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**Water resources for all the
Millennium Development Goals**

Why does water resources development and management matter?

Sound water resources development and management underpins attainment of *all* the Millennium Development Goals, not only the one dealing specifically with water supply and sanitation. Moreover, it can avert tremendous human suffering (box 10.1). In this chapter and the two that follow it, we discuss the links between water resources and the Goals (especially those on poverty, hunger, health, gender, and environmental sustainability) and the actions that countries will need to take to optimize the contribution of water resources to the achievement of the Goals.

We use the term “water resources development and management” to mean the actions required to manage and control freshwater to meet human and environmental needs. Such actions include investments in infrastructure for storage, abstraction, conveyance, and control, as well as for hydropower, flood control, irrigation and drainage, water harvesting, and so on; investments and actions undertaken to protect groundwater resources, control salinity, and promote water conservation; and an array of governance and management measures, including the development and strengthening of institutional and regu-

Box 10.1
Water-related disasters: facts from the World Health Organization

Source: WHO 2004a.

- Almost 2 billion people were affected by natural disasters in the last decade of the twentieth century, 86 percent of them by floods and droughts.
- Flooding frequently leads to contamination of drinking-water systems with human excreta from inadequate sanitation and with refuse and industrial waste from dumps.
- Droughts cause the most illness and death, not only by limiting adequate water supply but also by triggering and exacerbating malnutrition and famine.
- Droughts and floods have broad economic impact: the Zimbabwe drought of the early 1990s was associated with an 11 percent decline in GDP; the recent floods in Mozambique led to a 23 percent reduction in GDP; and the drought of 2000 in Brazil cut projected economic growth in half.

Water can act as a spur to economic development

latory systems and policy reforms to promote wise stewardship of freshwater resources.

Investments in water resources development and management can contribute to meeting the Millennium Development Goals as a whole both through broad interventions designed to promote sustainable development in an area—such as multipurpose river basin development and aquifer management—and through targeted actions addressing one or more particular goals in a specific location, such as watershed management within degraded areas farmed by poor families. Both types of interventions are important for making many of the Millennium Development Goals a reality; indeed, holistic approaches to water resources development and management can help to deliver the Goals more cheaply and sustainably.

Table 10.1 illustrates some of the many ways in which the development, management, and use of water affects the targets embodied in the Goals (see Goals on p. xvi). The role of water resources development and management in combating poverty and hunger, ensuring environmental sustainability, improving health, and reducing gender inequalities is analyzed in more detail below.¹

Poverty and hunger

One in five people on the planet, two-thirds of them women, live in extreme poverty. Of the world's 6 billion people, 2.8 billion live on less than \$2 a day, and 1.2 billion on less than \$1 a day (DFID and others 2002). Chronic hunger, among the starkest and most absolute manifestations of poverty, affects 800 million people. In this era of progress and plenty, 17 percent of the world's people are on the brink of starvation, and 11 children under the age of five die from malnutrition every minute.

In addition to the role that improving access to domestic water supply and sanitation plays in reducing poverty, water can act as a spur to economic

Box 10.2

Improving water management to spur economic development

Source: World Bank 2003.

- Water infrastructure and sound water resources management can spur rural development. In Petrolina, in Northeast Brazil, water resources management and development has created a large number of high-quality, permanent agricultural jobs (40 percent of which are held by women). For every job in agriculture, two jobs have been created in the supporting commercial and industrial sectors. These opportunities have reversed the historic pattern of outmigration.
- Experience has shown that cooperative programs for water resources management have played an important role in regional integration and stability in Eastern Europe (the Baltic Sea), Southeast Asia (Thailand and Laos), and South Asia (the Indus Basin).
- Irrigation and drainage have contributed to past success in doubling food production, forestalling famine, and reducing global food prices. Globally, irrigated areas represent 17 percent of the cultivated area, but account for 40 percent of food production. In India, districts with little irrigation have a poverty incidence 2.5 higher than those with substantial irrigation.

Table 10.1
Contribution
of improved
water resources
management to
the Millennium
Development Goals

Millennium Development Goal	Contribution of improved water resources management
<p>Poverty To halve the proportion of the world's people whose income is less than \$1/day</p>	<ul style="list-style-type: none"> • Water is a factor of production in agriculture, industry, and other economic activities. • Investments in water infrastructure and services are a catalyst for local and regional development. • Reduced vulnerability to water-related hazards reduces risks in investments and production. • Reduced ecosystem degradation makes livelihood systems of the poor more secure.
<p>Hunger To halve the proportion of the world's people who suffer from hunger</p>	<ul style="list-style-type: none"> • Water is a direct input to irrigation for expanded grain production. • Reliable water sources support subsistence agriculture, home gardens, livestock, and tree crops. • Reliable water sources support sustainable production of fish, tree crops, and other foods gathered on common property resources (also affects poverty when such goods are sold for income). • By helping to lower food prices, water management can reduce urban hunger.
<p>Primary education To ensure that children everywhere complete a full course of primary schooling</p>	<ul style="list-style-type: none"> • Improved water management reduces the incidence of such catastrophic events as floods that interrupt educational attainment.
<p>Gender equality To ensure that girls and boys have equal access to primary and secondary education</p>	<ul style="list-style-type: none"> • Community-based organizations for water management can improve social capital of women by giving them leadership and networking opportunities and building solidarity among them.
<p>Child mortality To reduce by two-thirds the death rate for children under five</p>	<ul style="list-style-type: none"> • Improved nutrition and food security reduces susceptibility to diseases. • Well-managed water resources help poor people make a decent living and reduce their vulnerability to shocks, which in turn gives them more secure and fruitful livelihoods to draw upon in caring for their children. • Malaria is a leading cause of death among children, and better water management reduces mosquito habitats.
<p>Major disease To have halted and begun to reverse the spread of HIV, malaria, other major diseases</p>	<ul style="list-style-type: none"> • Improved water management in human settlements reduces transmission risks of such mosquito-borne illness as malaria and dengue fever. 1.2 million people die of malaria each year, 90 percent of whom are children under 5. • Improved health and nutrition reduce susceptibility to and severity of HIV/AIDS and other major diseases.
<p>Environmental sustainability To stop the unsustainable exploitation of natural resources</p>	<ul style="list-style-type: none"> • Improved water management, including pollution control and water conservation, is a key factor in maintaining ecosystems integrity. • Development of integrated management within river basis facilitates sustainable management of ecosystems and mitigates upstream-downstream effects. • Biodiversity conservation and combating desertification are furthered by sound water management.
<p>Slum dwellers To improve the lives of 100 million slum dwellers</p>	<ul style="list-style-type: none"> • Improved flood control and drainage in urban areas can improve conditions in slum settlements, which are often built on sites particularly vulnerable to water-related disasters.

development (box 10.2), and its role as a resource for agriculture, energy, and industry is essential to fighting poverty and hunger. Water is an important factor of production in a variety of industries crucial to economic development and poverty reduction; it is also central to the livelihood systems of the rural poor. Meeting the Millennium Development Goal in this area will be

**Three points
of connection
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health,
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and
vulnerability**

impossible without better water management and a dramatic expansion of access to water for the world's poorest (box 10.3). Ensuring an adequate food supply, achieving aggregate progress against poverty at the national level, and relieving poverty at the community and household levels simply cannot occur in many parts of the world, given current water shortages. Clearly, therefore, insufficient water blocks overall economic growth.

For the poor much more than for the nonpoor, the fulfillment of human-kind's most basic aspirations, such as living a long and healthy life, having sufficient resources to earn a living, and seeing one's children reach adulthood, is predicated on the state of the environment, including water resources. Environment is central to poor people's sense of well-being, empowerment, and control over their own lives. Three points of connection between poor people and their water environment stand out: health, livelihoods, and vulnerability.

- *Health.* The health of poor women and men is disproportionately affected by contaminated water and poor sanitation services, setting up a cycle of ill-health and further impoverishment that has severe financial and personal costs.
- *Livelihoods.* In rural areas, poor people's livelihood systems are rooted in the natural world and depend upon ecosystem health. Contamination of common property resources, such as lakes, rivers, and coastal areas, directly translates into less food, income, and time for the poor. Common property resources provide a significant share of food and household income for the poorest families.
- *Vulnerability.* Vulnerability is a critical dimension of poverty. Poor women and men are particularly at risk from environmental shocks and crises. Increasingly frequent and severe natural disasters (cyclones, hurricanes, floods, landslides, and droughts), as well as changes in rainfall patterns, shifting agricultural zones, and rising sea levels impact developing countries and the poor who live there disproportionately. The poor are the most affected by environment-based conflicts, which are

Box 10.3

**Main water-related
recommendations
of the Millennium
Project for
meeting the
poverty and
hunger Goals**

Target 1 on poverty

- Increase public investment in basic human needs, including water and sanitation, to foster a productive labor force that can participate effectively in a global economy.

Task Force on Hunger

- Increase agricultural productivity of food-insecure farmers, with a special focus on small-scale water management.
- Improve nutrition of the vulnerable (water-related diseases are a leading cause of diarrhea, which hinders the body's ability to absorb nutrients).
- Restore natural assets of food-insecure people, including water resources (lakes with fish, for instance).

**Poor water
management
practices
worsen
the water
shortages
in many
countries**

also becoming more frequent. Extreme events can have a strong impact on the ability of many developing countries, especially in the tropics, to achieve the Millennium Development Goals. Damage caused by floods and droughts and other extreme climate events can undo, in a short period, many years of steady development and growth. Although such extreme events start with direct damage to infrastructure and crops, they often ripple through many areas of economic activity, leading to widespread macroeconomic, financial, and political consequences. In Kenya, for example, flooding during the El Niño event of 1997–98 is estimated to have cost some \$880 million (10 percent of GDP) through the loss of roads, pipelines, and water treatment plants (Mogaka and others 2002).

The bulk of the world's poorest people, 800 million to 1 billion rural people, live in arid areas and depend directly on natural resources, including water, for their livelihoods (Dobie 2001). Many drylands people are subsistence farmers who also keep some livestock, while others are pastoralists, a nomadic way of life that is increasingly under threat. In dry, rural countries, such as Mali and Eritrea, most of the population lives this way, whereas in countries with both humid and dry regions, the dry areas are home to the poorest of the poor (Dobie 2001).

Retaining as much water as possible is a question of survival, but in arid areas a substantial amount of rainwater is lost through surface runoff, evaporation, and percolation. When the rains come and the water runs off, topsoil is carried away, gullies are formed, and the water is lost. People in drylands are uniquely vulnerable not only to drought and other natural disasters, but also to economic and social changes. Achieving sustainable development in the drylands has significant implications for reducing poverty and hunger globally.

Agriculture is now and will continue to be a key sector for low-income countries and the poor who live there. In developing countries, 80 percent of export earnings come from the agriculture sector. It is also the thirstiest sector: irrigated agriculture accounts for almost 70 percent of the global freshwater use. Limited and unreliable access to water is a determining factor in agricultural productivity in many regions, a problem rooted in rainfall variability that is likely to increase with climate change.

Today, underperforming irrigation systems and poor water management practices worsen the water shortages that already exist in many countries. Irrigation and poor drainage lead to salinization and waterlogging. Excessive extraction for irrigation has lowered water tables to critical levels in many places. The use of pesticides and fertilizers in agriculture pollutes groundwater. Invasive species have covered huge water areas throughout the world, clogging irrigation channels, threatening infrastructure, and leading to the collapse of fisheries.

**Most
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smallholders**

The return to water in food production, including the efficiency of agricultural water use, can be improved substantially through better water resources management—and provide “more crop per drop.” Clearly this is necessary to meet the hunger target; it is also critical in terms of the contribution increased grain production can make to the economy as a whole, and thus to meeting the poverty eradication Goal.

Projected increases in the world’s population will lead to greatly increased demands for food, primarily from developing countries. Currently, the 17 percent of the world’s cultivated land that is under irrigation produces 40 percent of the world’s food (FAO 2003). Much of the projected increased demand for food will have to come from improved and expanded irrigation, but this will be only a partial solution. Most irrigation systems are financially out of reach for poor smallholders. Most food demand for poor people will come from areas where investment in irrigation makes no sense, with too little return from the significant capital needed. The major part of the crops produced worldwide is still grown in rain-fed agriculture, and to improve the livelihoods of the farmers in the developing world more emphasis must be put on employing practices that ensure higher yields per water input.

Water is also a factor of production in industry and many other types of economic activity, including both large-scale activities and small, often home-based activities where the poor are entrepreneurs, such as food processing for vending in markets. Access to key factors of production, including water, is critical to the viability of activities that can serve as a ladder out of poverty. In some cases, investments in water infrastructure, such as dams and irrigation schemes, can act as a catalyst for local and regional development.

Water can be critical in supplying energy services to unserved poor women and men in rural areas, and safe, environmentally friendly, and affordable energy services are critical to poverty reduction. Energy services that allow for heating, cooking, and illumination are not only a boon to the activities of daily life; they are also critical inputs to agriculture and the types of small-scale productive activities that are a significant component of the rural economy in poor areas.

In sum, water is critical in achieving the Goals on poverty and hunger because:

- Agriculture is and will continue to be a key sector for low-income countries and the poor who live there.
- Water is a factor of production in industry and many other types of economic activity.
- Common environmental resources provide a significant share of food and household income for the poorest families, and the livelihood systems of poor women and men depend upon a healthy environment.
- Pollution of common resources, such as lakes, rivers, and coastal areas, directly translate into less food, income, and time for the poor.

Water is perhaps the most fundamental of all environmental resources

- Sound water management may reduce the incidence of a range of other diseases for which water is a vector.

Environmental sustainability

The overall Millennium Development Goal of ensuring environmental sustainability (Goal 7) has three specific targets:

- *Target 9:* Integrate the principles of sustainable development into country policies and programs; reverse loss of environmental resources.
- *Target 10:* Reduce by half the proportion of people without sustainable access to safe drinking water and basic sanitation.
- *Target 11:* Achieve significant improvement in the lives of at least 100 million slum dwellers by 2020.

Clearly, water is a key dimension in achieving each of these three targets.

Target 9 on sustainable development

Water is perhaps the most fundamental of all environmental resources and the most critical for the viability and long-term sustainability of the world's ecosystems (box 10.4). Ecosystem health, in turn, is critical for the quantity and quality of water supply. Human activities, such as infrastructure development, modification of river flows, land conversion (for example, deforestation), increased agricultural production, overfishing, introduction of exotic species, and release of pollutants, upset the delicate balance between water resources and environmental sustainability.

Several threats to overall ecosystem health, and consequently to the ability of ecosystems to provide the services upon which human life depends, are particularly relevant to water resources.

- Climate change and resulting alterations in weather patterns, water distribution, and fisheries will seriously affect marine ecosystems and small island developing states, and will also threaten poor populations unable to protect themselves from flooding, erosion, water shortages, and coral bleaching.

Box 10.4

Main water-related recommendations of the Millennium Project Task Force on Environmental Sustainability

- Institute integrated water resources management using an ecosystem-based approach.
- Invest in improving the water efficiency of cropping systems.
- Invest in wastewater treatment—particularly in urban areas.
- Improve environmental monitoring, indicators, assessment, and use of information in decisionmaking.
- Remove environmentally damaging subsidies in water use and fisheries.
- Protect critical land and marine ecosystems.
- Strengthen institutional capacity for integrated ecosystem management.

Poor slum dwellers have little way to insulate themselves from threats

- Loss of species diversity and genetic diversity within species impacts the health of marine and coastal environments, as well as that of wetlands.
- Global fisheries, marine ecosystems, and coastal habitats are quickly degrading because of overfishing and contamination from land-based activities.
- Freshwater ecosystems are being damaged by runoff, silting, fertilizers, pollution, and invasive species.
- Drylands are further degrading as a result of desertification, dropping water tables, and overirrigation.

It is important to note that target 9 is intended to address the goal of “stopping the unsustainable exploitation of water resources by developing water management strategies at the regional, national, and local levels, which promote both equitable access and adequate supplies,” which was clearly enunciated in the Millennium Declaration, but is not referred to explicitly or implicitly in any other of the eighteen Millennium Development targets.

Target 10 on water and sanitation

This is, of course, the Millennium Development target on water and sanitation that was discussed at length in previous chapters. Although clearly this target is much more than an “environment” target, given its implications for human health and poverty reduction, officially it resides with the overall Goal of ensuring environmental sustainability.

Target 11 on improvements for slum dwellers

For poor people living in slums, the water-related problems already discussed in relation to the other Millennium Development Goals—inadequate access to clean water and sanitation services; poorly managed water resources; and the resulting drain on human health, education, women’s empowerment, and environmental sustainability—are magnified (box 10.5). The geographical concen-

Box 10.5
Living with urban environmental problems

Source: UN-HABITAT 2004.

“We are eight people living in a small one-room shack where we have to sleep in shifts. There is a public toilet down the lane, but we have to queue for two hours. The toilet is broken, sewage flowing everywhere. Several girls have been molested there, and some even raped, in broad daylight. My sisters and mum don’t go there. We keep our “business” for the evenings. In the dark we wrap it into plastic bags and throw it as far away as possible. These are our flying toilets, and our neighbors do the same. We know it’s not right, so we do this only at night. Our tummies sometimes hurt the whole day, since we just have to hold. When it rains, the flying toilets [together with the contents] get washed with the rainwater and accumulate on the door. The feces stay there for days. When the rains are heavy, it gets washed right into the house. We have no hope of leaving here. We don’t have anywhere else to go.”

—Halima, a Nubian girl from Kibera, Nairobi’s largest slum, home to 700,000 people

**Management
of water
resources
more
generally has
significant
health
impacts**

tration of people, production, and pollution in slums amplifies the biological pathogens and chemical hazards to which urban people are exposed. Poor slum dwellers, unlike their wealthier urban counterparts, have little way to insulate themselves from these threats. They are exposed to a host of environmental risks because they live in poor housing, often built in hazardous locations (such as industrial sites or flood-prone areas). Poor urban dwellers are also frequently outdoors, because they generally face long commutes, often work as laborers or street vendors, and frequently flee their overcrowded houses. As a result, morbidity and infant mortality rates are higher among slum dwellers than among urban people who do not live in slums, or among the rural population (UN-HABITAT 2003).

As the Brundtland Commission noted more than 15 years ago, “the future will be predominantly urban, and the most important environmental concerns of most people will be urban ones” (World Commission on Environment and Development 1987). Two-fifths of people in Africa, Asia, the Pacific, Latin America, and the Caribbean now live in urban areas, and every passing day further swells the ranks of city and town dwellers. UN-HABITAT estimates that more than 900 million people in the developing world live in slums. In least developed countries and Sub-Saharan Africa, more than 70 percent of the urban population lives in slums, a figure expected to increase (UN-HABITAT 2003).

Tackling urban environmental problems is critical to meeting the Millennium Development target of improving the lives of 100 million slum dwellers (box 10.6). The main challenge is addressing threats to health, livelihoods, and security stemming from hazardous living conditions and poor services; these threats include substandard housing, polluted water, lack of sanitation and solid waste systems, outdoor air pollution from industry and traffic, indoor air pollution from low-quality cooking fuels, and extreme vulnerability to environmental disasters (which are likely to increase with climate change). Many steps taken to reduce environmental hazards, such as building with better materials and ensuring adequate drainage systems, also contribute to disaster preparedness, as does improving urban planning and zoning so that the poor are not relegated to flood-prone or otherwise unsafe living sites.

Box 10.6

**Main water-related
recommendations
of the Millennium
Project Task Force
on Improving
the Lives of
Slum Dwellers**

- Promote citywide slum upgrading including the provision of infrastructure services for water and sanitation.
- Provide alternatives to slum formation by making land and basic infrastructure available for low-income housing.
- Invest in urban trunk infrastructure, including for water and sanitation.
- Ensure that water tariffs are affordable for poor people.
- Improve solid waste disposal and provide investments to lower the pollution of water and air.

Vector-borne diseases are becoming more difficult to treat

Health

Over and above the impact of domestic water supplies and sanitation on human health, the management of water resources more generally has significant health impacts in terms of vector-borne diseases and water contamination. Worldwide, more than 160 million people are infected with schistosomiasis,² which causes tens of thousands of deaths each year; there is a 77 percent reduction in schistosomiasis from well-designed water supply and sanitation interventions (WHO 2004a). Human-built reservoirs and poorly designed irrigation schemes are the main drivers of schistosomiasis expansion and intensification. Malaria kills more than one million people each year, 90 percent of them in Africa, the great majority of them children. Along with HIV/AIDS, malaria is one of the major public health scourges eroding development in the poorest countries in the world, and costs Africa more than \$12 billion annually. It has slowed economic growth in African countries by 1.3 percent a year, the compounded effects of which are a gross domestic product level now 32 percent lower than it would have been had malaria been eradicated from Africa in 1960 (WHO 2004b).

Vector-borne illnesses, which include malaria (box 10.7), dengue, and schistosomiasis, are passed to humans by insects and snails that breed in aquatic ecosystems (UN/WWAP 2003). Vector-borne diseases are becoming more difficult to treat because of the growing resistance of bacteria to antibiotics, parasites to other drugs, and insects to insecticides. Thus, improved water management practices are becoming an increasingly important tool in combating this category of disease. For instance, improving irrigation techniques to avoid standing or slow-moving water can have a big impact on the breeding of mosquitoes that carry malaria. Improved disposal of household wastewater can also eliminate a choice breeding ground for mosquitoes.

Persistent organic pollutants, or POPs, are another danger as a source of water contamination. POPs are produced and released into the soil, air, and water by human activity, such as irrigation, industrial discharges, and improper waste disposal. Derived from pesticides, other agrochemicals, industrial chemicals, and the byproducts of industrial processes, they can accumulate in living organisms to levels harmful to both human and environmental health. They include such substances as dioxin, PCBs, and DDT.

Box 10.7

Malaria: facts from the World Health Organization

Source: WHO 2004b.

- Some 1.2 million people die of malaria each year, 90 percent of whom are children less than 5 years old.
- There are 396 million episodes of malaria every year; most of the disease burden is in Sub-Saharan Africa.
- Intensified irrigation, dams, and other water-related projects contribute significantly to this disease burden, and better management of water resources reduces transmission of malaria and other vector-borne diseases.

Management of water resources has significant gender dimensions

Research suggests that the rural and urban poor, who are most exposed to environmental hazards, and especially women, children, and infants, are generally the groups most affected by POPs. Evidence points to links between human exposure to specific POPs and cancers and tumors, learning disorders and changes in temperament, immune system changes, reproductive disorders, birth defects, a shortened period of lactation in nursing mothers, and diseases such as endometriosis and increased incidence of diabetes, among others. These substances appear to become highly concentrated in human tissue and breast milk and can be passed to the developing fetus through the placenta. Even in small amounts (parts per trillion) these substances can have serious impacts on the development of the brain and reproductive system of children (CIEL website). These substances become integrated into the food chain, prolonging their damaging effects on ecosystem and human health.

Gender equality

In addition to the gender implications of improving access to domestic water supplies and sanitation, as described in part 1, the management of water resources more generally has significant gender dimensions (box 10.8). For example:

- Rural women produce 60 percent to 80 percent of food in developing countries, and their contribution to food security is likely to increase because of the “feminization of agriculture,” which results when rural men migrate to urban areas in search of paid work and women remain to farm and care for family members. Women’s role as farmers is frequently overlooked by agricultural extensionists, including those working for irrigation agencies; they often exclude women from access to water (for instance, by requiring land titles for access to irrigation systems). Explicitly involving women farmers in irrigation schemes and giving them a voice in decisionmaking processes related to water management is essential to fighting rural poverty. Also helpful would be including other ways women use irrigation water, such as in home-based cottage industries and home gardens, in water development and management plans (Molden and de Fraiture 2004).

Box 10.8

Main water-related recommendations of the Millennium Project Task Force on Education and Gender Equality

- Provide incentives to keep girls in primary and secondary school.
- Invest in gender-sensitive infrastructure such as girls’ toilets, without which many girls drop out of school.
- Invest in “gender-responsive infrastructure,” that is, infrastructure that reduces the time poverty of women and girls, such as infrastructure for water supply and sanitation.
- Protect women’s property and inheritance rights, to which access to water is often linked.

There are positive reinforcements among the Goals, as well as downward spirals

- Social and economic analyses, including documenting natural resource uses, are incomplete without an understanding of gender differences and inequalities. With gender analysis, planners gain a more accurate picture of communities, natural resource uses, households, and water users. Understanding the differences between women and men (who does what work, who makes which decisions, who uses water for what, who controls which resources, who is responsible for the different family obligations) is part of a good analysis and can contribute to more effective initiatives.
- Without specific attention to gender issues, initiatives and projects can reinforce and even worsen inequalities between women and men. Although many initiatives are thought to be “gender neutral,” they rarely are. Projects and programs often bring new resources, such as training, tools, and technology. Whether someone is male or female can influence whether he or she can take advantage of these opportunities, and even projects aimed at women can be “captured” by men when significant new resources are at stake.
- The involvement of both women and men in integrated water resources initiatives can increase project effectiveness. Experience shows that ensuring both women’s and men’s participation can enhance project results and improve the likelihood of sustainability. In other words, a project is more likely to achieve what planners hope it will achieve if women are active participants and decisionmakers.

In addition, even water-related environmental challenges affect women more negatively than men. For example, studies in Bangladesh show that women suffered most following the 1991 cyclone and flood. Among women ages 20–44, the death rate was 71 per 1,000, compared to 15 per 1,000 for men. The reasons: women were left at home by their husbands to care for children and protect property; their saris restricted their mobility; they were malnourished and thus physically weaker than men; and during the cyclone, the lack of *purdah* (partitions used to separate women from men or strangers) in public shelters may also have deterred women from seeking refuge (Baden and others 1994).

Exploiting potential synergies through combined approaches

There is a fundamental synergy between the various Goals.³ It is difficult—if not impossible—to make progress on a few Goals without progress on the others. There are positive reinforcements among the Goals, as well as downward spirals. Malnourished people are more susceptible to diseases, such as diarrhea, and diarrhea in turn saps the body of calories and micronutrients. Healthy, well-fed people have more energy to escape from poverty. Safe drinking water near home keeps more girls in school, and educated girls have better nourished children, even without an increase in income. Poor, malnourished people are more likely to mine their natural resources for short-term benefits, regardless

Countries should avoid actions that focus single-mindedly on one target at the expense of another

of the long-term cost. Environmental degradation and polluted water affect the poor first. Healthy, well-nourished people with a decent income prioritize protection of their environment and natural resources. Conservation of natural forests provides “famine foods” to prevent malnutrition during periods of crop failure. Rehabilitation of degraded soil and water resources reduces the risk of crop failure and shortens the preharvest hunger period.

A critical challenge for meeting the Millennium Development Goals, therefore, is to define and promote strategies that will contribute to multiple Goals, and avoid strategies that create conflicts among them. Independent sectoral planning will increase the total cost of achieving the Goals, reduce effectiveness, and make it hard for communities to plan and manage multiple programs. Achieving the Goals will require political consensus and mobilization across many constituencies; integrated and synergistic strategies are more likely to generate enthusiasm and reduce costs of conflict. While exploiting all possible synergies, countries should also actively avoid water resource development and management actions that focus single-mindedly on one target at the expense of another.

Six key synergistic approaches that involve the planning, development, management, and use of water are:

- *Disseminate small-scale water technologies for livelihoods.* These technologies provide livelihoods to small and landless farmers, while addressing the hunger and environment goals (Rijsberman 2004). An array of technologies is available, appropriate to a variety of agroclimatic and socioeconomic conditions, ranging from rainwater harvesting in dry areas to the use of manual pumps to access shallow groundwater. What needs to be recognized is that successful adoption by a large number of people depends less on the exact nature of the technology itself than on: (a) the social marketing of the technology; (b) the availability of micro-credit programs; (c) the institutional support through nongovernmental networks or community-based organizations to provide training and technical support; and (d) the community and household preferences.
- *Reduce the vulnerability of communities to water-related natural disasters through land reform, infrastructure construction for water storage and flood protection, and improved land use planning, including slum upgrading.* These changes would address poverty, hunger, and health goals by increasing incomes and reducing the domestic and production risks faced by poor households.
- *Invest in water and sanitation systems, including new infrastructure for water management, in support of the nutrition, health, and environment Goals.* Investments in water supply and sanitation services will contribute to the achievement of public health, poverty, and hunger Goals. Infrastructure investment creates both temporary and permanent job opportunities, contributing to poverty alleviation.

Win-win approaches are highly desirable but not always possible

- *Invest in community-based natural resource management, including urban agriculture, for hunger, poverty, and environment Goals.* This might involve investing in community fisheries conservation strategies to reduce hunger in fisher and fish-consuming populations and to achieve marine conservation objectives; strengthening resource tenure and building the capacity of forest communities for joint conservation and rehabilitation, as well as sustainable commercial use; and investing in community herding systems that jointly address livestock, rangeland, and wildlife management with a view to protecting and enhancing the livelihoods of poor, rangeland-dependent communities. This might involve supporting urban and periurban small-scale agriculture, livestock, and forestry to jointly address tenure, water, food access, micro-nutrient malnutrition, and poverty goals.
- *Develop new sanitation technologies to use wastewater for periurban agriculture.* This development would address a key aspect of the sanitation Goal by turning the challenge of dealing with urban wastewater into an opportunity, a resource for generating additional livelihoods. It also addresses the poverty and malnutrition Goals for one of the most vulnerable groups of very poor people, those living in the periurban areas, the slums, of medium-to-large cities in developing countries. The Food and Agriculture Organization has estimated that 20 million hectare are directly or indirectly⁴ irrigated with wastewater in 50 countries—close to 10 percent of the total irrigated area (UN/WWAP 2003).
- *Improve terms of agricultural trade.* Trade creates markets for agricultural products, thus enabling investment in more efficient water use. In an increasing number of developing countries, irrigated agriculture can be a key to export-led economic growth, as illustrated by the experience of Chile and South Africa. A change in global trade regimes and the opening up of markets by industrialized countries would greatly enhance the opportunities for such growth, which, if supported by appropriate macroeconomic policies, would also provide strong incentives for more efficient water use. Furthermore, trade in agricultural products and in “virtual water,”⁵ as governed by the World Trade Organization, has important ramifications for the availability of water resources in many countries.

Although win-win approaches that advance more than one Millennium Development Goal simultaneously are highly desirable, they are not always possible. Indeed, there are many situations in which tradeoffs among the Goals are inevitable, particularly in the short term. Initiatives designed to spur economic development, for example, can come into conflict with the need to protect the quantity and quality of water. Cutting down trees for firewood or income-generating activities can contribute to deforestation, which eventually affects both rainfall and siltation of streams and rivers. Development of

small dams to enable dry-season irrigation by smallholders can increase suitable breeding places for malaria mosquitoes and snail vectors of bilharzia or schistosomiasis. Pollution from industrial or agricultural activities designed to generate livelihoods and reduce poverty can greatly affect water quality. Irrigation and poor drainage can lead to salinization and waterlogging, negating the intended improvements in agricultural productivity. Excessive extraction of groundwater for irrigation can lower water tables to critical levels, which may deplete drinking-water supplies for the poor. Sewerage systems that “solve” environmental problems and avert health crises in one area can create environmental problems elsewhere, if the untreated sewage is dumped into another community’s water source. As all these examples demonstrate, careful analysis and coherent management is called for to keep improvements in one area from having negative effects in another.

What actions are needed?

Whereas investments in water resources development and management contribute in a variety of ways to meeting the Millennium Development Goals as a whole, the specific water-related interventions required to meet the Goals will vary across regions, countries, and even subnational areas. Context strongly influences the nature of the water resources actions that must be taken to meet the Goals.

The key determinant across virtually all regions and scales of analysis is the relationship between the availability of freshwater and the requirement for its use. Both availability and requirement are multidimensional notions, each having quantitative, qualitative, temporal, and spatial dimensions. Simply put, the actions needed to meet the Millennium Development Goals in a given case depend on the extent to which the availability of water resources—in its many dimensions—is adequate to meet the requirement for water resources to meet the health, poverty, gender, and environmental sustainability objectives of the Millennium Development Goals.

The availability of freshwater resources can be disaggregated into three principal dimensions: quantity, quality, and variability.

- The *quantity* of water available, from both surface and groundwater sources, is one fundamental aspect of availability. This amount is, of course, strongly related to rainfall and to the infrastructure already in place for water storage and abstraction. Availability comprises both physical access to sources wholly within a particular boundary (including fossil groundwater) and negotiated access to shared water sources, such as rivers, lakes, and aquifers.
- *Quality* is an aspect of freshwater availability that has become a major issue in some parts of the world, and that can also have a major impact on attainment of the health and environmental sustainability Goals. In

**Tradeoffs will
need to be
made in the
use of water
resources
to meet the
various Goals**

some cases, such as Bangladesh's problem with arsenic-contaminated groundwater, water quality problems are naturally occurring. Much more common, however, is the degradation of water quality by anthropogenic causes, such as pollution discharges into surface water bodies and leaching of contaminants into underground water sources.

- *Variability* in the availability of water, both in time and space, depends both on climatic variables and on the types of infrastructure and management arrangements already in place for water control. Surface waters often have highly seasonal regimes; this is particularly the case in the tropics, where most of the countries that are off-track in meeting the Goals lie. In addition to seasonal variability, there is often considerable variability from one year to another. Both seasonal and year-to-year variability create a need for diversification of water sources, early-warning systems, contingency plans for droughts and floods, and storage alternatives (both surface and subsurface).

The requirement for freshwater resources not only has quantity, quality, and (spatial and temporal) variability characteristics, but also goal-specific dimensions—which mean that the nature of the water resources actions needed to meet the Millennium Development Goals will vary from Goal to Goal. For example, to meet the poverty Goal, countries will need to use water for productive purposes to ensure livelihoods in water-dependent sectors, such as agriculture, industry, energy, transport, and fisheries; they will also need to control water variability, since households living at the brink of survival can easily be devastated by a single water-related extreme event, such as a flood or drought. Meeting the hunger Goal will require the use of water as an input to agriculture and to support productive activities that help ensure economic access to food (for example, through employment of landless labor in the dry season), as well as access to safe water and adequate sanitation to maintain the health conditions required for proper absorption of nutrients. Meeting the health Goals will require access to domestic water availability and sanitation, sound water management to limit vector-borne diseases, and appropriate levels of water quality. Meeting the gender Goal will require ensuring that women have a strong voice in decisionmaking processes related to water management. Meeting the environment Goals will require that sufficient amounts of water are reserved to ensure healthy ecosystem functioning. It is, however, important to note that the Millennium Development Goals will not be addressed in isolation. Typically, other uses—agricultural, municipal, and industrial—dominate water management activities and need to be addressed to ensure that the Millennium Development Goals receive priority.

All this will greatly affect the level and the nature of requirements for water, the stress on water resources, and the mechanisms for identifying and ensuring its best use—the actions needed to meet the Millennium Development Goals. Unfortunately, in many of the world's poorest countries, the quantity, quality, and variability of water resources is such that tradeoffs will need to be made in the

**Countries
that start
“from behind”
can overcome
these
constraints**

use of water resources to meet the various Goals, particularly between the hunger and environmental sustainability Goals. According to a recent study conducted under the Comprehensive Assessment of Water Management in Agriculture, sponsored by the Consultative Group on International Agricultural Research (CGIAR), more than 1.4 billion people already live in river basins where high water-use levels threaten freshwater ecosystems (Smakhtin and others 2004). Other studies have shown that in order to sustain ecosystems, irrigation withdrawals—vitaly needed to meet the hunger Goals—will need to be reduced by 7 percent by 2025, in comparison with 1995 levels (Alcamo and others 2000). Clearly, innovative approaches will be required to reduce these inherent tradeoffs among the uses of water resources to meet the various Goals.

A quick picture of this situation is provided in map 11.1, which depicts water stress in major basins, taking into account environmental water requirements (Smakhtin and others 2004). The map uses a water-stress indicator that relates total withdrawals to the mean annual flow less an estimated amount for environmental flow. Much of the area under greatest stress, where people are already overexploiting rivers by tapping water that should be reserved for environmental flows, coincides with areas that are heavily developed for irrigation to provide water for food. Much of Sub-Saharan Africa and Latin America has low degrees of environmental water stress, raising the issue of whether these areas could be tapped for additional water to support livelihoods, if that could be done sustainably. Note that areas with high levels of water stress do not coincide with areas with low levels of access to safe drinking water or basic sanitation.

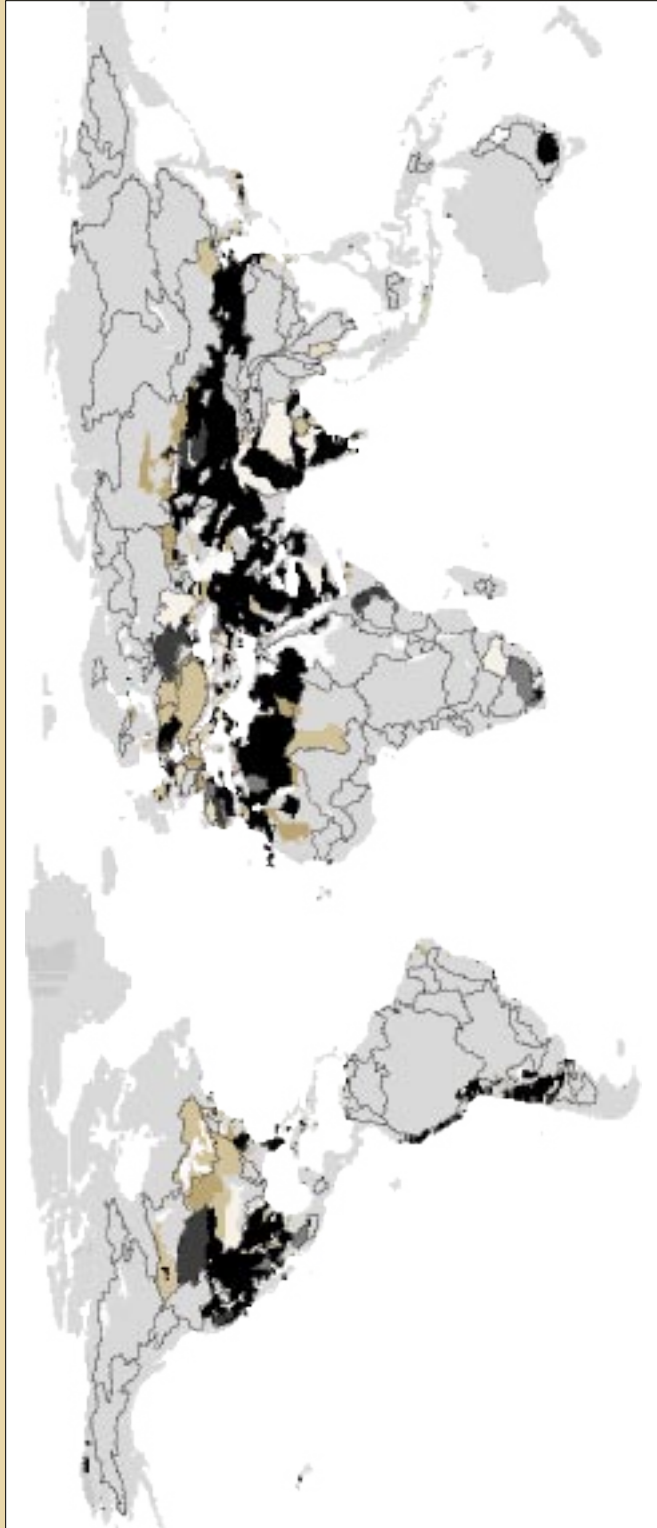
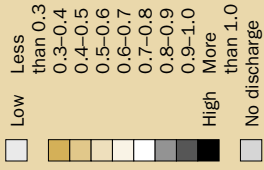
The preceding analyses suggest two important conclusions:

First, the specific actions that a particular country or region should take to improve water resources management depend on the relationship between the availability and requirement for water resources, as well as the socioeconomic, political, and historical circumstances of that area. Clearly, natural endowments give countries and regions different starting points for water resources development and management. But countries that start “from behind”—with high variability and low per capita freshwater availability—can overcome these constraints through appropriate investments and management arrangements.

Second, given the complex relationship between water resources and poverty, hunger, gender equity, and environmental sustainability, coordinated water management will have to be a fundamental component of any national strategy to attain the Millennium Development Goals. In particular, planning and policy development based on the Goals must be supported by an integrated approach to land, water, and ecosystems, one which conforms broadly to the recommendations from the Johannesburg Summit regarding integrated water resources management and water efficiency strategies. Meeting the Millennium Development Goals will therefore require investing in water resources development and management and adopting an integrated water resources management approach, as outlined below.

Map 11.1.1
Water stress in major river basins

Source: Smakhtin and others 2004.



Note: High water stress indicates that the amount of water withdrawn for human use is a large share of the amount available after environmental requirements are met. In most basins with a water stress indicator of 0.7 or higher, aquatic ecosystems are already suffering some degree of degradation, and there is little or no scope to increase water withdrawals without causing irreversible damage

Countries will need to embark on a plan of action involving both supply and demand management

Investing in water resources development and management

As the challenges for sound water resources management vary within and among countries, so must the strategies for identifying and addressing water-related obstacles to achieving the Millennium Development Goals. In general, however, countries with high variability or low availability in relation to freshwater requirements will need to embark on a plan of action involving both supply and demand management. A coherent approach to investing in water resources infrastructure and management to meet the Millennium Development Goals in a particular country might include:

- *Identifying intermediate water resource targets that support each of the key Millennium Development targets.* In the case of the hunger target, for example, a short-term water-related target might be an estimate of the land area that would need to be brought under irrigation or the degree of investment required to improve the efficiency of existing systems. For both the poverty and the hunger targets, an intermediate water target might be a calculation of the storage capacity and early warning systems that would be needed to effectively control floods and droughts.

Intermediate targets for water resources should address both investment and management issues, taking into account the vast deficiencies in infrastructure endowments in the countries farthest from reaching the Goals, as well as the potential for demand management. Intermediate targets will need to include both a physical dimension—for example, the need for irrigation infrastructure in working order—as well as a concept of use—for example, whether communities and local governments are able to maintain a safe, reliable supply of water from a tube well.

- *Carrying out needs assessments for water resources development and management based on intermediate targets.* Governments should determine the infrastructure development, watershed management practices, demand management systems, and institutional and policy measures needed for meeting the Millennium Development Goals, as well as the human and financial resource requirements to achieve them. They should cost out these needs, including both capital and operation and maintenance costs. The water infrastructure considered should include all hydraulic infrastructure needed to align water supply with demand, from water storage and irrigation infrastructure to interbasin water transfers and infrastructure for industrial and other economic uses. Such costs should also include investments needed to ensure that infrastructure development does not negatively impact any of the Millennium Development Goals, especially the environmental sustainability targets. Equally important, estimates of the resources necessary to ensure proper, sustainable functioning of installed infrastructure—for example, through training and institutional capacity-building programs—should be included in such assessments.

**Water
resources
development
and
management
should be
integrated**

- *Developing a plan that outlines how to meet the needs identified in the assessment and how such actions will be integrated into a national poverty reduction strategy based on the Millennium Development Goals.* This would entail mapping out, with specific milestones at national and subnational levels, the year-to-year actions and investments required to meet the needs identified in the assessment. Such plans should not be stand-alone sectoral documents, but elements that will be integrated into overall strategies to reduce poverty and promote sustainable development in line with the Goals.
- *Defining and promoting strategies that will contribute to multiple Goals, and avoiding strategies that create conflicts among them.* A coherent national planning process should guide sectoral planning. The absence of coherence may increase the total cost of achieving the Millennium Development Goals, reduce effectiveness, and make it hard for communities and subnational governments to plan and manage multiple programs. Integrated and synergistic strategies that generate buy-in from all stakeholders and reduce costs and conflict should be given priority. This is not to advocate rigid central planning; what is recommended is a coordination of sectoral activities in such a way that promotes synergies among them, rather than attempts to plan entire national economies.

Adopting integrated water resources management

Because the Millennium Development Goals are interlinked, water resources development and management in support of the Goals should be pursued in an integrated manner, with priority given to actions that further multiple goals. Integrated water resources management (IWRM), as defined by the Global Water Partnership, is a process that “promotes the coordinated development and management of water, land, and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.”¹ Integrated water resources management builds on three basic pillars: an enabling environment of proper water resources policies and legislation; an institutional framework of capable institutions at national, local, and river-basin levels; and a set of management instruments for these institutions. Of course, the form that IWRM will take must vary from country to country; in some cases, groups of neighboring countries may profitably engage in joint IWRM exercises.

IWRM focuses on development (investment), as well as management issues. This approach is particularly important for the poorest countries most at risk of failing to achieve the Millennium Development Goals, where deficiencies in infrastructure endowments are vast. The target set by the World Summit on Sustainable Development in Johannesburg for countries to develop IWRM and water efficiency strategies by 2005 provides an opportunity to

Integrated development will need to recognize the challenges of sharing water between countries

infuse planning processes based on the Millennium Development Goals with consideration of water resources (GWP 2004). If properly designed, these national IWRM strategies and processes can establish an enabling framework that encourages water management and services that benefit the poor, and thus advance the Goals.

At the same time, the 2005 IWRM target included in the Johannesburg Plan of Implementation should be interpreted as meaning the *initiation* of a robust water resource management process. For example, one meaningful measure of progress toward a national IWRM process would be that representatives of all stakeholder groups have had the opportunity to discuss the necessary compromises between competing interests in water. Such processes take time, and the IWRM activities initiated in anticipation of the 2005 milestone should be considered essential first steps in a much longer journey toward sustainable water resources management.

Experience in several countries suggests that IWRM is an effective way of coordinating development strategies across sectors and geographical regions. Uganda and Burkina Faso have gone through multiyear IWRM processes resulting in new national policies, strategies, and laws for their water resources development and management. China, India, Thailand, and Nicaragua refer to their policy reform processes as IWRM-based.

The integrated development and management of water resources in support of the Millennium Development Goals in countries sharing transboundary water resources will need to recognize the challenges of sharing water between countries. Transboundary considerations, however, should not be viewed simply as an additional level of integration; they can also be a potential catalyst for the development of more effective approaches to reaching the Millennium Development Goals.

Examples of context-specific actions

Ultimately, context should determine the specific actions and strategies a country should use to reach the Millennium Development Goals. Context includes the relationship between availability and requirement for freshwater resources, as well as the socio-economic circumstances of the country. Four examples will illustrate this point.

Regions with a tropical monsoon climate (ample water but high variability in time) and low levels of investment in water storage infrastructure.² In these situations, meeting the Millennium Development Goals may require:

- A significant investment in water storage capacity.
- Diversification of water sources.
- Development and implementation of early warning systems based on climate prediction tools.
- Development of contingency plans.

*Areas where the impact of climate change on water resources is anticipated to be grave, leading to more frequent and severe floods, droughts, mudslides, typhoons, and cyclones.*³ Here, actions might include:

- Greater investments in storage capacity.
- Increased investment in technologies, capacity, and institutional structures to monitor and predict extreme weather events (early warning systems).
- Improved national disaster preparedness and planning.
- Zoning regulations (or improved enforcement of existing regulations) that keep people from living in areas regularly destroyed by floods.
- Long-term national water management plans that take into account the affects of climate change and focus on achieving the Millennium Development Goals.

*Water-scarce regions, in which water is a limiting factor in the achievement of the hunger Goal.*⁴ Here, actions might include:

- Identifying new incentive structures for water use and conservation to influence unsustainable consumption patterns.
- Identifying unsustainable agricultural subsidies and trade barriers and assessing the degree to which trade can help solve regional food deficiency problems.
- Closing the productivity gap between what can be and what is produced by exploiting the potential for water productivity gains in rain-fed and irrigated areas through innovative agronomic, economic, and social interventions.
- Facilitating the diffusion and use of new technologies for increasing water productivity—whether low-tech or high-tech—in irrigated and rain-fed agriculture.
- Closing nutrient loops—making sure that nutrients are returned to agricultural lands and improving soil fertility through the reuse of urban domestic wastewater for periurban agriculture.

Regions in which current levels of economic and social activity impact on water resources, leaving them inadequate to meet the health and environmental sustainability Millennium Development Goals or where future depleting water use will further threaten aquatic ecosystems and the goods and services that they provide. In these situations, actions might include:

- Investment in infrastructure to reduce the environmental impact of urban and industrial activity, which may include both water-specific infrastructure (sewage treatment works) and broader investments (slum upgrading, may dramatically reduce “diffuse” pollution).
- Identifying minimum ecological service criteria for protection of aquatic ecosystems against water depletion.

- National-level monitoring of aquatic ecosystem health, public health, water quality and quantity, and biodiversity.
- Establishing national policies, strategies, and institutions and developing national environmental action plans.
- Using the tools of environmental economics for reflecting the true value of ecosystem services and the real costs of pollution.

Monitoring and support systems

This chapter explores how the global community can help monitor the nature, quality, quantity, and current and projected uses of water resources for all the Millennium Development Goals, and how it can better support national governments in their efforts to address a range of water and sanitation questions. The following discussion and set of recommendations relates both to United Nations organizations and to their international partners.

Monitoring water resources

Monitoring is a critical component of planning and action. Monitoring change in situations over time is necessary to gauge the effectiveness of interventions and measure the impact of policy reforms and investment at the national and subnational levels. Monitoring is also critical to compare needs and prioritize action among countries at the international level, which implies a need for standardized approaches, data, and methods of gathering information. And at all levels, civil society's most powerful advocacy tool is accurate information, the end product of reliable monitoring efforts.

The challenges related to tracking progress in the development and management of water resources for all the Millennium Development Goals are very different from those involved in tracking progress in expanding access to domestic water supply and sanitation services as called for in target 10. Target 10 is in itself a measurable goal, whereas water resources management is not an end in itself, but rather an input to efforts to increase food production, reduce poverty and disease, and protect ecosystems. The international community has a fairly well-developed conceptual framework and institutional mechanism for monitoring target 10, but the frameworks and institutions for monitoring water resources management and development in relation to the Millennium Development Goals are still in their infancy. As a result, mea-

Three types of intermediate targets could be monitored: process measures, output measures, and impact measures

asuring “success” in this area presents a host of issues that have not yet been resolved.

Conceptual framework

Although the international community does not yet have a conceptual framework for monitoring water resources for all the Millennium Development Goals, we present below what we believe to be four essential foundations on which such a conceptual framework might be built:

- *A framework for sorting out the ways in which the development, management, and use of water resources will affect the Millennium Development Goals.* Table 10.1 captures the specific parameters that need to be monitored to ensure that the development, management, and use of water is having the best possible impact on the achievement of the Millennium Development Goals. Meeting the poverty target (target 1), for instance, will require not only attaining equity in access to safe drinking water, but also reducing poor people’s vulnerability to such water-related diseases and disasters as floods and droughts.
- *A set of intermediate targets that relate the development, management, and use of water resources to each of the relevant Millennium Development targets.* Following the concept of “nested systems frameworks” (Small and Svendsen 1992), the relationship between water and any one of the Millennium Development Goals can be described as a set of nested systems, each with its own particular set of intermediate objectives. The primary link between these systems is that the outputs from one system become part of the inputs into the next system. In this context, three types of intermediate targets could be monitored: *process measures*, which refer to the processes internal to any given system; *output measures*, which describe the quality and quantity of outputs at a point where they become inputs to the next higher system; and *impact measures*, which refer to the impact of these outputs on the Millennium Development Goals as a whole. This approach requires monitoring not only the inputs and outputs of any subsystem, but also the efficiency with which inputs to any subsystem are turned into outputs. In relation to the hunger target, for example, it is important to measure not only the water consumed in irrigated agriculture and the resultant food output, but also the relationship between the two—the “crop per drop” ratio.
- *For each intermediate target, an analytical system to define and measure the target.* As with target 10, this effort will require, for each intermediate target, terminology for defining precisely what we mean by the contribution of water resources management and development for that target, the operational meaning of the agreed terminologies, and survey instruments and indicators for assessing progress in water resources management and development toward the target. In the case of the hunger target,

**Intermediate
targets
for water
resources
will need to
give attention
to both
development
and
management**

for example, an intermediate target might be the proportion of land area that is effectively irrigated in relation to the proportion of land area that would need to be irrigated if the hunger target is to be met. For both the poverty and the hunger targets, one parameter to monitor might be the degree to which the unequal distribution of water in time and space can be controlled, for example, by measuring the proportion of storage infrastructure (both surface and subsurface) and early warning systems that are effectively in place in relation to the infrastructure and management systems that would be needed to effectively control floods and droughts.

- *A system for monitoring the extent to which each country's vision of integrated water resources management is translated into tailored solutions as a base for achieving the Millennium Development Goals as a whole.* As noted earlier, there is increasing acceptance that the management of water resources must be undertaken with an integrated approach. Management decisions to alleviate poverty, to allow economic development, to ensure food security and the health of human populations, as well as preserve vital ecosystems, must be based on our best possible understanding of all relevant systems. From this point of view, the implementation of one of the task force's fundamental propositions—that countries should elaborate coherent water resources development and management plans that will support the achievement of the Millennium Development Goals as a whole (see chapter 13)—also needs to be carefully monitored. In the short term, this implies monitoring the implementation of the target set in Johannesburg, which requires countries to have formulated integrated water resources management strategies by 2005.

Clearly, these four essential foundations only begin to scratch the surface of the needed conceptual framework for monitoring water for all the Millennium Development Goals. In further developing this framework, a wide range of issues will need to be taken into account. Perhaps the most important is that, since the relationship between water and the Millennium Development Goals is enormously site specific, intermediate targets and milestones will need to be set and monitored at national and subnational levels. In addition, baseline dates will need to be set for all targets (1990 is recommended in all cases, unless special circumstances dictate otherwise). Finally, as with target 10, intermediate targets for water resources will need to give attention to both development and management issues, recognizing the key role of investment in infrastructure and the vast deficiencies in infrastructure endowments in the poorest countries most at risk of failing to achieve the Millennium Development Goals.

Institutional mechanisms

Within the overall reporting process referred to earlier, there is currently no global system in place to produce a systematic, continuing, integrated, and

**The World
Water
Assessment
Programme
focuses on
assessing the
situation of
freshwater
throughout
the world**

comprehensive global picture of freshwater and its management in relation to the Millennium Development Goals. Designed to help close this gap is the World Water Assessment Programme (WWAP), which focuses on assessing the situation of freshwater throughout the world (WWAP website). Its primary output is the periodic *World Water Development Report* (UN/WWAP 2003). The current report, which came out in 2003, will be updated every three years; the next volumes are slated for 2006, 2009, 2012, and 2015. The program focuses on terrestrial freshwater, but links with the marine near-shore environments and coastal zone regions as principal sinks for land-based sources of pollution and sedimentation and as areas where the threat of flooding and the potential impact of sea level rise on freshwater resources is particularly acute.

The WWAP is undertaken by UN agencies working in concert under the auspices of UN-Water. The program is hosted by UNESCO and serves as an “umbrella” for coordination of existing UN initiatives within the freshwater assessment sphere. In this regard it links strongly with the data and information systems of the UN agencies.¹ Currently, the compilation and development of indicators are being undertaken in all key areas of water resources and reflected in the *World Water Development Report*. Organized in terms of the Millennium Development Goals, these areas include:

Goal 1: eradicate extreme poverty and hunger

- *Food security.* Food security, particularly of the poor and vulnerable, depends upon the more efficient mobilization and use of water and the more equitable allocation of water for food production.
- *Water and industry.* Industry needs and private-sector responsibility to respect water quality and take account of the needs of competing sectors has a significant impact on water quality and quantity.
- *Water and energy.* Water is vital for all forms of energy production, and there is a need to ensure that energy requirements are met in a sustainable manner.
- *Risk management.* There is tremendous need in developing countries to provide security from floods, droughts, pollution, and other water-related hazards, especially in light of climate change.

Goals 4, 5, and 6: reduce child mortality; improve maternal health; and combat HIV/AIDS, malaria, and other diseases

- *Meeting basic needs.* Because of its importance in the promotion and protection of human health, access to safe and sufficient water supply and sanitation is a basic human right and essential to health and well-being.

Goal 7: ensure environmental sustainability

- *Protecting ecosystems.* Safeguarding the integrity of ecosystems requires sustainable water resources management.

**The World
Water
Development
Report
appears
to be the
most viable
mechanism
for
periodically
reporting on
progress**

- *Water and cities.* Urban areas are increasingly the focus of human settlements and economic activities, and they present distinctive challenges to water managers.

Integrated approaches to achieve all goals

- *The nature of the resource.* The availability of water (quantity and quality) from all sources and its variation through time affect all aspects of development.
- *Valuing water.* Managing water in a way that reflects its economic, social, environmental, and cultural values in all its uses and moving toward pricing water services to reflect the cost of their provision, taking account of the need for equity and the basic needs of the poor and the vulnerable, are important components of sound water management.
- *Governing water wisely.* Good water governance requires the involvement of the public and the interests of all stakeholders in the management of water resources.
- *Ensuring the knowledge base.* Good water policies and management depend upon the quality of knowledge available to decisionmakers.
- *Sharing water resources.* Promoting peaceful cooperation and developing synergies among different users of water at all levels within and between states through sustainable river basin management or other appropriate approaches is critical.

Clearly, much needs to be done to help the *World Water Development Report* system become an effective process to monitor water resources for the Millennium Development Goals. In addition to conceptual problems, enormous measurement challenges remain to be tackled. Just to take one example, data and information collection is not done in a systematic and consistent fashion at any level, and thus it is difficult to compare data over time or between countries. In addition, there are problems of definition. Despite these challenges, the *World Water Development Report* appears to be the most viable mechanism currently available for periodically reporting on progress made in the area of water resources development and management toward achieving the Millennium Development Goals as a whole.

In addition to monitoring the larger question of water resources for all the Millennium Development Goals, the international community should support and track progress on the development of plans and strategies for integrated water resources management and efficiency by 2005, as called for in the Johannesburg Plan of Implementation. The information gathered through these monitoring processes can be used by the international community during the second Water Decade, “Water for Life,” which runs from 2005 to 2015, to mobilize international awareness and political commitment to water resources planning, development, management, and use to meet the Millennium Development Goals (UNESCO website).

**UN
organizations
need to play
a strong
supporting
role**

Global institutional support structures

Direct action to manage and develop water resources to meet the Millennium Development Goals should take place as close as possible to where the problems and opportunities lie—principally at national and subnational levels. Nevertheless, UN organizations with their international partners (including international water and sanitation networks and partnerships) need to play a strong supporting role. In particular, they need to assist countries to meet the water supply and sanitation target and to manage water resources through technical support and capacity building, objective analysis and knowledge sharing, global monitoring, and advocacy functions. The need for these types of support was one of the key lessons of the International Drinking Water Supply and Sanitation Decade (see box 1.2). These functions need to be effectively aligned toward the achievement of the Millennium Development Goals, and they need to be accompanied by international leadership and strategic guidance through a clear mechanism that builds on each organization’s strengths and comparative advantages and reduces duplication.

The way in which UN organizations and their partners (including international water and sanitation networks and partnerships) presently support national water and sanitation efforts could be substantially improved. The current system has two characteristics that both contribute to its weaknesses and set it apart from the way in which the international community addresses other Millennium Development Goal issues, such as hunger or health.

First, some 24 UN system organizations and a number of international water and sanitation networks and partnerships are involved in water resources and sanitation. There is no single “lead agency” (as, say, FAO is for agriculture and WHO is for health). With so many actors involved in water and sanitation, ensuring coordinated and effective action that is aligned with the Millennium Development Goals is a challenge; indeed, organizations sometimes compete with one another, and “turf battles” occur. The United Nations System Chief Executive Board for Coordination endorsed UN-Water in November 2003 as the new official United Nations systemwide interagency mechanism for follow-up of the water-related decisions reached at the World Summit on Sustainable Development 2002 and the Millennium Development Goals (box 12.1). The new terms of reference of UN-Water respond to the need to increase coherence and coordination at inter-agency and country levels and also to the needs described earlier concerning coherent and coordinated leadership (UN DESA website). Nevertheless, the task force is concerned that UN-Water does not have adequate budget or staff to execute these functions at the scale required, especially in light of the policy prominence of water and sanitation in the forthcoming decade.

Second, in the past 15 years, most UN system organizations have experienced pressure to respond to emerging issues. Declining contributions to many organizations coupled with these increased demands have tended to reduce core funds and increase reliance on financing tied to pre-defined areas of work. The

Box 12.1
The evolution
of interagency
coordination in
water resources
and sanitation

Cooperation and coordination among UN agencies in the area of water resources started with the Intersecretariat Group for Water Resources, which was established in 1977 following the UN Water Conference at Mar del Plata, Argentina. The intersecretariat defined areas where interagency collaboration would be important, such as in the implementation of the International Drinking Water Supply and Sanitation Decade, which extended from 1981 to 1990. After the Earth Summit in 1992, the intersecretariat was integrated into the former Administrative Committee on Coordination as the ACC Subcommittee on Water Resources. In 2000 the subcommittee started a long-term project called the World Water Assessment Program, the main product of which is the World Water Development Report (UN 2003). Following the recent restructuring of the ACC, the members of the UN system entities dealing with water formed “UN-Water,” the United Nations Inter-Agency Committee on Water Resources. In late 2003, the United Nations System Chief Executive Board for Coordination (CEB) formally established UN-Water as the interagency mechanism for follow-up of the water-related decisions coming out of the 2002 World Summit on Sustainable Development and the Millennium Development Goals concerning freshwater.

overall effects of these trends vary among organizations, but have included a reduced emphasis on water and sanitation, wide gaps between mandated responsibilities and delivery capacity, and a resulting inability to provide intellectual and practical leadership. In parallel, several international networks and partnerships have emerged and are active in technical analysis, knowledge sharing, and advocacy. These entities include the Water Supply and Sanitation Collaborative Council (WSSCC website), the Global Water Partnership (GWP website), and the World Water Council (WWC website), as well as nongovernmental organizations such as WaterAid. This diversity of actors contributes much to the strength of international water and sanitation support and advocacy, but also creates new challenges to coordination to ensure effective coherent action.

Recommendations for the international community

To reach the Millennium Development Goals, the problems identified above need to be addressed forthrightly and urgently.

- United Nations system organizations and their member states must ensure that the UN actors engaged in technical support and capacity building, objective analysis and knowledge sharing, global monitoring, and advocacy have, both individually and collectively, the organizational capacity, mandate, staffing, and resources needed to carry out these functions.
- At the country level, UN Country Teams must strengthen their efforts to provide technical and capacity-building support to governments, including in the preparation of national strategies for water supply and sanitation based on the Millennium Development Goals, as well as strategies for integrated water resources management and water efficiency. Likewise, development banks and bilateral donor agencies must

The provision of leadership and strategic guidance to the international community is essential

effectively coordinate their actions at the country level, including harmonization of procedures and joint programs.

- The WHO/UNICEF Joint Monitoring Programme must be strengthened as the key global mechanism for monitoring access to water supply and sanitation and provided with greater funding. WHO and UNICEF should ensure that arrangements increasingly enable contribution to and participation in the JMP. Bilateral agencies should both provide more funding and refrain from setting up parallel structures. UN-Water should be mandated to periodically report, through the *World Water Development Report*, on progress in water resources development and management for the Millennium Development Goals, including progress on the development of strategies for integrated water resources management and efficiency by 2005. UN-Water and *World Water Development Report* must be strengthened and provided with greater funding to fulfill these roles successfully.

At the global level, provision of leadership and strategic guidance to the international community is essential. UN organizations and key operational actors and others involved in water and sanitation must be involved in this effort through a clear mechanism that should build on each organization's strengths and comparative advantages and reduce duplication. The recently defined mandate and widened participation of UN-Water correspond closely to this need, but this mechanism presently has neither the necessary funds nor staff. Several options exist:

- A multiagency entity (such as the Global Fund to Fight HIV/AIDS, Tuberculosis and Malaria or UNAIDS) could be created to act as the main advocate for global action on water and sanitation and to lead, strengthen, and support national scaling-up efforts. Such a mechanism would need to include the key operational actors in water and sanitation, build on the various organizations' strengths and comparative advantages, and have a clear joint strategy, designation of roles and responsibilities, a program of action, and accountability for results. UN Water, which has recently been reconstituted to include broader representation from non-UN bodies, could be transformed into a body with this responsibility; at present the entity has neither the funding nor staff to take on this role, but with a concerted capacity-building effort over the next year, it might be possible for it to assume that responsibility within a reasonable timeframe.
- A second option would be to establish a truly operational group and program on water and sanitation with the key operational bodies in and outside the UN system. The program would need to be well funded and staffed, with a clear mandate to act on achieving the targets and possibly a sunset clause in 2025.

The global networks and the funding agencies supporting them must strengthen and rationalize their efforts

- A third option would be to assign UN system task managers for the various aspects of water resources and water supply and sanitation. WHO and UNICEF, for example, could take the lead in sanitation; UNESCO or UNEP in the management of freshwater resources.

In addition, the recently established Secretary General's Advisory Board on Water and Sanitation must focus on providing high-level policy commentary on progress toward the water and sanitation target, advising on strategic direction, identifying critical obstacles to progress, and making recommendations for overcoming them. It should independently and boldly comment on developing country, donor country, and UN system practices, and produce a periodic, brief, focused, high-profile report that would eschew advocacy in favor of pointed recommendations aimed at improving progress within the sector and at advancing the sector's position in the development arena.

Finally, the global networks engaged in water and sanitation and the funding agencies supporting them must collectively strengthen and rationalize their efforts to provide technical support, capacity-building, objective analysis, knowledge-sharing, and advocacy functions, and align those functions towards the achievement of the Millennium Development Goals, while at the same time taking steps to ensure they are accountable to the communities of the developing world.