transboundary ecosystems. These waters are included as one of the four focal areas of the Global Environment Facility (GEF), which was created as a pilot program in 1991 and restructured by the world community in 1994 as a permanent financial mechanism. GEF provides grant and concessional finance for the incremental cost of measures that generate global environment benefits in its four focal areas—climate change, biodiversity, international waters, and ozone depletion, as well as land degradation related to the four focal areas—through its implementing agencies, the United Nations Development Programme, the United Nations Energy Programme, and the World Bank.

Approximately 55 international waters projects are under implementation or preparation with GEF funding as a result of requests from 113 countries. They range from familiar river basins such as the Danube, Mekong, Niger, Nile, Okavango, Senegal, and the Upper Paraguay River to shared lake basins such as Malawi, Ohrid, Titicaca, and Victoria. Coastal oceans such as the Baltic, Bay of Bengal, Black Sea, the Caribbean, Gulf of Guinea, Mediterranean, Red Sea, South China Sea, West Indian Ocean, and Yellow Sea are also included. Of significance is that GEF does not just consider the basin or the ocean separately but seeks to integrate consideration of the impact of adjoining freshwater basins on coastal waters as part of its comprehensive approach to land and water resource management. This approach was adopted by the GEF Council in its 1995 Operational Strategy.

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Surely, weak as it is, it deserves to be approved if only as a first step towards a greater appreciation of the international character of water. In the meantime, the doctrine (embodied in the Convention) is of no appreciable harm to other riparians, and equitable and reasonable treatment of the precious resource must be the guide for pragmatic action in internationally shared river basins.

Beyond these issues, we specifically note that the issues of international groundwater are far less known or understood than those of surface water. But management of international aquifers presents many of the same issues of traversing international political boundaries, and issues of quantity and quality aspects of groundwater management will be as crucial as surface water management in the years ahead.

Experience shows that countries can and do work together to address international water issues. The experiences of cooperation on the Rhine and the Great Lakes are well known. The end of the Cold War, with its associated search for peaceful, cooperative international relations, has had a profound and positive impact on international water management. Riparians are now working actively in many river basins—including the Danube, the Mekong, the Nile, and the Zambezi—to establish mutually agreeable management arrangements. And some countries have unilaterally “raised the bar” for others. South Africa is a shining example: by acknowledging international law and obligations within its constitution, South Africa has recognized the rights of its neighbors to water from rivers that originate within its boundaries.

***Quantity and quality aspects of groundwater management will be as crucial as surface water management in the years ahead***



## Participation is the key

The key to making the IWRM-inspired institutional reforms work is the participation of all the actors in the decisionmaking process. This means governments (both national and local), private and public sectors (both formal and the informal), civil society, women's groups, nongovernmental organizations (NGOs), community-based groups, professional associations, environmental groups, and user associations. Only with the participation of key actors at all these levels will it be possible to develop policies that will have broad support and to put in place mechanisms of decisionmaking that will have legitimacy. In this effort, it is essential to ensure that special outreach to empower women, minorities, and the poor to fully participate in the processes of decisionmaking—and that these efforts not be token ones.

*Only with the participation of key actors at all these levels will it be possible to develop policies that will have broad support*

So central is the idea of participation that we consider it the second essential pillar with IWRM. To make this happen, however, experience shows that exhortations alone are not enough and that there will be transparency and accountability only when financial arrangements are consistent with participatory management. Accordingly, we now turn our attention to the issue of pricing.

## Full-cost pricing

Commission members agreed that the single most immediate and important measure that we can recommend is the systematic adoption of full-cost pricing for water services. This recommendation is based on the following observations:

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- *Far too few public resources are devoted to public goods, especially environmental enhancement.* Even in many middle-income countries in Latin America, for example, less than 10% of sewage is properly treated. Economic growth is an essential precondition for greater investment in these public goods. But it is also essential that a much greater proportion of available funds be used for public goods, rather than for subsidizing what are largely private urban water supply and irrigation services.
- *Free water leads to wasted water.* When water is metered, consumption drops. Where services are free, the result is inevitably politicization of the concerned agencies, inefficiency, lack of accountability, capture of the subsidies by influential groups, and a vicious cycle of poor quality services, water rationing, and insufficient resources for operation, maintenance, and investment. In almost all cases, the poor end up without access to water. They also pay exorbitant prices for inferior and unreliable services provided by unregulated vendors and bear the brunt of environmental degradation.
- *Considerable resources invested in the water and sanitation sectors in developing countries—estimated at \$30 billion a year—are used inefficiently.* In most urban water systems, unaccounted for water is as much as 50% of total water production—and in some instances as high as 70%. In many public irrigation systems only 30% of water supplied is actually used by plants. This is unacceptable when half of the people of the developing world live on less than \$2 a day—and when more than 1 billion peo-

**The single most immediate and important measure is the systematic adoption of full-cost pricing for water services**

ple have no access to clean water and 2 billion lack adequate sanitation.

- *Governments in developing countries cannot meet the investment demands for water services now, let alone for the future, yet they are under-investing in public goods.* The main alternative to relying on governments is to attract private investment for urban water and sanitation and irrigation services. But it is axiomatic that private parties will not invest unless they can be assured of a reasonable return on their investments and unless they can be assured that political risks are being acknowledged and managed. There is no rabbit to be pulled out of a hat—this return has to come from those who benefit from the service provided.

***Without full-cost pricing the present vicious cycle of waste, inefficiency, and lack of service for the poor will continue***

The situation is clear—without full-cost pricing the present vicious cycle of waste, inefficiency, and lack of service for the poor will continue. There will be little investment from the private sector, services will be of poor quality and rationed, and there will be little left for investing in water quality and other environmental improvement. The corollary is that there could be a “virtuous cycle”, too. This could be one in which users pay for the services they want, in which urban utilities and irrigation agencies provide these services efficiently and accountably, in which users pay the costs of these services, in which investors place their money, and in which public funds are used primarily for public purposes. Fortunately, there is evidence that such a virtuous cycle is possible—and that it is possible, with political leadership, to make the transition from vicious to virtuous cycle.

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A reality in many developing countries is that many people are poor and cannot afford to pay the full costs of conventional water and sanitation services. Experience has shown that there are several core ingredients in addressing this central problem. First, it is necessary to recognize that it is a legitimate, indeed central, role of government to provide safety nets for poor people. Second, it is imperative that subsidies be provided to people, not to service providers. This both ensures that service providers are accountable to poor people and allows service providers to do what they should be doing, namely focussing their attention on providing the best service at the least cost (box 3.2).

Third, it is imperative that poor people be offered choices from a menu of services of different costs and qualities and that this include the possibility that they reduce financial costs by mobilizing their own labor. The experiences of the condominal sewerage system in Brazil and the Orangi Pilot Projects in Pakistan show

*A legitimate, indeed central, role of government is to provide safety nets for poor people*

### **Box 3.2** Water stamps in Chile

In Santiago, Chile, the government realized that it was inherently contradictory to require that an urban water utility function as a commercial entity and provide subsidized services to the poor, since each subsidized person served would represent a loss of revenue to the utility. Accordingly, the government decided to institute a targeted, means-tested, government-administered “water stamps” program, whereby poor people get “stamps” to cover part of their water bill. The utility then not only strengthened its focus (getting out of the welfare business and focusing on becoming the most efficient utility it could), but now had a clear incentive to serve the poor, who became revenue-generating customers like all others. The system works well.



how innovative approaches not only work properly but also offer choices to people (box 3.3).

Full-cost pricing has long been advocated in the irrigation sector, and yet has seldom happened. It is clear that it cannot and will not happen unless it is preceded by a fundamental reform in the service agencies. Farmers, quite reasonably, resist paying for services when they have no say about what these are and when they know that the irrigation agencies are inefficient and corrupt.

*It is imperative that poor people be offered choices from a menu of services of different costs and qualities*

**Box 3.3 User involvement in urban sanitation in Brazil and Pakistan**

The condominium sewerage system in Brazil represents a remarkable technological and institutional innovation for dealing with the sanitation needs of poor people. The technological innovation was to recognize that the costs of the feeder sewers within neighborhoods could be dramatically reduced by laying low-slope, shallow sewers through the backyards of blocks of houses. The main elements of the accompanying institutional innovations were to give people choices of service level and cost, with the lowest-cost system costing about one third of a conventional system and to develop a system of comanagement, whereby the utility is responsible for the trunk infrastructure and the community for the feeder infrastructure, thus involving the community in the management of their neighborhood sewers. Finally, because of the greatly reduced responsibility of the utility, its operating costs are sharply reduced. The condominium system is now providing affordable service to millions of poor people and has become the method of choice in many cities, including the national capital of Brasilia.

The Orangi Pilot Project in Karachi independently blazed a path, which is similar in many ways. In this case an innovative NGO works with communities in building low-cost sewage collection networks, the costs of which are fully paid by the communities themselves. These sewers now serve about one million people in a low-income area. This has freed the utility to concentrate its limited resources on constructing trunk sewers and treatment plants.

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As is demonstrated so clearly in the reform of irrigation in Victoria, Australia, and Mexico, putting users in the driver's seat is a necessary condition for full-cost pricing in the irrigation sector (box 3.4).

An important difference in the reality of the urban water sector and the irrigation sector is that urban water systems are primarily a local issue, whereas farmers are deeply and increasingly exposed to the forces of a globalizing economy. On the one hand, the forces of economic liberalization are positive in that they remove one of the main arguments for water subsidies, namely that output prices were suppressed. In many developing countries most of the input and output price distortions have been substantially removed. In Mexico in 1990, for example, price and input subsidies accounted for about 30% of value added in agriculture. Today these distorting subsidies have largely been eliminated. On the other hand, there is one very fundamental block to completing this revolution, namely the protectionist agricultural policies of some industrialized countries. These policies are estimated to cost developing countries \$20 billion a year in lost revenues (and for consumers in industrialized countries, welfare losses of \$60 billion!). What are developing countries to make of the rhetoric in favor of capital liberalization when rich countries—with full employment and strong safety nets—do not implement similar policies themselves? This Commission, accordingly, urges the rich countries of the world to eliminate their own agricultural subsidies. This will enhance the welfare of their own people and open markets for agricultural products from developing countries, facilitating the end of environmentally destructive subsidies on water and energy for water pumping in developing countries.

***Urban water systems are primarily a local issue, whereas farmers are deeply and increasingly exposed to the forces of a globalizing economy***



**Box 3.4 Irrigation reform in Australia and Mexico**

**Australia**—Farmers in Australia, as elsewhere, had long been accustomed to receiving government subsidies for irrigation. In the 1990s a series of events led to fundamental change in Australia, in general, and irrigation services in Victoria in particular. The precipitating factor was a state fiscal crisis and the decision to eliminate all subsidies to irrigation. Farmers reacted strongly, but once it was clear that there was no going back, they made several fundamental changes. First, if they were going to pay the full costs of irrigation services, farmers insisted that the irrigation agencies become accountable to them. Although the previous agencies were considered to be good operators, this increased accountability led to cost reductions of about 40%, without any loss of service quality. Farmers also became responsible for all replacement and investment costs, and thus made sure that all large capital expenditure items were subject to the question: Is it worth it? In many cases, they have found that they can eliminate some substantial new capital expenditures by accepting slightly less reliable services. After initial suspicion, farmers have also enthusiastically embraced the practice of tradable water and salinity rights as mechanisms for ensuring that water is allocated voluntarily to the highest-value uses and away from environmentally destructive areas. User associations have rapidly expanded their concerns into environmental management and have become cornerstones of Australia's innovative landcare program.

**Mexico**—The Mexican story has many similarities. In 1992 the government passed a new water law, which largely embodied the Dublin and Rio principles. Of particular note were two features—enshrining the principle of participation, from the irrigation district to the river basin management level, and formalizing property rights in water. Reform of the irrigation districts has been a remarkable success, and an inspiration for reforms in places as India and Turkey. At the heart of the "irrigation turnover process" was the idea that farmers could form user associations that could manage the irrigation districts. In less than a decade the results have been impressive. Over 92% of the 3 million hectares in irrigation districts have been turned over to the user associations representing half a million farmers. With users in the drivers' seat, many good things have happened. Cost recovery has risen from 30% to 80%. In some cases, user associations have mobilized their own funds for rehabilitation and investment. And in some cases, as in the coastal aquifers of Sonora, user associations have evolved into groundwater management agencies—with remarkable effect. In Hermosillo, for example, users have voluntarily reduced pumping by about 50%, bringing pumping and recharge into balance. This has been made possible both by participation, and by the fact that those who need water for high-value crops are able to obtain it through transactions in the water market.

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Finally, it is pertinent to note that the recommendation on full-cost pricing of water services is not new, yet it has been practiced far too infrequently. What can be done to help make the transition from the vicious cycle to the virtuous cycle (of which full-cost pricing is a central element)? As with all reforms, it will require ingenuity, political commitment, and adaptation to local circumstances. The experience of the city of Conakry in Guinea is enlightening (box 3.5). It suggests that an essential element will be to use targeted, time-bound subsidies to attract first-class service providers who can be paid the costs of their services and can provide users with high-quality services. Once service quality is improved and consumers are informed about costs, subsidies can be phased out gradually.

*To make the transition from the vicious cycle to the virtuous cycle will require ingenuity and political commitment*

In summary, the issue of pricing is, in the view of this Commission, central for three reasons. First, experience

### **Box 3.5** The transition from low-level to high-level equilibrium in Conakry, Guinea

In Conakry, Guinea, the performance of the water utility in the late 1980s was catastrophic—water was available for only a few hours a day, with the poor, as always, at the end of the line. The familiar low-level equilibrium prevailed—service was poor, people were not willing to pay, revenues were inadequate, service got worse, and so on. The government made creative use of an external credit to get to a high-level equilibrium. The assets were leased to a private operator who was paid a fee that reflected the full cost of the service. Users initially paid only about a quarter of this fee, with three-quarters of the operator’s fee covered by the external credit. Users were informed that service would improve and that as it did tariffs would be increased to cover costs over a five-year period. Although problems remain, this innovative approach worked well, with coverage increasing by 300% in the first five years of the contract.

shows that clarity about who is paying for what and what the resources are being used for is an essential requirement for accountability and participation. Second, pricing is a key element in eliminating waste and environmental degradation. And, third, pricing is central if the required quantum leap of investment in the sector is to occur.

### **Technologies for tomorrow**

Beyond the institutional issues are the questions of technology. Without major technological innovation, there is little hope of bringing the water equation into balance. There is no doubt that many technological changes can help improve services for millions and reduce the stress on water systems around the world.

Technological innovation exists at many levels. At the community level, innovative on-site sanitation technologies, such as ventilated improved pit latrines, have played a vital role, as have low-slope shallow neighborhood sewers made famous by the condominium system of Brazil and the Orangi Pilot Project in Karachi (see box 3.3). And there is much innovation to be done in recapturing the wisdom of the past, as has been demonstrated in rain harvesting systems in India (box 3.6) and China. This is also important in looking for traditional plants and wild races in breeding more adapted crops.

There are also vital needs for high-tech innovation. In some cases the application may be mundane—for example in the use of computer chips to control the digestion process in smart-composting toilets. In other cases,

*Clarity about who is paying for what and what the resources are being used for is an essential requirement for accountability and participation*

## A Holistic Vision

such as so-called precision agriculture, it will mean the integration of drip technology, computerized sensors of evapotranspiration requirements, and just-in-time and just-where-needed application of water and fertilizers. In recent years, breakthroughs in membrane technology have had profound effects in many areas, ranging from waste treatment to desalination.

*There are also vital needs for high-tech innovation*

A particularly promising and controversial area of innovation is biotechnology. Today, a revolution is taking place in the biological sciences. It is fueled by the groundbreaking work in modern molecular genetics, the breathtaking advances in informatics and computing, and the enormous private sums being invested in biotechnology research. While taking care of both the possible short-term and long-term consequences, the benefits of that revolution can and must be harnessed for solving the challenges of water in the interests of the poor and the environment (box 3.7).

### Box 3.6 Water harvesting in India

Where Indian communities have taken up water management themselves, they have not only ensured that the total investment costs were low but have also contributed substantially to these costs. For example, Tarun Bharat Sangh, an NGO, has been working with more than 500 villages in the Alwar district of Rajasthan, which have been encouraged to build almost 2,500 water harvesting structures. These villages have contributed to raise as much as 51% to 92% of the total cost of these structures, and over time, with the success of these efforts, the share of village contribution has been increasing. As of 1998 the total investment in the water harvesting structures was Rs. 150 million (\$3 million), of which Rs. 110 million had come from the villagers. The structures were also built by the village communities at extremely low cost—ranging from a low of Rs. 2 (\$ 0.04) per cubic metre of storage capacity to a maximum of Rs. 3 (\$ 0.07) per cubic metre.

Today, we are living in a time unmatched for the opportunities that it provides. New, higher yielding plants that are more environment friendly and more drought tolerant, plants that can grow in brine or have increased salt tolerance, edible vaccines, single-cell proteins to feed cattle and clean wastes, hyper-accumulating plants

*The benefits of the revolution in biological sciences can and must be harnessed for solving the challenges of water in the interests of the poor and the environment*

### **Box 3.7 The promises and challenges of biotechnology**

Despite the success of the Green Revolution today, we require a Doubly Green Revolution, a revolution that is even more productive and even more “green” in terms of conserving natural resources and the environment, and one that reaches the less favored areas bypassed by the first. This is a tough demand, but we believe it can be met by a combination of ecological approaches to sustainable agriculture; greater participation by farmers in analysis, design, and research; and the application of modern biotechnology directed towards the needs of the poor in developing countries, in particular those living in drought-prone areas.

Biotechnology can help by harnessing the enormous power of the new knowledge about genes and their functions and the ever-more sophisticated techniques for manipulating genes. Plants more resistant to salinity and drought, and plants whose metabolism require less water, are direct ways to reduce water requirements in agriculture. Likewise, developments in pest resistance (reducing chemical pesticide use) and nitrogen-fixing ability (reducing fertilizer use) could reduce pollution from agricultural runoff. Furthermore, single cell proteins for animal feed to reduce the need for crop residue consumption, or breaking the cellulose-lignin link to increase digestibility of such crop residues, could also increase biomass availability for more grain production for humans with the same amount of land and water. Biotechnology could also help in wastewater treatment for agricultural reuse. Finally, it could help increase yields in rainfed agriculture, thereby reducing the pressure to expand cultivated land areas with its negative impacts. Biotechnology is also expected to contribute to yield increases in irrigated agriculture. To reach the hands of hundreds of millions of very poor farmers and to address the needs of the environment, many of these biotechnology research programs may be of the public goods variety. These programs would require public funding for implementation through the CGIAR or other international or national not-for-profit agricultural research bodies.


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to take toxins out of the soil, and so much more. All of that, coupled with agronomic techniques suitable to the small holder farmer, can be marshaled in the coming years to yield “more crop per drop” of water.

Energy changes of the future will have equally profound implications. As energy costs have dropped (a trend that is expected to continue in coming decades) and as new technologies have been introduced, the cost of desalination has plummeted to less than \$1 per cubic metre. It is quite conceivable that with further advances, desalinated water could become the source of choice for municipal and industrial use in coastal cities.

***With further advances, desalinated water could become the source of choice for municipal and industrial use in coastal cities***



The technological possibilities are tantalizing and central to overcoming the gloomy arithmetic of water. But technological innovation does not happen in isolation, and so the question becomes what is needed by way of public policy to create the right climate for innovation and to ensure that these innovations are used to address the problems?

As described above, a major recommendation of this Commission is that there should be full-cost pricing for all water services (with governments dealing with subsidies in a transparent and targeted way). This will result in a huge increase in the role of the private sector as a provider and financier of water services to people and agriculture. Not only can this mobilize large-scale investments, but it will also mean that the private sector will be motivated to find ways to provide better services at lower cost—in short, to innovate. There are, however, some areas where innovation will not happen



without special attention. The question is whether the appropriate research will be done and whether the appropriate results will be deployed in the right places. This is not trivial, for there is a real danger that the benefits of proprietary science, driven by profits and patents, will focus on the needs of the wealthy or of services and products that can be sold in large markets. This would bring more and more to the privileged few rather than serve the needs of the billions of marginalized poor and their children.

*The private sector will be motivated to find ways to provide better services at lower cost—in short, to innovate*

Provocatively, we can say that the oil price shock of 1973–74 revolutionized the attitudes of the world towards the energy sector, prompting conservation measures in the most profligate societies and spurring investments in alternative and renewable energy sources. We are now experiencing a similar awakening of public consciousness concerning water.

What ties the prospects of these technologies together? It is the necessary framework for research and application that must meet three requirements:

- Providing adequate incentives for the private sector to contribute where it is well equipped to do.
- Recognizing the value of traditional knowledge and technologies that can be reevaluated and adapted to the needs of specific locations and people.
- Recognizing the public goods nature of much of the environmental or other aspects of water, which will require an effective program of public-sponsored research and development.

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### **No silver bullet, but an integrated package of reforms**

Every human being, now and in the future, should have access to safe water for drinking, appropriate sanitation, and enough food and energy at reasonable cost. Providing adequate water to meet these basic needs must be done in an equitable manner that works in harmony with nature.

It is clear that in striving to meet these lofty goals, we face both an unprecedented challenge and an unprecedented set of capabilities for dealing with this challenge. It is equally clear that there is no silver bullet, in terms of either institutional reform or technology.

- Full-cost pricing cannot happen unless service institutions are efficient, transparent, and accountable to users—and unless government gives poor consumers assistance in paying their bills.
- Participation cannot work unless users are able to raise financial resources and use these for purposes they agree on.
- The private sector will bring neither its money nor its management skills and know-how unless it can operate in a predictable, transparent regulatory environment—and unless it can get a reasonable return on its investment without undue political interference.
- Public providers will not be efficient unless they compete on a level playing field with private providers.


*Providing adequate water to meet human needs must be done in an equitable manner that works in harmony with nature*



- Government will not spend enough on environmental protection unless it is able to get out of the business of large-scale subsidization of private services for which alternatives are available.

What is equally clear is that it is possible to make this package of reforms work in the real world. To varying degrees, a number of countries—several of them mentioned in this report—have already taken important steps down this road. The hope of the Commission is that the meeting in The Hague will lead to a redoubled effort to move more broadly and more rapidly down this road. This, and the role of each of the various actors, is the subject of the next chapter.

***It is possible  
to make this  
package of  
reforms work  
in the real  
world***







**Framework for  
Action:  
Necessary Steps for  
Turning the Vision  
into Reality**

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## **Water management is everyone's responsibility**

**When sketching out our Vision of the future, we are often asked: Who will make it happen? Where will the funds come from? These questions are posed as though the person asking were not concerned—as though it were the responsibility of others to make it happen because the questioner is an observer, critic, or evaluator of the actions of others. This is not so. Water is everybody's concern. Water management involves every person on this planet—from the simple act of how water is used by individuals to the more direct involvement of everybody in how water is used in the home or on the job. Each of us has a role to play as a concerned citizen, as a member of a community, and as someone whose views must be heard on the topic in all these forums—be they formal or informal, specialized in water issues, or simply forums that bring people together for other purposes.**

**We hope that this Report will contribute to launching a worldwide movement for the better management of water. Having already spelled out the philosophical approach**

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(integrated water resource management), the institutional approach (participatory, basin-level organizations), and some of the key measures (full-cost pricing and targeted subsidies), let us address the scale of the challenge and the funding issues before we turn to the responsibilities of the principal actors.

### **Scale of the challenge and funding requirements**

How much investment will be required to reach the Vision of a world in which every human being, now and in the future, will have enough clean water for drinking and sanitation and enough food grown with adequate water?

Let us try to put some orders of magnitude. Given that agriculture is responsible for much of the water withdrawals, a clarification of the issues of food security is in order. Food security does not mean food self-sufficiency in each country or that each country grows within its own borders all the food required by its citizens. While most countries are expected to continue to meet the bulk of their food requirements nationally, both comparative advantage and water use efficiency considerations suggest that trade will play an increasing role in meeting the quantitative needs for caloric coverage. After all, it takes 2,000 tons of water to grow a ton of rice, and some 1,000 tons of water to grow a ton of wheat. Besides, food security is about many things, of which production is the most important but certainly not the only one. Food security involves recognition of access to the available food (income and purchasing power). It involves the manner in which the food is produced (ecologically sustainable), the complex farming

***Most countries are expected to continue to meet the bulk of their food requirements nationally***



systems of the smallholder farmers in the developing world, the policy framework (removing urban bias against rural and agricultural development), appropriate pricing and inputs, credit and distribution, appropriate technologies, and the nutritional content of the food being produced. Despite fully recognizing the multiplicity of factors that go into ensuring food security, for purposes of this Report we are only looking at the water dimension of growing enough food in an environmentally friendly and socially responsible fashion, to meet the quantitative requirements of global and regional food security. Clearly, much more needs to be discussed in terms of food security, but others are addressing this complex but important issue.

*Trade will play an increasing role in meeting the quantitative needs for caloric coverage*

Table 4.1 shows the level of capital investments that will be required to meet the Commission’s objectives. The figures represent investments in new infrastructure only, exclusive of the costs of renewing aging or badly maintained systems and of the costs of operations and maintenance. The total annual investment requirement of \$180 billion compares with \$70–80 billion currently

**Table 4.1** Indicative annual investment requirements

*Billions U.S.\$*

<b>Water use</b>	<b>2000</b>	<b>2025 Vision</b>
Agriculture	30–35	30
Environment, energy, and industry	10–15	75
Water supply and sanitation	30	75
<b>Total</b>	<b>70–80</b>	<b>180</b>

Source: Vision Secretariat estimate.




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being invested. The data are such that there are uncertainties in the numbers. What is clear is that there will need to be a quantum increase in the level and efficiency of investments.

The key to making investments more productive and to mobilizing new investments is the set of actions advocated in this Report. As detailed in earlier chapters, these include empowering communities to mobilize existing resources, making service agencies and water resource management agencies accountable to users, introducing appropriate pricing with transparent and predictive regulations, and creating incentives to mobilize the innovation and investment of the private sector.

***Each actor has a different and complementary contribution to make in order to create this new reality***



### **Defining the roles of different actors**

If something is the concern of all, it must be clear that each actor has a different and complementary contribution to make in order to create this new reality.

#### **The role of governments**

The role of governments is absolutely crucial. Even if the vast bulk of the funding required to make this Vision a reality comes from the communities as labor and energy and from large and small private sector investments, governments remain the sovereign bodies that must be the enablers to make this possible.

The primary responsibilities of governments will be the legislative and regulatory framework that governs water, from the creation of national and basin-level authorities, to providing the enabling framework for community action that empowers the poor, minorities,

and women's groups to participate fully. Furthermore, their macroeconomic policies must be sound, must encourage domestic saving and private entrepreneurship, and must provide the fiscal incentives for private investments. Their own patterns of investment in land and water must support, not undermine, the general approach we advocate in this Report. They must be able to provide an effective as well as transparent and predictable regulatory framework for private action.

While much of this cannot be done without leadership and a reinvigorated public sector, it is evident that this will mostly happen only when there is a demand from voters that the government perform this enabling and regulatory role. As mentioned in chapter 3, global experiences show that the introduction of the private sector as a service provider is (appropriately) accompanied by a demand from consumers that there be transparency, effective regulation, and proper service.

But as we move into the era of true public-private partnerships, governments must also ensure transparent and sustained rules for the accountability of public and private operators alike, for the enforcement of the polluter pays and user pays principles, and for the protection of environmental resources. Finally, governments will be the key agents for ensuring that as full-cost pricing is generalized, the offsetting targeted subsidies are in place to protect the poor and are not diverted to the rich, as has happened so many times before. The ideal way to do this is to completely separate the commercial and welfare functions. Rather than hidden, opaque cross-subsidies, subsidies need to be open and budgeted, with transparent mechanisms for targeting. This

*As full-cost pricing is generalized governments will be the key agents for ensuring that the offsetting targeted subsidies are in place to protect the poor*

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should not be confused with graduated tariffs to encourage conservation.

### **The role of communities and users**

The bulk of the contributions in rural and peri-urban areas will come from the people. First, it is salutary to remember that many of the poor already pay a huge price for water, typically 5–10 times more than would be necessary to pay the full costs of a well-run piped supply. Nevertheless, credit may be required for many, and microcredit schemes such as the Grameen scheme in Bangladesh that enable the rural poor to get tubewells show that microfinance systems can help. Extensive local knowledge exists for low-impact solutions to water harvesting (as described earlier for India), recharge of aquifers, and other means of using water more wisely in rural areas. Experience in Chile, India, Mexico, and Turkey shows that irrigation user associations can play a central role. Similarly, experiences from such urban successes as the Orangi Project in Karachi and the condominial scheme in Brazil show that the urban poor can effectively contribute their labor and energy, as well as their savings, in solving the water and sewerage problems of their communities.

As described earlier, transparent, on-budget subsidies to the poor are an essential part of the financing equation. These subsidies should empower local communities to find their own solutions, not subsidize the adoption of particular technical solutions, even if technical advice and information must be provided on the quality and quantity aspects of this water management.


***Transparent, on-budget subsidies to the poor should empower local communities to find their own solutions***



But it is essential that users and communities have a central role in the broader picture of sustainable water management. They have a major role in ensuring that service providers are held accountable, and they must be represented in user parliaments, which work with governments in managing aquifers and river basins. Such experiences are now emerging. For example, the user association that manages the Hermosillo aquifer in Mexico has managed the extraordinary feat of getting 50% reductions in pumping, so that abstractions now equal aquifer recharge. In the well-established river basin financing agencies in France, users decide on abstraction fees and polluter fees and on the application of these resources to priority investments. Such approaches are now becoming a reality in Brazil, Chile, Indonesia, Mexico, South Africa, and Zimbabwe. In all of this, global experience shows that money is the medium of accountability. If users are paying—even if from block grants—they will demand service; if they are not, supply and management agencies will end up being unaccountable, inefficient, and often corrupt. If public investments are financed out of user charges—even if supplemented by public resources—users will ensure that these resources are used most effectively.

Finally, local communities should be the guardians of sound water management practices, including involvement in monitoring quality and in ensuring that polluter pays and user pays principles are adequately enforced, by flagging violations. Local community empowerment and participation are the basic building block of any participatory approach. Women's groups have always been a key factor in promoting social capital, providing the glue that holds communities


*Local communities should be the guardians of sound water management practices*



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together. Given the gender dimension of hardship associated with lack of water access, women's voices must be heard in all water-related schemes (box 4.1). In short, community empowerment is essential for effective management of water systems and for the protection of the environment.

***Women's groups must be heard in all water-related schemes***



### **Box 4.1 Women and water**

Women are the major force in dealing with water in many communities. Their role in managing ecosystems, agriculture, fisheries, and marketing are well recognized. But whether it is unsafe water, poor sanitation, unreliable service, or reduced water supplies, it is women who end up bearing the inequities of the status quo. Unsafe water and poor hygiene leads to increased incidence of microbial diseases and greater time spent on tending the sick. Unreliable service means that women need to travel greater distances and spend long hours collecting water for domestic use. And water scarcity limits economic opportunities for women because many home-based, small-scale enterprises are adversely affected.

Bringing women into the decisionmaking loop concerning the planning, allocation, and management of water resources is vital. Ensuring that women's needs are addressed should be an essential element of enlightened public policy. These are not utopian ideas. A review by the World Bank of 121 water projects showed that ensuring women's participation in decisionmaking positively affects both project quality and sustainability.

At another level, it is encouraging to note that women professionals are playing an increasingly important role in project design and implementation. For example, in the GAP project in Anatolia, Turkey, 50% of the engineers are women. Unfortunately, such examples are few and far between, and there is an urgent need to replicate best practice examples and make them better known.

The Dublin Conference recognized that central role in a specific "gender principle" that calls for positive policies to address women's specific needs and empower them to participate at all levels in water resources programs. It is time to accept and systematically implement that principle.

### The private sector

Implicit in all of these reforms is a greatly increased role for the private sector in providing water services for people, irrigation, and electric power. The private sector can make a major contribution at several levels.

The first and most obvious contribution is in financing. The hope here is that the water sector can attract a small proportion of the estimated \$250 billion a year of private capital that now flows to developing countries—five times the size of official development assistance. And there are signs of hope. International private investments in water supply in developing countries have risen from virtually nothing to an accumulated \$25 billion over the last eight years. It is clear that a lot more money is available from the private sector for urban water, irrigation, and hydropower generation services. But it is equally clear that such flows will materialize only if investors are comfortable, which means that there is a predictable, transparent regulatory framework that protects the interests of investors and consumers alike.

Second, it is clear that the private sector can considerably improve the dismal technical and financial performance that characterizes most public utilities in developing countries. This means that large, existing infrastructure and financial resources can be used far more efficiently for the greater common good.

Beyond these broadly recognized impacts, there are more subtle, but equally important, consequences from the involvement of the private sector. First, it is important to recognize that the private sector serves less than

*The private sector can considerably improve the dismal technical and financial performance that characterizes most public utilities in developing countries*

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5% of all urban water consumers in the developing world. In the foreseeable future most consumers will still get their water services from public companies. These public companies are typically subject to no regulation and have no accountability to or contract with their users. Improving the performance of these companies is a vital policy challenge. Experience in many countries shows that the single greatest stimulus to improving the performance of public service companies is competition resulting from the introduction of private companies! For it is the inclusion of the private sector that catalyzes a demand for regulation, for information on comparative performance, and for transparency and accountability. The private sector, in the words of one astute observer, “has ended the days of water services as a sleepy backwater, and brought it under the light of public scrutiny”.

***The single greatest stimulus to improving the performance of public service companies is competition resulting from the introduction of private companies***



Private companies also catalyze action on water resources management. A private company cannot take a contract when it is unsure of the bulk supply of water, for its own reputation is at stake when the tap runs dry. Private companies have thus demanded clarification of often murky basin management rules and water rights. Similarly, private companies have liabilities for wastewater discharges, which again forces a discussion of discharge standards and policies.

Finally, although international water companies can and will play a vital role, especially in the initial market-creating stage, local companies and local entrepreneurs have a similar positive role to play. It is they who have often enabled people to compensate for the shortcomings of public services. This has often been done in a

highly competitive environment, one in which the local firms have learned to provide people with the services they want and are willing to pay for. It is vital that their initiative and capacity be harnessed as the critical process of regulation takes hold.

### **The role of international agencies**

Official development assistance cannot be the source of financing for the massive investments required. However, it can play a useful role in assuring the financing of complementary services such as research, reforms of governance, and the setting up of the subsidy systems for the poor that must accompany private sector participation.

Two observations and corollaries are important. First, whereas official development assistance was a dominant form of capital 10 years ago, these official flows are now dwarfed by private sector flows. The corollary is that official flows must be seen as instruments that facilitate the capture of private flows and complement these flows. Second, it is clear that development assistance can play an enormous positive role when countries themselves have the right policies and priorities, but that conditionality does little to correct policy distortions. The corollary is that international agencies should increasingly be directing their limited financial resources to countries that have embarked on paths of equitable and sustainable reform. International agencies of course must play an important role in providing technical assistance and institutional strengthening to assist countries that want to implement the kinds of actions that are recommended by this Commission.

*Official development assistance can play a useful role in assuring the financing of complementary services*



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The fundamental message is clear: it is the people of developing countries and their political leaders who can and must drive reform processes. Happily, there are now an increasing number of political leaders—some of them attending The Hague meeting—who have taken the courageous steps necessary for reform. It is from their reforms that most of the lessons in this Report are drawn. It is the fundamental responsibility of the international community to support them and to support other political leaders who have the courage to make these needed changes.

*It is the people of developing countries and their political leaders who can and must drive reform processes*



### The roles of NGOs and communities

A new alliance of local people, NGOs, and agencies focussed on water-asset creation and optimal use offer equal opportunities to all men and women and can make a major contribution to the achievement of the objectives of the Commission. Development and support for community-level actions could include:

- *Watershed action programs*, where local people work with NGOs and research organizations to promote conservation and local empowerment.
- *Local councils* to develop particular programs and tackle local water management problems in controlling pollution and increasing water-source rehabilitation.
- *Basin-level organizations* for integrated water management.
- *Groundwater recharge wells*, constructed to improve village water supply and improve the management of aquifers.

- *Integrated disaster preparedness* linked to community-level action.
- *Drought relief programs* that mobilize work and food supplies in drought-affected communities.
- *Community action* in controlling water-borne diseases.
- *Local action* for monitoring water quality, crop selection, and quality control of produce irrigated with effluent water.
- *Initiatives in integrated pest management* to reduce the use of pesticides and related pollutants.
- *Agencies to reform water rights and system management* in areas affected by diseases like AIDS, where children and the elderly become new key actors.

***Enormous gains can be made as innovations occur in institutional arrangements and technology application***

### **Promoting innovation**

Given the potential of the new technologies and the innate abilities of people, we can expect that enormous gains can be made as innovations occur in institutional arrangements and technology application. The latter may be by the rediscovery and deployment of traditional technologies or the emergence of new technologies. A key to getting the maximum global benefit from these new developments will be how quickly they are adequately evaluated, disseminated, and adopted throughout the world.


Innovation also requires some assistance in incubation. Thus an innovation fund may be envisaged that would

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help promote environmentally and socially desirable technical and institutional innovations. The possibilities are many and varied. They might include support for national “water stamps for the poor” programs; time-bound subsidies for transition arrangements (such as that of Conakry described in box 3.5); support in providing medium-term “bridging loans” in countries where long-term capital markets are not developed; political risk guarantees for private operators entering risky markets; new forms of NGO and community mobilization to improve services and protect the environment; and new approaches to the negotiation of international water treaties.

*Innovation  
requires  
some  
assistance in  
incubation*



In terms of technology, there are innumerable opportunities—in particular, innovations in “orphan” areas such as biotechnology for the food crops of the poor in water-deprived areas. Finally, there are geographic areas with problems that cry out for new approaches. For example, on the Indo-Gangetic Plains there are many poor and hungry people, yet so much water is badly distributed in space and in time. It is a great challenge to work out an environmentally sound, socially responsible, and economically productive water management paradigm for this area.

### **Summary of key recommendations**

The Commission’s Report covers many aspects, and on many of these we have made clear recommendations. It may be useful here to recapitulate these, grouped under four thematic headings: policy, institutions, research, and investments. How to follow up on these is the next and last step in our Report.

## Policy

Integrated water resources management should be the philosophical approach, based on participation, full-cost water pricing, private sector involvement, and respect for the integrity of ecosystems.

The most important policy recommendation we can make is for the adoption of full-cost pricing of water use and services. It will be the basis for promoting conservation, reducing waste, and mobilizing resources. But this can only be done when service providers are accountable and efficient. And it will require a new generation of subsidy programs—ones that provide subsidies to individuals, are transparent and targeted, and are the responsibility of government. Integrated water resource management will also require a careful and politically viable strategy for transition, with time-bound adjustment subsidies playing a vital role.

## Institutions

At the heart of this Vision is a vision of institutional renewal. Governments will play a central role, but a very different one. They will withdraw from their role as service providers, passing these responsibilities to users and the private sector. Above all they will be responsible for creating an enabling environment in which incentives for investors and for innovators are ensured and in which the interests of the public are secured. Government must phase out its role as financier of private services and assume the role of manager of well-designed subsidy schemes for the poor and custodian of the environment. Government will also become an enabling partner for the multitude of national basin and aquifer agencies that will play an increasing role in water management.

*The most important policy recommendation is the adoption of full-cost pricing of water use and services*

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User groups will play a more and more prominent role at all levels, from the basin level to the neighborhood level. At the more aggregate level this will mean participation in decisions on how to manage water resources; at the local level it will mean participation in neighborhood water service and consumer watchdog associations. In all of these groups, women have vital roles to play.

The private sector has a major role to play as a mobilizer of investment, an innovator, a service provider, and an advocate for transparent and effective resource management policies.

Finally, a special effort to involve youth is essential. From schools to universities to youth groups, education about water issues, coupled with opportunities for genuine participation, will be essential. Youth are the creators of better tomorrows.

### Research and data

There is an urgent need for better data on the stocks and flows of water, especially water and aquatic environmental quality, groundwater, and ecosystem health at the basin level. These are not academic issues; they are matters of life and death in many communities around the world. Witness the issues of arsenic in the groundwater in Bangladesh and West Bengal, India, or the heavy metals finding their way into the water in many poor countries with inadequate wastewater treatment programs. In arid regions, a shortage of data limits the optimum use of what little freshwater is available. The lack of information on past flooding encourages people to settle in flood-prone lands. Thus

**Government must phase out its role as financier of private services and assume the role of manager of well-designed subsidy schemes for the poor and custodian of the environment**



it is equally important that the raw data be publicly available and that reliable processed data be made public in forms that facilitate public understanding of water issues and public participation in water management.

Experience also shows that if users are empowered through aquifer associations or river basin associations, they will demand more and better data. In many instances they will, quite correctly, decide to raise resources for this purpose—through water levies, for example. Stimulating the demand for information will lead to a major increase in funding for data collection and in making such data useful and broadly available to users.

We need to learn much more about the complex processes involved in the hydrological cycle, the functioning and basic water requirements of ecosystems, and the likely impact on these of future changes in the world's climate. Budgets must be restored to the national agencies and institutions charged with such studies and with assessing the quality and quantity of freshwater available.

Increased public funding for research in agriculture and other aspects of water management will be essential. The private sector can and will address many issues. But public funding will continue to be required because of the public goods nature of water that affects the billions of poor farming families and the environmental management aspects of agriculture in developing countries where water use accounts for as much as 80–90% of water withdrawals. A major increase in funding of national agricultural research systems and the interna-

*Stimulating the demand for information will lead to a major increase in funding for data collection and in making such data broadly available to users*

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tional Agricultural Research Centers of the Consultative Group on International Agricultural Research would be a modest investment for the international donor community and would have enormous benefits to the world.

### Investments

As to investment incentives, it is our judgment that with full-cost pricing no special incentives are needed for the private sector, with three (temporary) exceptions. There should be time-bound adjustment subsidies to facilitate the entry of private operators under conditions of very low tariffs, political risk guarantees (with private operators assuming the commercial risk), and bridging financing, when local capital markets are unwilling to finance the long maturity instruments needed for this capital-intensive industry.

All of this should be provided within a framework of transparent, predictable regulations and a competitive accountable system of contract award and adjudication.

The capital provided by the international and local private sectors should lighten the burden on public budgets. This will make it possible for government to provide funding for public goods such as the restoration of wetlands and other measures to ensure that ecosystems continue to provide undervalued services, such as flood control and the protection of fish and wildlife habitat.

### Some concrete next steps

There must be institutionalized follow-up to the development of action plans for carrying out the Commis-

*The capital provided by the international and local private sectors should lighten the burden on public budgets*



sion's recommendations. Governments have the prime responsibility. Leadership needs to be provided at the international level as well. The Global Environment Facility (GEF) has a mandate to provide incremental funding to assist countries in incorporating environmental considerations in the management of international waters consistent with sustainable development goals. The Commission recommends that the GEF leverage additional financing, especially by the private sector, to fund national land and water actions that simultaneously contribute national, regional, and global benefits.

The World Water Council, which has taken the lead in convening the Commission and launching the Vision exercise, should continue to focus the world's attention on water issues, and the World Water Forum should be the venue where stocktaking and rededication are undertaken periodically.

The Global Water Partnership was established to encourage programs to fill gaps in research and technical assistance required for the implementation of integrated water resource management. It is now aligning its work towards helping implement this Vision. Through its emerging regional water partnerships, it is developing frameworks for action to support the implementation of regional and sector Visions. The Commission recommends that the international community support the action-oriented programs that emerge from these efforts.

International agencies should continue their increased emphasis on water, and a stocktaking report should be

*There must be institutionalized follow-up to the development of action plans for carrying out the Commission's recommendations*




## Framework for Action

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produced at least every other year. Intergovernmental forums, such as the Copenhagen Social Development Summit and the Rio + 10, should feature water issues prominently.

Finally, it is clear that implementation of the recommendations of the Commission will depend on innovative approaches to institutions and technology. Research into such innovation must be stimulated. The Commission recommends that an innovation fund be established for this purpose with support from both the private and public sectors. It can be affiliated with the Global Water Partnership.

***An innovation fund should be established with support from both the private and public sectors***



# World Commission on Water for the 21<sup>st</sup> Century



World  
Water  
Vision

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### **In memoriam Henry W. Kendall (1926–99)**

Henry W. Kendall an honorary member of the World Water Commission, winner of the 1990 Nobel Prize in physics, was the founder and chairman of the Union of Concerned Scientists. He was a driving force behind the 1992 "Scientists Warning to Humanity", signed by 1,600 scientists and presented to world leaders at the Earth Summit in Rio de Janeiro. Henry was deeply involved in all the environmental and ethical issues of our time. He was an enthusiastic supporter of this Commission's work, and we hope that our Report will do honor to his memory.