



"All efforts at reducing poverty would count for nothing if the basic needs of people for reliable drinking water and sanitation are not met. The vital importance of water must be recognized—equitable provision of water for human needs, protection of water quality, and conservation of a healthy natural environment are development prerequisites of the highest priority."

Tadao Chino  
ADB President

# Special Theme

# Water in the 21<sup>st</sup> Century

## Emerging global water issues

### *The looming water crisis*

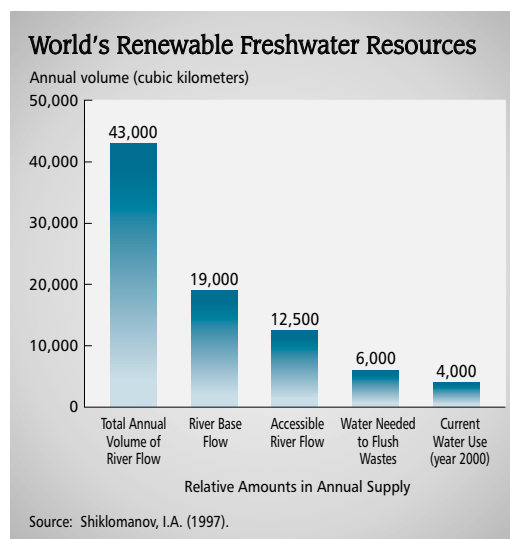
**E**arth is the blue planet with water one of the most plentiful natural substances in its environment. There is more than 1.4 billion cubic kilometers (km<sup>3</sup>) of the stuff—enough to give every man, woman, and child more than 230 million cubic meters (m<sup>3</sup>) each if we were to divide it evenly.

However, more than 98 percent of the world's water is salt water and we depend for our basic vital needs on freshwater. Most freshwater is locked in the polar ice caps. Less than 1 percent of the earth's freshwater is accessible in lakes, rivers, and groundwater aquifers. That vital 1 percent of available freshwater is constantly in motion, either flowing in rivers, evaporating and moving around the globe as water vapor, falling from the sky as rain or snow, or filtering slowly through the earth to emerge somewhere else. It is a renewable resource on which we all completely depend. It is the genesis and continuing source of all life on earth.

The most accessible water is that which flows in river channels or is stored in freshwater lakes and reservoirs. The major portion of the water diverted for human needs is taken from this renewable, readily accessible part of the world's freshwater resources. Although the total volume of water conveyed annually by the world's rivers is about 43,000 km<sup>3</sup> (see figure), most of this occurs as floods—the low river flows (base flows) make up only about 19,000 km<sup>3</sup>.<sup>1</sup> Of this, about 12,500 km<sup>3</sup> can be accessed, and present levels of withdrawal

account for about 4,000 km<sup>3</sup>. Withdrawals are anticipated to reach 5,500 km<sup>3</sup> per year by 2025.

The demand for freshwater increased six-fold between 1900 and 1995, twice the rate of population growth.<sup>2</sup> The 1997 United Nations (UN) Comprehensive Assessment of Freshwater Resources of the World concluded that one third of the world's population today already live in countries experiencing medium to high water stress. High water stress and unsustainable rates of withdrawal are already being experienced in Central and South Asia, where annual water withdrawals compared with available water resources are 50 percent or more. The northern People's Republic of China (PRC) and Mongolia have medium stress conditions with 25 percent water use. Although water stress (see box on page 8) computes at less than 10 percent in Southeast Asia (including southern PRC)



1 Shiklomanov, I. A. 1997. *Assessment of Water Resources and Water Availability in the World*. Report prepared for the Comprehensive Assessment of Freshwater Resources of the World. United Nations: St. Petersburg.

2 Gleick, Peter H. 1998. *The World's Water 1998–1999: The Biennial Report on Freshwater Resources*. Washington, DC: Island Press.

and the Pacific and is therefore considered to be low, this measure is highly distorted by seasonally high river flows. In the dry season, water scarcity occurs throughout Asia and the Pacific, and increased rainfall variability as a result of global climate change will worsen this problem. Water scarcity will affect food security throughout Asia and the Pacific.

The global population will expand from today's 6 billion people to almost 8 billion in 2025. By then, more than 80 percent of the world's population will be living in developing countries. The World Meteorological Organization estimates, assuming the renewable water resources will remain unchanged, that the number of countries facing water stress will increase from 29 today to 34 in 2025. How these countries manage their water resources, and whether they can produce sufficient food for their growing populations while catering to their water needs and preserving natural environments, have important implications—and imperatives—for the Asian Development Bank (ADB) and its developing member countries (DMCs). ADB has been extensively involved in planning, formulating, and financing water resource projects in its DMCs, and has accumulated valuable experience that must be used to respond proactively to the challenge. The poverty reduction strategy adopted in 1999 enjoins ADB, at the policy level, to continue to support governments in developing, in a participatory manner, master plans for effective management of critical natural resources, including water.

Competition for water is increasing among different water uses, including water for ecological needs. In many DMCs, irregular and

inequitably distributed supplies of piped water have a detrimental effect on the social and economic well-being of most of their citizens. Ironically, consumers in almost all DMCs are charged less for their water than it costs to provide. Hence, utilities are reluctant to connect new customers because water prices are too low to allow them to recoup their investment. For the poor, access to even a rudimentary level of municipal water supply is frequently denied, and they may be constrained to use untreated water from highly unreliable sources. Waterborne diseases are causing immense suffering and loss of productivity, with the poor suffering disproportionately. Large cities in Asia are not equipped to offer their burgeoning populations the water supply and sanitation services they require.

Nearly 70 percent of global freshwater withdrawals are directed toward agriculture, mainly for irrigation. By some estimates (UN 1997), annual irrigation water use will have to increase about 30 percent above present use for annual crop production to double and meet global food requirements by 2025. Although irrigation will remain the dominant water use in developing countries, an increase of 30 percent in irrigation withdrawals may not be possible if other essential human needs are to be met. Making irrigation more efficient will be necessary and unavoidable. The industry sector, which accounts for about 22 percent of current freshwater withdrawals globally, is likely to require an increasing share in all regions of the world in both absolute and relative terms. In developing countries, where 56 percent of the population will be living in urban areas by 2025, the share of water going toward domestic uses will also need to grow substantially.



### Water stress

**W**ater stress for a river basin is defined in degree of annual water use (that is, water withdrawn from a surface or groundwater source for human purposes) as a percentage of the total water resources available in that basin. Water stress for a country is the summation of water stress for all its river basins. Water stress begins when withdrawals of freshwater rise above

10 percent of renewable resources. Medium to high stress translates as water use that exceeds 20 percent of available water supply. Countries experience high water stress when the ratio of water use to supply exceeds 40 percent. At such levels, their patterns of use may not be sustainable, and water scarcity is likely to become the limiting factor to economic growth.

## Water quality, pollution, and the environment

*Emerging Asia*, published by ADB in 1997, identified water pollution as the most serious environmental problem facing the region. Water pollution exacerbates the problem of water scarcity at local and regional levels by reducing the amount of water available for productive purposes. Water pollution comes from many sources, including untreated sewage, chemical discharges, spillage of toxic materials, harmful products leached from land disposal sites, agricultural chemicals, salt from irrigation schemes, and atmospheric pollutants dissolved in rainwater. The direct disposal of domestic and industrial wastewater into watercourses is the major source of pollutants in developing countries. In Asia and the Pacific, fecal pollution is one of the most serious problems, affecting both surface water and groundwater bodies and leading to a tenacious persistence of such waterborne diseases as cholera, typhoid, and hepatitis. Estimates of the increase in water pollution loads in high growth areas of Asia over the next decades are as high as 16 times for suspended solids, 17 times for total dissolved solids, and 18 times for biological pollution loading.<sup>3</sup> The impact of this can be seen from the following comparison: the combined volume of water used and water needed to dilute and flush pollutants is almost equal to the volume of accessible freshwater in the world's river systems.

The development of freshwater resources for human uses has compromised natural ecosystems that depend on these resources for their continued integrity. Freshwater ecosystems, comprising lakes, rivers, and wetlands, have already lost a greater proportion of species and habitat than land or ocean ecosystems. Unrestricted development of surface water and groundwater has altered the hydrologic cycle and threatens the natural functions of deltas and wetlands. Wetlands have been converted to cropland, and rivers that channeled water to estuaries and deltas have dried up. The Yellow



**Water pollution is the most serious environmental problem facing the region.**

River in the PRC, for example, is now dry during substantial portions of the year, while adjacent wetlands that tempered floods have been lost.

The Aral Sea basin illustrates vividly the extent to which human intervention has affected the natural functioning of aquatic systems. Excessive diversion of water for irrigation so reduced the flow of rivers entering the sea that its surface has shrunk by 45 percent and its volume by 70 percent since 1970. A formerly flourishing fishing industry has collapsed, and major health problems are now associated with windblown toxic salts and contaminated residues. Diminished productive potential, loss of vegetation, increased health risks, and irreversible desecration of aquatic biota are the sad legacy.

### A double-edged sword: floods and droughts

Floods and droughts have always been features of life on earth and have produced some of the worst natural disasters in recorded history. Due to inappropriate land use and land management practices, uncoordinated and rapid growth of urban areas, and loss of natural flood storage wetlands, floods are becoming more frequent.

<sup>3</sup> United Nations Industrial Development Organization. 1996. *Global Assessment of the Use of Freshwater Resources for Industrial and Commercial Purposes*. Industry, Sustainable Development, and Water Programme Formulation, Technical Report. New York: UN.

According to the Office of the United Nations Disaster Relief Coordinator, flooding is the hazard that affects more people than any other. Associated damage to property is escalating. Concurrently, destruction of forest cover has altered the hydrologic cycle and reduced water retention in forest soils. Accompanying soil erosion has permanently stripped fertile topsoil from vast areas, leading to further degradation of river basins and threatening the basis for sustainable natural resource management. Global climate change will have unpredictable but potentially devastating consequences for the hydrologic cycle by changing the total amount of precipitation, its annual and seasonal distribution, the onset of snowmelt, the frequency and severity of floods and droughts, and the reliability of existing water supply reservoirs. According to the Intergovernmental Panel on Climate Change, the frequency of droughts could rise by 50 percent in certain parts of the world by 2050.

### Geographical variability in water resources

Asia has the lowest per capita availability of freshwater resources among the world's

continents. The contrasts within the region are stark. Annual freshwater resources (in m<sup>3</sup> per capita) reach as high as 200,000 in Papua New Guinea and as low as 2,000 in parts of South Asia and the PRC, and are generally below 20,000 in Southeast Asia (*see figure at right*). The region's weather is largely governed by a monsoon climate, which creates large seasonal variations in addition to spatial variation.

The two most populous nations in the world, the PRC and India, will have 1.5 billion and 1.4 billion people, respectively, by 2025, by which time the availability of freshwater will have dropped to 1,500 m<sup>3</sup> per capita in India and 1,800 m<sup>3</sup> in the PRC.

Many of ADB's DMCs depend heavily on groundwater exploitation to supplement scarce surface water resources. In Bangladesh, groundwater abstraction already represents 35 percent of total annual water withdrawals; in India, 32 percent; in Pakistan, 30 percent; and in PRC, 11 percent. Groundwater overuse and aquifer depletion are becoming serious problems in the intensively farmed areas of northern PRC, India, and Pakistan. In heavily populated cities such as Bangkok, Jakarta, and Manila, land is subsiding as groundwater is withdrawn to serve the needs

### Water Issues in the Pacific

The geographic region of the Pacific refers to the Melanesian, Micronesian, and Polynesian islands in the Pacific Ocean. The total area covered by the region is vast: the Pacific Ocean itself occupies almost one third of the earth's surface. The Pacific islands, however, comprise only 1.3 million square kilometers of land area, of which 70 percent is in Irian Jaya and Papua New Guinea, and 20 percent in New Zealand. The remaining 10 percent of land area is spread over more than 10,000 scattered islands.

There are two main groups: (i) small atolls with severe water shortages and water quality problems and (ii) larger volcanic and high mountainous islands where water is generally abundant. Both have fragile natural resource bases, but suffer to different degrees from inefficiency of water use, overuse of limited

groundwater, pollution of both surface water and groundwater bodies, and contamination due to inadequate sanitation and waste management.

The first group—including some of the Cook Islands, Kiribati, Marshall Islands, Nauru, Tonga, and Tuvalu—is deficient in surface water and prone to prolonged droughts (especially Kiribati and Tuvalu). Rainwater collection and storage, supplemented where possible by extracting groundwater from shallow freshwater lenses, present the only real choice. Desalination has been proposed in cases of extreme need, and seawater is sometimes used for sanitation. People generally conserve water and use it sparingly. However, because surface water supplies are highly unreliable and groundwater resources limited, conflicts over ownership and access are increasing. Saltwater intrusion and



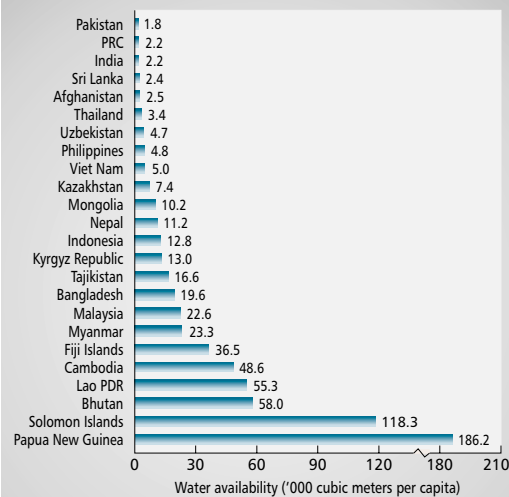
of their growing urban populations, and salt-water intrusion is rendering much of the groundwater unusable.

The special circumstances affecting water availability and quality in the Pacific are discussed in the box on page 10 and below.

## Shared waters

International conflicts over water are becoming more frequent as competition for available freshwater resources increases. There are 215 international rivers as well as about 300 groundwater basins and aquifers that are shared by several countries. Although many difficult issues remain to be resolved, the 1996 treaty signed by Bangladesh and India for managing flows in the Ganges-Brahmaputra system represents a major victory for rational approaches to shared water resources. Similarly, Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan—in recognition of their common strategic, economic, and environmental interests—created in 1992 the Interstate Coordinating Water Commission to facilitate water sharing and common solutions to related environmental issues. However, more than 70 water-related flash points

**Annual Per Capita Water Resources in Selected Countries**



Sources: Economic and Social Commission for Asia and the Pacific (ESCAP). 1995. *Integrated Water Resources Management in Asia and the Pacific*. Water Resources Series No. 75. United Nations, New York; Seckler, D., U. Amerasinghe, D. Molden, R. de Silva, and R. Baker. 1998. *World Water Demand and Supply, 1990 to 2025: Scenarios and Issues*. International Water Management Institute, Colombo; and Raskin, P., P. Gleick, P. Kirshen, G. Pontius, and K. Strzepek. 1997. *Water Futures: Assessment of Long Range Patterns and Problems*. Stockholm Environment Institute, Stockholm.

have been identified, mainly in Africa, Middle East, and Latin America.

Eight countries in Asia (Bangladesh, Cambodia, Kazakhstan, Pakistan, Tajikistan, Thailand, Uzbekistan, and Viet Nam) rely on

pollution by human waste are reducing the availability of usable water.

The larger volcanic islands include Fiji Islands, Papua New Guinea, Samoa, Solomon Islands, and Vanuatu. Rainfall and surface runoff are adequate to meet needs, but pollution is a serious problem in urban areas. Villages in riverine and estuarine environments often have poor water quality. Competition for water is intensifying among domestic and industrial uses, irrigation, hydropower, tourism, and recreational uses.

As for many other developing countries, those in the Pacific are hampered by inefficient water utilities that operate in a monopoly regime and do not fully recover costs, depending instead on government and external financing to meet operation and maintenance costs. The utilities

exhibit chronic under funding and increasing deterioration of the physical assets, coupled with low operational efficiency and high levels of unaccounted-for water.

ADB is providing loans to improve water supply and sanitation in Kiribati, Marshall Islands, Federated States of Micronesia, and Papua New Guinea. These include capacity building elements to (i) improve allocation and management of water resources, (ii) develop skills for financial/managerial autonomy in water supply institutions, (iii) regulate water supply investments and operations, (iv) introduce tariff structures that would recover at least the costs associated with operation and maintenance, (v) establish demand-side management and water conservation, and (vi) monitor water quality and environmental conditions.

international rivers to supply more than 30 percent of their annual water resources. Four of these (Bangladesh, Cambodia, Uzbekistan, and Viet Nam) rely on water from external sources for more than 65 percent of their annual water resources. The reliability of water supplies in the face of such dependence is a key issue when seasonal variations, particularly droughts and El Niño events, enter the equation. Unsustainable rates of groundwater extraction can only make matters worse. The impact of global climate change, which cannot be determined at this time, will be to increase the overall uncertainty within which water planners operate.

### Heightened awareness of water issues

Traditionally seen as limitless bounty, water has only recently been recognized as a scarce resource, and only since the 1950s have policymakers begun to espouse the economic and environmental values of water. Since the 1970s, a series of international meetings addressed water issues, starting with the First UN Water Conference at Mar del Plata in March 1977. This was followed by others (the box below shows the major international conferences that have drawn attention to the serious condition of the globe's freshwater resources in the last decade).

A consensus is growing among scientists, water planners, governments, and civil society

that new policies and approaches will have to be adopted within the next two decades to avoid calamity, and that supply, use, and management of water resources will have to be integrated across sectors and between regions sharing the same source.

The concept of fully integrated water resource management (IWRM) emerged from the Dublin and Rio Conferences of 1992. The four guiding principles (now referred to as the Dublin Principles) are (i) freshwater is a finite and vulnerable resource, essential to sustain life, development, and the environment; (ii) water development and management should be based on a participatory approach, involving users, planners, and policymakers at all levels; (iii) women play a central part in providing, managing, and safeguarding water; and (iv) water has an economic value in all its competing uses and should be recognized as an economic good.

### Elements of a water strategy

#### *Basic human rights and environmental renewal*

The Dublin Principles recognize that freshwater is an input to which every human has the right to claim an essential minimum amount—the amount necessary to sustain life and meet basic sanitation needs. For human survival, the absolute minimum daily water requirement is

### Major International Conferences in the 1990s

- 1990 Safe Water and Sanitation for the 1990s (United Nations Development Programme [UNDP], New Delhi): appealed for concerted action to ensure access for all to the basic human needs of safe drinking water and environmentally sound sanitation.
- 1991 A Strategy for Water Sector Capacity Building (UNDP, Delft): defined the basic elements of capacity building necessary to create an enabling environment in the water sector.
- 1992 International Conference on Water and Environment (UN, Dublin): set out the four principles of water resource management that came to be known as the Dublin Principles.
- 1992 United Nations Conference on Environment and Development (UN, Rio de Janeiro): promoted integrated water resource management based on the perception of water as an integral part of the ecosystem, a natural resource, and a socioeconomic good.

only about 5 liters per day, whereas the daily requirement for sanitation, bathing, and cooking needs, as well as for assuring survival, is about 50 liters per person (equivalent to about 20 m<sup>3</sup> per year).<sup>4</sup> Despite concerted efforts made during the 1980s (the International Drinking Water and Sanitation Decade), even this minimal amount was not provided in 55 countries (representing close to 1 billion people) by 1990.

One in five people living today does not have access to safe drinking water, and half the world's population does not have adequate sanitation. This is most acute in Asia where the majority of the world's poor people live. Not surprisingly, water- and sanitation-related diseases are widespread and increasing. Almost 250 million cases are reported each year, with about 10 million deaths. Diarrhea alone kills more than 2 million children in developing countries. A recent UN report<sup>5</sup> notes that "at any given time, 50 percent of the population in developing countries is suffering from water-related diseases caused either by infection, or indirectly by disease-carrying organisms." The global imperative is to ensure that at least 95 percent of human beings have safe water and sanitation by 2025 (World Water Council 1999).

ADB's *Second Water Utilities Data Book* (1997), which presents illustrative data on



water use in 42 cities across the region, shows that water supply and sanitation investments are not keeping pace with population growth. In ADB's DMCs, an estimated 737 million people in rural areas and 93 million in urban areas still have no access to safe drinking water. Access to sanitation is denied to 1.74 billion in rural areas and 298 million in urban areas. This is a major human tragedy; provision of such services to all people should be one of the highest priorities of all governments. The box on pages 14 and 15 provides a discussion of the issues affecting water supply and sanitation in ADB's DMCs.

Irrigation will remain the dominant water use in developing countries.

4 A daily water supply of 300 liters per person (the level of use achieved in many developed countries) is considered an appropriate design standard for modern urban water supply schemes.

5 United Nations Commission on Sustainable Development. 1997. *Overall Progress Achieved Since the United Nations Conference on Environment and Development*. Report of the Secretary General, UN: New York.

- 1997 First World Water Forum (Marrakech): recommended action to meet basic human needs for clean water and sanitation, establish effective mechanism for management of shared waters, preserve ecosystems, encourage efficient use of water, address gender equality issues in water use, and encourage partnerships between civil society and governments.
- 1998 Water and Sustainable Development (United Nations Educational, Scientific and Cultural Organization [UNESCO] and the French Government): raised concerns about tendencies to focus on scarcity as the main water crisis while neglecting problems of poor water management and the proliferation of regional coordination issues.
- 1999 Fifth Joint International Conference on Hydrology (UNESCO and the World Meteorological Organization): drew attention to the catastrophic consequences of water mismanagement on the poorer communities in developing countries.



At the 1992 Rio Earth Summit, the rights of all human beings to basic daily water requirements were expanded to include environmental water needs. This was reinforced in a statement issued by the UN in 1997: "... it is essential for water planning to secure basic human and environmental needs for water [and]... develop sustainable water strategies that address basic human needs, as well as preservation of ecosystems."

### ***Water for poverty reduction***

Not only are the poor more prone to the adverse impacts of unsafe drinking water and inadequate sanitation, but ADB's field surveys also consistently show that the poor spend disproportionately more of their incomes on potable water than more privileged sections of the community for whom piped water supplies are assured. For example, the poor in Manila pay as much as 10 percent of their household income for a meager quantity of poor-quality water (see box on page 16). While investments in human capital (education, health care, shelter, and protection from the effects of natural disasters) are also required to break the cycle of poverty, the impacts of poor-quality drinking water and the lack of adequate sanitation

are particularly strong and immediate. The policy imperative of this—for governments as well as for ADB—is quite clear.

While the poor are disadvantaged in terms of access to the benefits of improved water supply and sanitation, poor women are in a particularly invidious situation. The gender division of labor in many societies allocates to women the responsibility for collecting and storing water, caring for children and the sick, cooking, cleaning, and maintaining sanitation. The availability of a decent water supply and sanitation system goes a long way to improving the quality of life for poor women and their families. In many parts of the region, the arduous task of walking long distances over difficult terrain to fetch water falls to women, often with the help of their daughters. Women care for the sick, who are often children suffering diseases caused directly by contaminated water. Providing clean and dependable water close to the home can substantially reduce women's workloads, and free up time for women to engage in economic activities to improve household incomes. For girls, the time saved can be used to attend school. Hence, providing water supply and sanitation is pivotal to improving both the social and economic



### **Water Supply and Sanitation in the Region**

In terms of human needs, water availability is highly variable across Asia and the Pacific. In Singapore, affordable high-quality water is available to all, 24 hours a day. In rural Nepal, fetching water for basic needs occupies up to four hours a day. Most people in the region do not have access in their homes to a 24-hour supply and are forced to boil or filter the water they obtain to make it potable.

In urban areas, unaccounted-for water averages 35 percent of production. Leakage (especially from house connections) probably accounts for half of this. Illegal connections, inadequate metering, and slack meter reading account for the rest. Where tariffs are too low, excessive water consumption (more than 150 liters per capita per day) is common. By contrast, power bills are normally about four times those for water. Low tariffs mean that utilities are always

struggling with financial viability and cannot contribute to capital investments.

Sewerage exists for less than 5 percent of our regional population, and only about 20 percent have on-site septic tanks. Basic latrines are available for about 50 percent, but as many as 25 percent have no formal sanitation at all. In urban areas, building controls are lax, and industries are often allowed to discharge effluents without treatment.

Competition for water has become intense and, because prior claim to a large portion of the resource has often been established (particularly by irrigators), urban suppliers are obliged to tap sources remote from the users. An example is the \$400 million Melamchi Water Supply Project in Nepal, which will draw water from three river basins outside the Kathmandu Valley to serve urban areas within the valley.

status of women, while simultaneously addressing gender and poverty concerns. The central role that women play in providing, managing, and safeguarding water is recognized in the third Dublin Principle.

### ***Water for food production***

A major problem to be resolved by 2025 is producing enough food for the anticipated population of 8 billion people. Economic development and changes in food preferences will exert strong demand for additional production and more varied food products. In 1998, the International Water Management Institute (IWMI) stated that in many parts of the world, water is becoming the single most important constraint to increased food production.

Even when good technical solutions appear to be at hand, they do not always produce the expected results; and the poorest, most vulnerable members of the community are among the worst affected. In Bangladesh, for example, the use of tubewells to raise shallow groundwater has been promoted by funding agencies to support intensive irrigation while also providing safe drinking water in rural areas. This gave a dramatic boost during the last three decades

to agricultural production, bringing the prospect of food self-sufficiency within reach for the first time. However, the same water has recently been found to contain traces of naturally occurring arsenic. Arsenic buildup in the body initially manifests itself through the appearance of skin diseases, and prolonged ingestion damages internal organs, leading to cancer and death. About 20 million people are at risk. The Government, with the aid of nongovernment organizations (NGOs) and international agencies, has embarked on a nationwide program to define site-specific countermeasures, but this may not be adequate to avoid suffering and loss of life for people who cannot afford alternative water supplies.

IWMI notes in its draft strategic plan for 2000-2005 (October 1999) that "the potential for expanding irrigated area is extremely limited." The UN has estimated the potential area for new irrigation as 45 million hectares worldwide, which could provide up to 21 percent of the projected additional food needs. Increases in yield and cropping intensity are expected to provide the rest. However, erosion, waterlogging, and land degradation are reducing the area of irrigated land; and some of the most fertile and productive areas close to urban

The three main problems facing the sector are financial sustainability, water resource availability, and equitable access. Planning for the long term is now critical. Water rights for domestic and industrial water supplies should be secured for at least 50 years. Tariffs need to be set to reflect the financial costs (and preferably the economic costs) of water. For example, in the water-scarce Maldives, consumers in the capital of Malé pay the equivalent of \$5 per cubic meter for desalinated piped water. Distortions in tariffs, where one part of a community cross-subsidizes another, need to be smoothed out, and all schemes should make adequate supplies available in poor areas. The poor can, and are willing, to pay for water.

In rural areas, special efforts are needed to reduce the distance to water supplies wherever possible and to encourage conservation

approaches, such as rainwater harvesting. Based on ADB's evaluation of many water supply and sanitation projects, it is essential to include complementary education in hygiene to derive the full health benefits of improvements in infrastructure.

Privatization of urban water supplies has not so far achieved a remarkably high success rate. Independent regulatory bodies are needed to reduce political interference and ensure accountable management and efficient delivery of water. The challenges in future are to (i) open up competition, (ii) allow domestic privatization, (iii) allow existing utilities to operate with transparent cost recovery policies and independent regulatory bodies, (iv) greatly increase tariffs to affordable limits, and (v) introduce performance benchmarking in all utilities. An urgent need exists to reduce non-revenue water.



Women are usually given the responsibility for collecting and storing water, caring for the children and the sick, cooking, cleaning, and maintaining sanitation.

centers are being absorbed into urban sprawl. In Indonesia, about 20,000 hectares (ha) are lost each year to urban development on Java alone. About 20 percent of the world's 250 million ha of irrigated land are degraded to the point where crop yields are declining.

ADB's 1998 study of rural Asia noted that, from 1966 to 1988, the real cost of new irrigation schemes increased by more than 150 percent in South and Southeast Asia. Given the limited scope for expanding irrigation and the sharply increased cost of new irrigation schemes, the justification for investing in new irrigation grows steadily weaker. The future of irrigation lies mainly in improving the efficiency of present irrigation schemes in terms of operational performance and water use, supported by the introduction of mechanisms to ensure financial sustainability. Expansion of irrigation, where possible, will need to be justified on criteria of cost-effectiveness relative to other uses. Water-scarce regions need to plan for a future in which they may not be able to achieve food self-sufficiency.

In a world where food security can no longer be assured by an ever-expanding irrigation sector, what possibilities exist for increasing food production? The future of agriculture will increasingly be linked to careful use of marginal areas. Techniques for water harvesting and supplemental irrigation have shown great promise for increasing crop yields,

and many scientists believe that rain-fed areas offer the greatest potential for increasing grain production in the future. More research will be needed, and both assistance and encouragement should be provided to poor farmers to help overcome their reluctance to invest time and scarce resources into inherently risky farming. Smallholder water management systems, where groups of farmers finance relatively small water capture and distribution infrastructure, can eliminate much of the insecurity of rain-fed agriculture without increasing stress on the available water resources. Crops with low water requirements should be selected, and technology employed to determine accurately the exact amounts of water needed at different stages of crop growth. Innovative techniques for precision irrigation will also help to increase the productivity of water—ensuring more crop per drop. ADB supports research in selecting appropriate crops for nonirrigated areas, for example, by providing regional technical assistance (approved in 1999) for collecting, conserving, and using indigenous vegetables.

### *Water as a finite and economic good*

The limits of the world's freshwater resources have become all too apparent, even though in many of the world's regions, detailed data on the hydrologic cycle are not available. Inefficient use, often initiated and then reinforced by government subsidies, has become ingrained; and the attendant water rights, whether formal or informal, are jealously defended by the

### Manila Case Study: Water and Poverty

Winnie lives in Block A of the Kabusig Floodway, Cainta, Metro Manila. She is 34 and earns \$162 per month as a domestic helper. Her husband, a messenger, earns \$138 per month. They support a family of seven, which includes Winnie's mother-in-law and four children aged 6 months to 7 years. They rent a 20-square meter room and share a kitchen and toilet with another family. With monthly expenses of \$125 for food, \$50 for transport, and \$38 for rent, there is little

left to cover costs of power, water, gas, medicines, and schooling.

Water costs Winnie \$20 per month, or 7 percent of their household income. She used to pay \$12.50 per month for a metered piped supply from a deep tubewell operated by a private contractor. However, the supply was only for one hour twice a day. She paid another \$7.50 per month for drinking water purchased by the container from another contractor. The source

privileged users. Agriculture and manufacturing use the greatest share of the world's water. Irrigation is particularly voracious, accounting for up to 80 percent of water demand in hot, dry regions.

The river basin constitutes the natural hydrologic unit within which users compete for the same resource and water quality is modified in ways that affect its value to other users. Management of water resources must therefore be approached on a comprehensive basis within this hydrologic unit. Beyond the basic needs for human well-being and environmental renewal, scarcity of water is largely an economic issue. This idea, that water has an economic value in all its competing uses and should be recognized as an economic good, must underlie all efforts for rational water resource management.

Part of the value of water is reflected in the costs of extraction and delivery to the users. As a minimum, users should pay these costs to ensure accountability and financial sustainability. In addition, the opportunity cost, representing the value of the resource to some other user, must be considered. And finally, there are also the external costs related to the impacts on the environment and the health effects of polluted water.

Treating water as a tradable commodity would help ensure greater efficiency and productivity in its use. However, important cultural concerns and complex issues exist regarding resource sustainability and natural habitat, which means that government intervention is needed in resource allocation and investment decisions. Governments should therefore establish the policy, legislative, and regulatory frameworks for managing water supply and

demand. Governments should also provide financing for large water projects—dams, large-scale irrigation, flood control—for which private financing may not be readily available. They should also intervene, directly or indirectly, to ensure that water resources are used in the most beneficial way for the greater society.

Allocations frequently become locked, however, into what are clearly low-return uses (e.g., irrigation), when new projects are required to meet priority high-return needs (e.g., cities and industries). As the readily accessible water resources become committed, the costs of new projects can rise rapidly, resulting in high economic costs relative to the alternative of reallocating existing supplies. Even if countries are willing to incur the subsidies inherent in such solutions—for instance, to meet social, political, or environmental objectives—the full burden of these subsidies is seldom transparent; large costs may inadvertently be incurred as a result of inefficient resource allocations resulting from such decisions.

## Imperatives for wise water management

### *From development to water resource management*

The past century has seen enormous changes in the way society conducts the business of economic development, food production, and trade. Concurrently, and especially in the latter part of the century, there has been an explosion in the construction of large projects for water

was purported to be from the concessionaire's piped supply.

Recently, there was trouble with both sources of water at the same time. The deep tubewell closed down due to pump problems. Diarrhea and typhoid broke out in the neighborhood. One of Winnie's boys had to be hospitalized.

Now Winnie has a connection to a more distant deep tubewell and is selling water (not fit for drinking) by the container to five of her neighbors

who do not have water. At \$1.25 for the first 10 cubic meter (m<sup>3</sup>) and \$0.40 per m<sup>3</sup> thereafter, she fears she may not have collected enough to pay the excess charges at the end of the month as well as the installments on the \$50 connection fee.

The message brought home by Winnie's case study is that the poor can and do pay for water. Local governments should ensure that piped water supplies reach the poorer areas, and that the poor are assisted to make use of such supplies.

storage, flood control, irrigation, and hydro-power. These were conceived and realized in an atmosphere of challenge: how to tame nature to serve the needs of humanity. The limits to the scale of the projects were set by the ingenuity of engineering solutions. The driving forces were population growth, food security, and industrial development. According to the UN Food and Agriculture Organization, irrigated area grew from 50 million to 250 million ha in the last century, and withdrawals of freshwater increased from 500 to about 4,000 km<sup>3</sup> per year.

Most large-scale projects have been financed by governments, and governments have naturally assumed responsibility for their management. The absence of private investors reflects not only the scale of the investments required, but also the fact that for some of these projects there were political objectives: for example, to encourage development in remote areas or to distribute development funds among regions. In many cases, it was assumed that users would repay the investment costs through water and other charges. This did not always happen. The repayment obligations have been eased and the cost of providing the services has frequently become institutionalized as a direct subsidy.

Water planners and developers have always worked from projections based on population

growth, industrial and agricultural production, and level of economic and social development to determine demand, and hence to formulate engineering solutions to provide the appropriate freshwater supply. However, because of natural resource constraints and the accumulating adverse environmental impact of past projects, changes are beginning to be made in the way planners approach the problems of water supply. This is evident as a discernible shift from water resource development toward supply and demand management. The tightening fiscal environment, recent financial crisis, and reduction in the potential for developing additional surface water and groundwater supplies have added impetus to this shift in the last decades. In addition, people the world over now place a higher value on maintaining the ecological function of freshwater ecosystems. There is also growing public pressure for the costs and benefits of water development projects to be shared more equitably and prudently, and for investments to be directed toward satisfying basic human needs rather than benefiting elite groups at a high cost to the community at large. The heightened awareness of the issues relating to large dams (and which are also relevant to other large-scale engineering solutions) is described in the box below.

### The Large Dam Debate

**R**eservoirs created by dams are essential for supplying water for human needs. They conserve water that would otherwise flow out of the river basin, and thereby enable release of water when river flows are insufficient. They enable the development of towns, industries, and irrigation with all of their economic and social benefits. They also provide hydroelectric power, flood mitigation, and recreational facilities. Water can be released to maintain environmental flows, dilute pollutants, and flush sediments out of the lower river reaches, thereby promoting healthier instream conditions and improving navigation.

Until the early 1980s, systematic evaluation of their environmental and social impacts was not mandatory. Such impacts are frequently serious but difficult to predict and quantify. The

displacement of people to make way for the construction of dams and their reservoirs can cause great suffering and social dislocation. The negative ecological impacts can extend upstream into the reservoir and downstream to the sea.

There is now growing opposition in most countries to new large dams, and several projects have recently been canceled due to public opposition. There is also a stricter regulatory framework for such projects. International nongovernment organizations have played a role in fostering independent scrutiny of large dam projects, and they have emboldened the affected communities to seek a greater role in decisions that impact directly on their lives. The good dam sites (and many not so good sites) have already been used, and strict environmental and social conditions are now imposed.



### *From public good to priced commodity*

Improving the efficiency of water use is indispensable. In the United States, contrary to all expectations, total water use has declined by 10 percent since 1980, even with population growth and a continued increase in economic wealth. Industrial use has declined by 40 percent from a peak in 1970, while industrial output and productivity have both increased. Similarly, in Japan, where industrial output has soared since the 1970s, total industrial water use has fallen by 25 percent. These reductions have been achieved through technological improvements (using less water to produce the same goods) and a change in the composition of industries making up the sector. The potential to reduce industrial use through further innovation, improved technology, and cost incentives is 20–30 percent. Comparable saving is possible in developing countries.

Residential water use, although only a small part (about 10 percent) of total water use, can be reduced without sacrificing living standards. Readily available means include

improving the efficiency of household appliances, better pricing structures, use of recycled water for certain applications, and especially reducing unaccounted-for water due to leaks and nonmetered connections in aging distribution networks. In many cities, such as Dhaka, Jakarta, and Manila, nonrevenue water exceeds 50 percent of water use.

The single largest variable in future water use for human needs is irrigation. According to the UN's Economic and Social Commission for Asia and the Pacific, irrigation in Asia and the Pacific accounts for 80 percent of total withdrawals, compared with 70 percent globally. By far the largest share of investments in agriculture during the green revolution era went into irrigation schemes. These were often—and remain—heavily subsidized. The adopted technology was generally at the lowest end of the scale: as much as 60 percent of the water is lost through leakage and evaporation before it even reaches the crop and an additional 20 percent may be lost on the field.<sup>6</sup> There are few incentives for the service providers or the farmers to improve

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6 A large part of these losses returns to rivers through the drainage network and as groundwater seepage and is, therefore, not lost from the river system, although the quality of return flows is often poor and limits their usefulness.

In response to growing concern, the World Conservation Union (IUCN) and the World Bank established an independent World Commission on Dams in 1997 to review their development effectiveness and develop standards, criteria, and guidelines to guide decision makers in planning, implementing, and decommissioning dams. Key issues in three areas—social, environmental, and economic/engineering—are being examined to work toward a new consensus on the role of large dams in sustainable development. The Commission's report is expected to be issued in August 2000. In support of this initiative, ADB is undertaking a regional technical assistance to examine four major projects and to prepare recommendations on best practices for evaluating, designing, constructing, operating, monitoring, and decommissioning dam projects in Asia.

A positive outcome of the growing opposition to large dams (and generally to large engineering solutions to water-related problems) is the impetus this has given to finding new ways of solving problems of water scarcity. As a first step, planners now look for ways of improving the efficiency of existing physical infrastructure and distribution systems, introducing more efficient industrial processes, reallocating available water among competing users, and finding innovative ways of recycling water. These approaches are fully concordant with ADB's policies and guidelines, through which ADB encourages conservation and more efficient use of water. ADB takes a proactive role by helping its DMCs put in place sound policies for integrated water resource management, including pricing strategies and practices that reward efficiency rather than wastefulness.

the efficiency of water delivery and use in such schemes where water is free or priced well below its cost.

Agriculture's contribution to national income is declining in all DMCs. The agriculture sector is, therefore, coming under increasing pressure to release water to meet other, more productive needs. For producing high-value crops in water-scarce areas, new irrigation techniques have been shown to be highly efficient and cost-effective. Even simple improvements in surface canal systems, which are used almost exclusively in developing countries, can lead to impressive gains in efficiency. Efforts to increase efficiency in water use could, however, have serious impacts on poor farmers, who may not be able to finance technological improvements. Hence, special assistance may be required to help poor farmers move up the technological ladder. Potentially greater saving can be achieved in delivering water, and the incentives for such improvements should be structured in such a way that the major beneficiaries (those who will avail of the "saved" water) contribute their share of the costs.

Groundwater irrigation presents a special case of too much of a good thing. Rapid expansion of groundwater irrigation during the

last two decades, initiated using public funding but now largely driven by private investment, provided remarkable increases in yield, productivity, and area of irrigated crops in parts of rural Bangladesh, PRC, India, Indonesia, and Pakistan. However, unregulated extraction over vast areas has caused extensive and rapid lowering of the water table and, in coastal areas, contributed to saltwater intrusion. In other parts, overwatering (combined with inadequate drainage) is bringing the water table dangerously close to the ground surface, rendering the surface saline and unusable. The productivity of some areas is now so threatened that large investments will be needed to avert complete collapse of the resource base, as described in the box below.

#### ***Future water resource projects***

New projects for dams, water storage, irrigation, drainage, flood protection, and water supply will continue to be needed in many countries where the basic water requirements for people have not yet been met. Sustainability criteria will predominate in decision making and particular emphasis will be given to environmental and social values. Increasingly, these projects will be financed with private sector participation

### **Waterlogging and Salinity in Pakistan**

**P**akistan's Indus Basin irrigation system is the largest contiguous irrigation system in the world with three major dams, 19 barrages, and 43 interlinked canal systems. This vast system is served by an equally large drainage network commanding about 6 million hectares (ha). More than 400,000 tubewells (mostly privately owned) provide groundwater to supplement the surface canal supplies.

As a result of inequitable water application and inadequate drainage, 38 percent of the irrigated area is now waterlogged. In addition, irrigation adds more than 1.2 tons of salt per year to each ha. The salt is carried into the root zone where it reduces yields. The high rates of evaporation characteristic of the region's semiarid climate have rendered 14 percent of the surface too saline for use.

Recognizing the seriousness of the waterlogging and salinity problems, the Government began an extensive and costly reclamation program in 1959. Originally focused on providing surface and subsurface drainage, the program later included canal remodeling and selective lining to reduce aquifer recharge.

The Government's 1993 Drainage Sector Environmental Assessment recommended measures for overcoming the waterlogging and salinity problems:

- precluding further developments that would mobilize salt from deep groundwater aquifers,
- restricting irrigation to areas where existing drainage is adequate,
- ceasing public investment for drainage where improvements could reasonably be carried out by the private sector,

where possible, and a wider range of stakeholders will be invited to participate in the process.

Before deciding to invest in new storage and conveyance infrastructure, water planners will consider using existing infrastructure to meet the demands through reallocation of the available water among users, taking advantage of the greater efficiency offered by improved technology and the opportunities for recycling water. Major obstacles to the rational reallocation of water among users, however, are the legal and regulatory constraints on water transfers and, in many countries, the complex systems of water rights that inhibit the free movement of water as an economic good. An additional constraint is the lack of detailed understanding of the actual amount of water needed for various processes.

Because of their scale and the need to safeguard national and regional concerns above local interests, flood control and flood protection projects represent a special case in which private investment is unlikely to displace government funding. However, the desire to secure higher levels of flood protection must be balanced against the effectiveness of non-structural alternatives (such as planning and building controls, enhancing wetlands, providing means for evacuating persons and livestock,

flood-proofing of essential infrastructure, and improving flood warning systems), which are less expensive and which do not disturb the river system and its aquatic ecology. The potential exists in most countries for greater use of flood damage insurance. Properly managed, this would avoid the cost escalation of disaster rehabilitation and flood protection. Modern approaches emphasize balanced structural and nonstructural measures within an integrated and comprehensive plan for management of natural resources in the river basin.

For flood protection and all future projects using and controlling freshwater resources, the operational guidelines and procedures need to be adjusted to account for greater variability in climate as a result of global warming. This could add considerably to their costs.

Irrigation and drainage projects have accounted for about 10 percent of the total lending of the international financing agencies, and such financing has been the most important factor behind the rapid expansion in irrigated agriculture since the 1960s. As shown in the figure, ADB's lending for irrigation and drainage for the past three decades represents 33 percent of the \$15.7 billion in total lending for water projects. In many cases, the irrigation schemes have performed well below

- restricting subsurface drainage interventions to areas affected by saline groundwater, and only where there is an environmentally acceptable means of eliminating drainage effluent,
- concentrating surface drainage interventions to areas at risk of storm water damage, and
- giving special attention to beneficiary participation in both structural and nonstructural interventions.

It is recognized that structural interventions to control waterlogging and salinity need to be complemented by agricultural strategies that promote the efficient use of water, beginning at the national level and continuing to the field level. Accordingly, in 1995 the Government adopted a long-term strategy for institutional

reforms in the water sector. The role of the Government was redefined with the objective of phasing out subsidies for operation and maintenance of irrigation schemes within 10 years, and decentralizing management of irrigation and drainage services. Separate organizations will be established for operation and maintenance of each main canal system, and secondary irrigation and drainage systems will be transferred to farmer organizations. Implementation started in 1996 and is being supported by major international financiers, including ADB, World Bank, and Japan Bank for International Cooperation.

Despite such environmental problems, irrigated agriculture continues to support the country's economic development and provides livelihood for millions of families.



expectations. Yet, the same agencies have repeatedly supported programs for rehabilitation and improvement of physical infrastructure, often ignoring the institutional and statutory obstacles to more responsive service provision and sustainable operation. In response to growing competition for the available resources, both financial and physical, many countries are now tackling the challenge of policy and institutional reforms to achieve integrated water resource management and sustainable operation and maintenance of their irrigation schemes.

Creation of incentives for more efficient allocation and delivery of water is now urgently needed throughout Asia and the Pacific. First, user charges must be levied. These should be fair, consistently applied, and set at levels that not only distinguish different uses but also ensure access for disadvantaged groups (especially the poor, and among the poor women). All users in the river basin must be included in any system of water charging. Second, the conditions for trading of water rights should be created. This requires clear definition of water rights, a condition that does not yet exist in most countries. In a complementary manner, greater control of the operation and maintenance of irrigation schemes needs to be given to the users.

The current global commitment of financial resources for all water-related infrastructure is estimated to be \$80 billion annually. For water supply and sanitation alone, an annual investment of about \$70 billion would be required over the next 10 years. Although official development assistance will continue to provide an important part of the necessary resources, the private sector will be called on increasingly. ADB's lending for water-related operations in 1999 totaled \$1.24 billion (25 percent of total lending), an indication of the importance attached to water sector operations. Nevertheless, this represents only a small part of the total need.

## ADB's evolving role in the changing context

### *ADB's experience and lessons learned*

ADB has implemented 437 water-related projects, for which financing totaling \$15.7 billion has been provided (*see figures at right*). Evaluation studies show 51 percent of these projects were generally successful, but 11 percent were unsuccessful. Success was evaluated by a variety of indexes—including economic internal rate of return—many of which are affected by external factors, such as changes in the economic environment. For instance, declining real rice prices over the long term have adversely affected the economic evaluation of many irrigation projects.

An analysis of ADB's water operations shows positive trends for such concerns as the incorporation of social and environmental dimensions, increased water user responsibility and water use efficiency, cost recovery, institutional strengthening, quality control, and monitoring arrangements. ADB's water projects, however, tended to be identified, processed, administered, and evaluated within their subsector context, reflecting the fragmented approach to planning and implementing water projects in most DMCs. For example, legal aspects of water allocation have been addressed in less than one quarter of approved projects, and only one third of the projects included water conservation measures. This tends to confirm that ADB's water loans have, in the past, focused largely on improving water services (supply-side solutions) in a subsector context, and that relatively few have addressed water resource issues, including water scarcity and efficient allocation of water between different uses.

The striking lesson from ADB's involvement in water-related projects is that, as competition for water increases, a more comprehensive and integrated approach to water operations is needed to encompass goals of social welfare, environmental integrity, and economic productivity. Fundamental actions to achieve this are

- stakeholder participation in all stages of the project cycle;

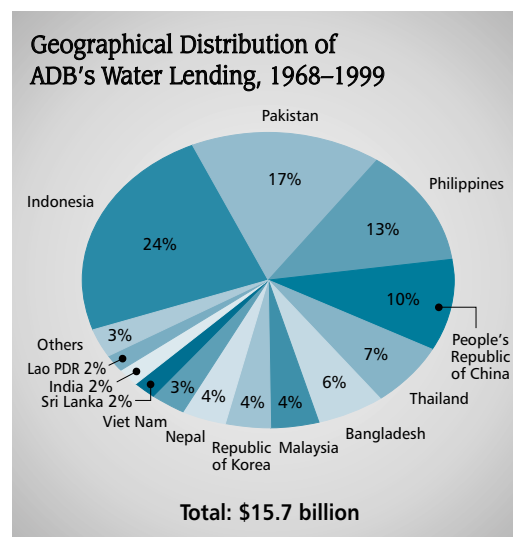
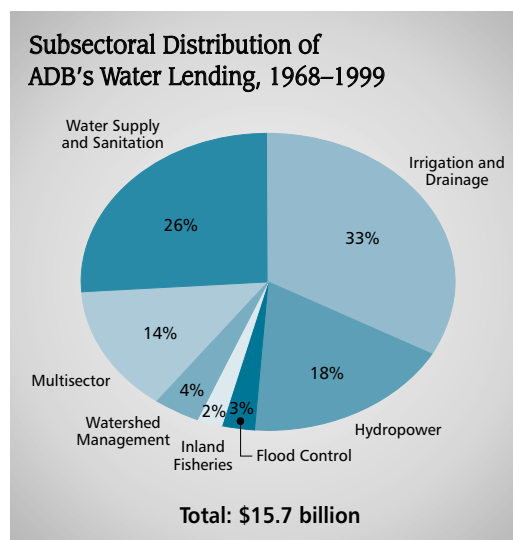


- attention to the complementary roles of the public and private sectors, recognition of the special contribution of women, and incorporation of economic instruments to improve allocation efficiency;
- integration of pro-poor strategies into project formulation to ensure that services are extended to poor areas and that rights of access are assured for the poor and other disadvantaged groups;
- strengthening of regulatory and control functions to maximize opportunities for private sector participation in service delivery;
- environmental protection and enhancement as an integral part of every new project, with each project being evaluated in the whole river basin context; and
- acquiescence of directly affected communities prior to committing investment funds.

A new generation of water projects with an integrated approach to supply and demand management has emerged. These incorporate fully the principles of integrated water resource management and build on country-specific analyses of water resource needs, constraints, and potential. The first such analysis was made with ADB assistance in Sri Lanka in 1993 and led to the formulation of a national water sector profile and reform action plan. This was followed by ADB-supported institutional strengthening and policy reforms, which will pave the way for new investments in water resource development. Other examples include Lao People's Democratic Republic, Pakistan, and Viet Nam where ADB is now supporting policy reforms and capacity building for integrated water resource management. An ADB-financed assessment of the water sector in the PRC (concluded in 1999) helped formulate strategic initiatives and an action plan that reflect a shift from a sectoral focus toward a more integrated and comprehensive approach. Projects now being prepared in the PRC are tackling traditional water resource problems in conjunction with biodiversity conservation

and legislative changes for improved natural resource management.

As the private sector assumes greater importance in development financing, ADB's catalytic role of mobilizing private capital has also grown. ADB's private sector support focuses on projects with significant economic and social merit and, where, because of long payback periods or perceived high risks, private investors have tended to be reticent. In the water sector, provided the projects are part of a well-conceived privatization strategy, ADB encourages private initiatives by providing direct financial support. Significant recent examples are the Maynilad Water Services Project for



water and sewage facilities in Metro Manila, Philippines, which is expected to benefit 90,000 poor families; and Chengdu Water Supply Project in Sichuan Province, PRC, ADB's first build-own-transfer project. In line with the evolving water policy, which encourages increased private sector participation to improve service accountability, such initiatives are expected to increase and encompass an ever-widening range of social infrastructure.

### *ADB's evolving water policy*

Lack of effective water policies and institutional arrangements is a pressing issue in most of ADB's DMCs. In the absence of reforms, private investments and increased community involvement will remain severely constrained, and potentially wasteful and destructive projects will be embarked upon. ADB's policy recognizes this problem and sets out a process for implementing water sector reforms as a prerequisite to new investments. To avail of ADB assistance, governments will need to adopt national water policies, laws, institutional reform, sector coordination mechanisms, and a national water action agenda.

Financial incentives and regulation, together with concerted efforts to protect water quality, aquatic ecosystems, and watersheds, need to be reinforced to improve the efficiency and sustainability of resource use.

Stakeholder recognition and participation will be promoted, and the needs of women and vulnerable groups will be adequately considered in water projects. New partnerships between public, private, community, and NGO stakeholders will be developed to ensure effective policy reform and environmentally sustainable, socially acceptable projects.

Implementing such reforms will require sustained financial and policy support, for which ADB has a comparative advantage because of its long experience of working with water agencies in the region. In addition, its cofinancing modalities and experience in catalyzing private investments provide a window for increasing support from other funding agencies.

Possible changes in climate are of particular concern in Asia and the Pacific where such phenomena as monsoons, the El Niño Southern Oscillation, and tropical cyclones play such a large role. ADB has supported regional studies on the possible impacts of climate change and is assisting its DMCs to develop national response strategies to help them cope with the greater climatic uncertainty. Comprehensive coastal zone management plans have been prepared for countries vulnerable to sea level changes, and national strategies for managing water resources under conditions of heightened uncertainty will form part of the policy agenda.

Making better use of Asia's shared rivers is an unfinished agenda with potentially large

## Regional Cooperation in the Water Sector

International cooperation need not be complex and controversial when it comes to exchanging information and experience in water sector policies and reforms. While circumstances are different in each country, there are enough common issues in the water sector that make such an exchange useful and cost-effective. Following its regional water policy consultation in 1996, ADB has promoted subregional water resource cooperation in Southeast Asia and South Asia in collaboration with the Global Water Partnership. These resulted in subregional water partnerships being established.

ADB's regional water policy consultations in Southeast Asia concluded that

- water has become the critical natural resource in most countries of Asia and the Pacific;
- national action programs are needed to manage water resources and improve water services that will sustain human and economic development in each DMC in the coming decades;
- governments should provide leadership, commitment, and a focus on principles to direct an effective water sector reform process in each country;

benefits to millions of poor people in the region. However, formulating agreements between sub-regions to enable equitable sharing of resources and better control of transboundary pollution has proven to be highly controversial and, in some cases, strongly divisive. In promoting regional cooperation, ADB has the potential to play an increasingly important role. ADB has shown its capability to act as a fair and impartial broker in analyzing the needs of populations both upstream and downstream, as demonstrated by its support to the countries of the Greater Mekong Subregion to expand their cooperation around a broader economic agenda of priority regional projects. ADB has also promoted international cooperation in other river basins, such as the Red River shared by the PRC and Viet Nam. ADB's role in promoting international cooperation is well illustrated by its regional water policy consultations, as described in the box on page 24 and below.

ADB's water policy, which is being formulated after extensive global and regional consultations, for consideration by the Board of Directors in 2000, will embody an integrated approach to water resource assessment within the river basin as the basic hydrologic unit. The water policy will incorporate pro-poor strategies and respond to the shift from water resource development to management of supply and demand. Its seven major policy elements are described in the box on page 26.



***Looking ahead:  
working for a blue revolution***

The hope for the future lies in doing for water productivity what the green revolution did for crop productivity. This "blue revolution," as it has been termed by various scientists and water planners, would dramatically improve the efficiency of freshwater use, particularly in agriculture. The revolution will begin with greater public awareness of the potential dangers of a business-as-usual approach; help create policies, strategies, and incentives needed to establish integrated water resource management on a global basis; and culminate in the

- national water apex bodies should be formed to oversee sector reforms;
- a range of modalities for river basin organizations exists, and such river basin organizations need to respond to demand and suit local conditions;
- water conservation requires supply and demand management, pricing, charging, public awareness, and ecosystem maintenance; and
- ADB should target the water sector in its operations with a long-term perspective and through effective partnerships to catalyze investments in integrated water sector programs in the region.

In South Asia, regional consultations resolved that

- sustainability of water resources, institutions, and financing is critical to poverty reduction;
- national water policies need to adopt cross-sectoral approaches and be practical and implementable;
- water institutions need to be reformed to deal with cross-sectoral dimensions through approaches that involve stakeholders at all levels; and
- participatory planning and management need to focus on people's needs, equity, gender, and accountability.



allocation of resources to effect the social, institutional, and technological changes necessary for efficient water allocation and use.

ADB is keenly aware of the magnitude of the challenges to be faced in water resource management during the coming decades if the worst-case scenarios are to be avoided. ADB has wide experience in analyzing the macroeconomic impacts of subsidies, formulating appropriate cost recovery and cost-sharing strategies, institutionalizing community participation in resource management, improving governance and transparency, making environmental enhancement cost-effective, and building capacity. ADB, as a rigorously impartial and fair adviser, has particular strength in promoting and fostering regional cooperation for shared water resources. ADB's approach stresses actions to ensure fair and equitable access for the poor and for others whose voices have not always been heard in decisions affecting the allocation of resources. ADB recognizes the special role of women in ensuring the health and well-being of families, both as principal agents for fetching water and preventing the spread of waterborne diseases, and as highly productive farmers and irrigators.

ADB is equally aware of the opportunities that exist for concerted action by governments, funding agencies, private sector, and civil society for improving the management of natural resources. A consensus has been formed among the international funding agencies for strong cooperation and concerted action in analyzing the needs of each country and region, identifying common goals among conflicting stakeholders, and adopting uniform standards and criteria for development decision making. Cooperation to achieve the maximum impact of development assistance will be the hallmark of international aid in the 21<sup>st</sup> century.

Despite the difficult choices that must be made worldwide to ensure sustainable water use and management, there is some cause for optimism. Commitment to stricter environmental controls and their enforcement does help to maintain healthier ecological conditions and can restore the severely degraded environment. The efficiency of water use can be improved without sacrificing quality of life, and such improvements can alleviate, if not completely avoid, looming water crises. Adopting socially inclusive policies to spread the benefits of water resource development to the poor and other traditionally disadvantaged members of the community benefits society as a whole by improving living conditions, health, social stability, and opportunities for productive employment.

### Elements of ADB's Water Policy

The following policy elements are being developed in the proposed water policy:

- promote effective national water policies and action programs;
- apply principles of socially inclusive development to improve the equitability of water service delivery; support adoption of appropriate pricing policies to promote greater efficiency; and encourage decentralization and autonomy to foster increased private sector participation and to improve service accountability;
- foster an integrated approach to management of water resources;
- foster the efficient and sustainable use and conservation of water;
- promote cooperation for beneficial use of shared resources within and between countries;
- facilitate stakeholder consultation and participation at all levels; and
- improve governance through capacity building, monitoring, and evaluation.