Chapter 1

Getting out of the box – linking water to decisions for sustainable development

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Key messages

- The 'water box' dilemma must be resolved. Leaders in the water sector – in water supply and sanitation, hydropower, irrigation and flood control – have long been aware that water is essential to sustainable development, but they do not make the decisions on development objectives and the allocation of human and financial resources to meet them. These decisions are made or influenced by leaders in government, the private sector and civil society, who must learn to recognize water's role in obtaining their objectives.

- Water is essential for achieving sustainable development and the Millennium Development Goals. Properly managing water resources is an essential component of growth, social and economic development, poverty reduction and equity and sustainable environmental services – all essential for achieving the Millennium Development Goals.

- Water is linked to the crises of climate change, energy and food supplies and prices, and troubled financial markets. Unless their links with water are addressed and water crises around the world are resolved, these other crises may intensify and local water crises may worsen, converging into a global water crisis and leading to political insecurity and conflict at various levels.

The media today are full of talk of crises – in climate change, energy and food supplies and prices, and troubled financial markets. These global crises are linked to each other and to water resources. Unless resolved, they may lead to increasing political insecurity and conflict at local and national levels.

These crises arise against a background of continuing poverty for much of the world. Managing water resources is essential to social and economic development, poverty reduction and equity and to achieving the Millennium Development Goals. Sustainable development depends on managing the costs of service provision using existing infrastructure along with additional investments in new water infrastructure and rehabilitation, both physical and institutional.

Specialists and managers in water supply and sanitation, hydropower, irrigation and flood control have long been aware that water is essential to sustainable development. But they often have a narrow, sectoral perspective that blinds many decisions on water. And they do not make the decisions on development objectives and the allocation of human and financial resources needed to meet these broader objectives. These decisions are made or influenced by leaders in government, the private sector and civil society. These leaders must learn to recognize water's role in attaining their objectives and act accordingly.

An understanding of water issues and of the support needed for investments, institutions, incentives, information and capacity inside the 'water sector' requires partnerships between those responsible for the economy-wide benefits of water and those responsible for managing water

And they must act in a changing world, a world driven by forces that they often do not control – forces of demography, the global economy, changing societal values and norms, technological innovation, international law, financial markets and climate change.

Opening the water box

Until the 1990s (and continuing in some countries) water subsectors generally worked independently, with specialists in water supply and sanitation, hydropower, irrigation, flood control and so on interacting very little.[1] As population growth and other pressures on water ('water drivers') brought more and more basins near closure (the allocation of all of the water in a basin), the need to manage water across subsectors at the basin level became evident. Water management was expanded during the 1990s to incorporate efficient water use, equitable sharing of benefits, and environmental sustainability – what came to be called integrated water resources management. And in 2002 the World Summit on Sustainable Development in Johannesburg set for all countries the goal to develop integrated water resources management plans by 2005.

Many countries are applying integrated water resources management at the basin level. But management is still largely confined to the water sector, where it is well understood that water is essential to all life on the planet (human and other species) and to human livelihoods. The sector is beginning to recognize that decisions by people outside the water sector determine how water will be used, but the other sectors are seen as cross-cutting in water management. The approach within the sector has been to invite those working in other socioeconomic sectors to join in integrated water resources management. But the societal and political questions that determine the real allocation and management of water resources also need to take into account the technological aspects of integrated water resources management.

The sphere of decision-making and the water box

Within government, water use is decided by the interaction of decision-makers in the main socioeconomic sectors – health, education, agriculture, housing, industry, energy, economic development and environment. In many countries this interaction occurs through a cabinet of ministers presided over by the prime minister or president. Parallel mechanisms may exist at a regional, state (provincial) or local (municipal) government level. The role of these government structures is critical in water management.

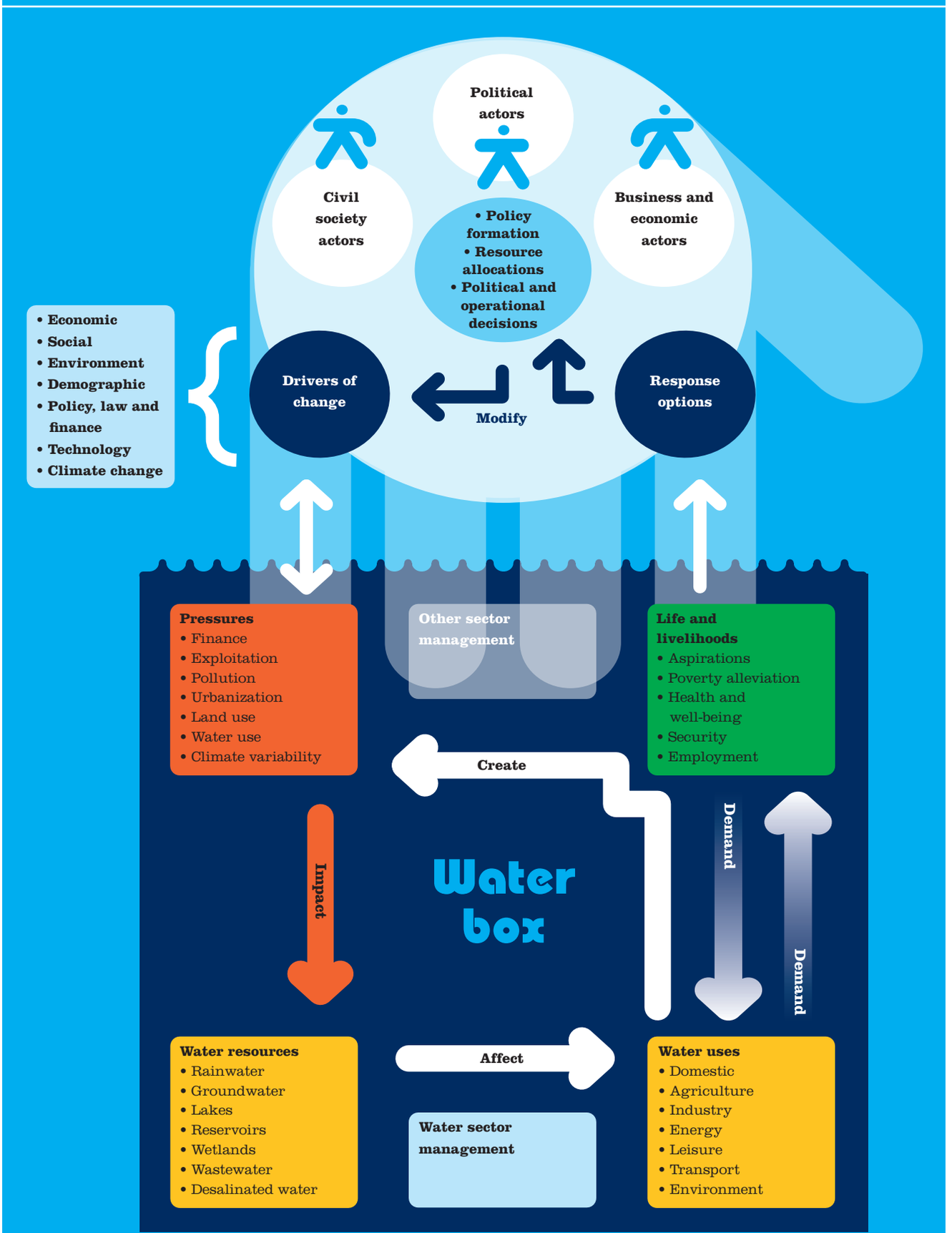
In many countries government directly controls only a small fraction of investments in the economy, but it determines the conditions that will attract or discourage investment. To be most effective, decisions should be taken through an interactive process that involves leaders in business (finance, industries, commerce) and civil society (community-based organizations and other non-governmental organizations).

Ideally, government, business and civil society leaders would work together in the interest of society. Because of the implications of their decisions for water use, an understanding of water issues and of the support needed for investments, institutions, incentives, information and capacity inside what has traditionally been considered the 'water sector' requires partnerships between those responsible for the economy-wide benefits of water and those responsible for managing water. Leaders in the water sector must thus ensure that these leaders outside the 'water box' know the constraints and options for water resources and help them implement their decisions efficiently and effectively.

Among the decisions that affect water the most are those relating to how a country meets its objectives for energy and food security, employment, disaster preparedness, environmental sustainability and other societal goals. These decisions are made in broader political frameworks and not by water managers, who subsequently deal with their implications for water and with other outcomes that touch on water. Figure 1.1 illustrates this process.

Outside the water sector is an area of synergy, tradeoffs, coordination and integration, involving higher-level, multisectoral decision-making processes. Water professionals, stakeholders and individuals can inform and influence decisions in this area, affecting outcomes. But they need to have a seat at the decision-making table and to respond by implementing water management effectively and efficiently and by properly informing the decision-making process. These efforts are facilitated in the many countries that have adopted water resources management laws, policies or strategies that reflect links between water and the social and economic sectors.

Figure 1.1 **Decision-making affecting water**



Source: Authors' construction.

Everywhere decisions related to development of necessity incorporate water development decisions, whether explicitly recognized or not

Decision-makers and water management

Providing water is but a means of achieving a country's development objectives – generally job creation, food security, GDP growth and social goals including poverty reduction. In pursuing these objectives, decision-makers are challenged by trade-offs between possible investments and possible synergies between sectors. Making trade-offs and searching for synergies require cooperation between those responsible for different sectors of the economy.

Where there has been sustained development, the role of government has generally been to facilitate action by others and to regulate the process.[2] The role of water managers has been to inform decision-makers of the constraints and opportunities of water resources management and water infrastructure development and then to act in accordance with the national development strategy.

Partnerships have been strongly promoted in the water sector, particularly for service provision. Public-private partnerships have been the predominant model, some functioning as intended, and some with mixed impacts. Water user associations in participatory irrigation management have become widespread in a number of countries, with some success in improving irrigation scheme management. But whether the operator is a private company, a public corporation or a municipal service, the successes have clearly demonstrated the importance of the complementary roles of public decision-makers and authorities on the one side and service operators on the other. In the long-term neither can succeed without the other.

Other types of partnerships include civil society organizations, municipalities and the private sector. A recent study on Latin America concluded that proper institutional frameworks, incentives and mutual trust are keys to successful partnerships.[3] River basin organizations are increasingly playing an important role. Broad coalitions of development partners, including different levels of government; donors; multinational, international and regional agencies; and local non-governmental organizations are being created in some countries, such as Mozambique,[4] to advise on priorities for public expenditures. Speaking at the Davos economic summit in January 2008, U.K. Prime Minister Gordon Brown said that the Millennium Development Goals will not be met 'unless there is a private, voluntary and government partnership'.[5] He added that 'governments have to understand that they have to make it possible for companies to affect change' and at times have to see companies as providers not just of resources but also of resourcefulness.

Where development is occurring rapidly and growth is viable, greater emphasis will be on private sector engagement and market-based mechanisms. Where development is slower and growth prospects are weaker, greater emphasis will be on providing basic services, including safety nets targeting society's poorest. Where governments and institutions are weak (fragile states) emphasis will be on reconstruction and rehabilitation. And where there are humanitarian crises, conflicts and natural disasters, emphasis will be on emergency responses. Working across many countries simultaneously, regional approaches emphasize integration, regional security and equity. Thus, although development is taking place in very different settings, with different integrating frameworks and processes and different sets of actors, everywhere decisions related to development of necessity incorporate water development decisions, whether explicitly recognized or not.

More important than trying to quantify the relative 'market share' of the public and private sectors is recognizing that they face similar challenges, constraints and difficulties. The task for decision-makers and political leaders is to create the framework conditions under which operators of all kinds – public, private, mixed, community providers and others – can provide services and investments effectively over the long term.

Sustainable development as the framework for water management

In the overview of *The Growth Report* of 2008 the Commission on Growth and Development argues that

> Growth is not an end in itself. But it makes it possible to achieve other important objectives of individuals and societies. It can spare people *en masse* from poverty and drudgery. Nothing else ever has. It also creates the resources to support health care, education, and the other Millennium Development Goals to which the world has committed itself. In short, we take the view that growth is a necessary, if not sufficient, condition for broader development, enlarging the scope

for individuals to be productive and creative.[6]

Sustained growth requires water

Growth requires access to natural resources. *The Growth Report* acknowledges that we may be entering a period in which natural resources, broadly defined, impose new limits on growth. But the report makes no major reference to the essential role of water resources. *World Water Development Report 3*, which places more emphasis on development than its predecessors, makes the case that the availability of water resources and their management are determinants of a country's growth strategy.

Africa provides a good example because both growth and water are major challenges there. The African heads of state recognized the importance of water to development when they gathered in Sharm el-Sheikh, Egypt, in mid-2008 and adopted a declaration explicitly noting the role of water as a key to sustainable development in the region (box 1.1).

Societies do not become wealthy first and then invest in water management; they find ways to manage water and risk first, which then leads to wealth. If they are wise, they do this in a way that avoids pollution, cares for equity and otherwise ensures the sustainability of the resource.

Investment in water infrastructure is required to meet basic needs in rural areas and to enhance agricultural productivity through better management of water. As development proceeds, with the shift to commercial and industrial activities in urban areas, water has to be managed for energy and food production, transportation, flood control, and drinking water and sanitation, as well as for industrial and commercial activities.

Asian Water Development Outlook 2007 highlights the significant global development challenge this represents.[7] That report emphasizes a 'multidisciplinary and multi-sector perspective [on water] around the Asia and Pacific region' in facing the challenges of sustaining growth. It highlights

> important topics that have been neglected or are being inadequately considered in most countries of the region. Among these is the urgent need to address the inherent interrelationships between water and other important development-related sectors, like energy, food, and the environment.

It has little in the way of a detailed roadmap for water resources development, however.

Box 1.1 Commitment of African heads of state to water as a key to sustainable development

WE, the Heads of State and Government of the African Union, meeting at the 11th Ordinary Session of our Assembly in Sharm el-Sheikh, Arab Republic of Egypt, from 30 June to 1 July 2008,

Recognizing the importance of water and sanitation for social, economic and environmental development of our countries and Continent; . . .

Recognizing that water is and must remain a key to sustainable development in Africa and that water supply and sanitation are prerequisites for Africa's human capital development;

Concerned that there is an underutilization and uneven sharing of water resources in Africa, and that remains a growing challenge in the achievement of food and energy securities. . . .

WE COMMIT OURSELVES TO:

(a) *Increase* our efforts to implement our past declarations related to water and sanitation.

(b) *Raise* the profile of sanitation by addressing the gaps in the context of the 2008 eThekwini Ministerial Declaration on sanitation in Africa adopted by [the African Ministers Council on Water].

(c) *Address* issues pertaining to agricultural water use for food security as provided for in the Ministerial Declaration and outcomes of the first African Water Week.

And particularly;

(d) *Develop and/or update* national water management policies, regulatory frameworks, and programmes, and prepare national strategies and action plans for achieving the [Millennium Development Goal] targets for water and sanitation over the next seven (7) years;

(e) *Create* conducive environment to enhance the effective engagement of local authorities and the private sector;

(f) *Ensure* the equitable and sustainable use, as well as promote integrated management and development, of national and shared water resources in Africa;

(g) *Build* institutional and human resources capacity at all levels including the decentralized local government level for programme implementation, enhance information and knowledge management as well as strengthen monitoring and evaluation;

(h) *Put in place* adaptation measures to improve the resilience of our countries to the increasing threat of climate change and variability to our water resources and our capacity to meet the water and sanitation targets;

(i) *Significantly increase* domestic financial resources allocated for implementing national and regional water and sanitation development activities and call upon Ministers of water and finance to develop appropriate investment plans;

(j) *Develop* local financial instruments and markets for investments in the water and sanitation sectors;

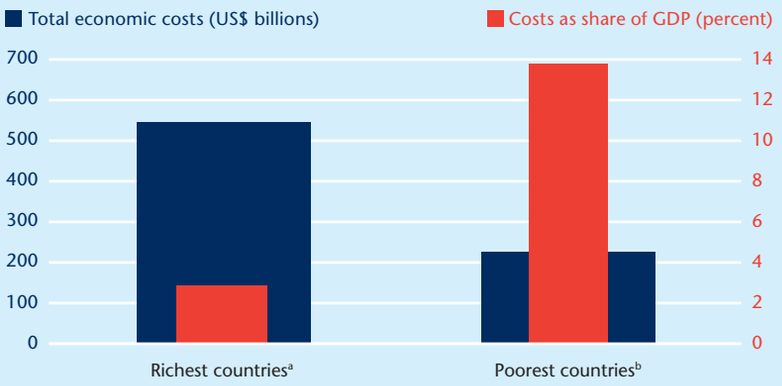
(k) *Mobilize* increased donor and other financing for the water and sanitation initiatives. . . .

Source: African Union 2008.

Benefits from investing in water

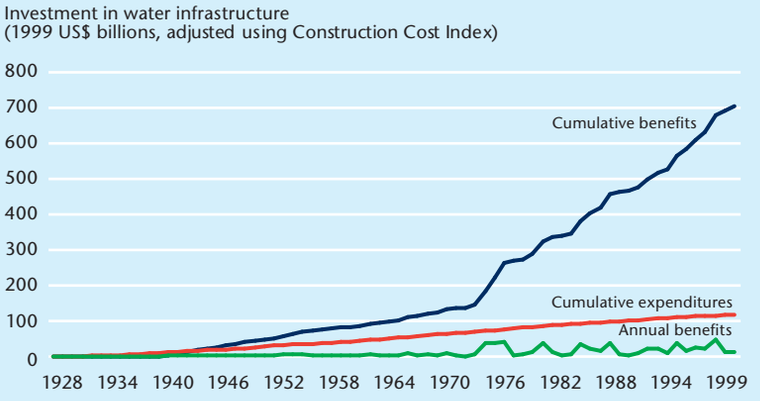
Many water investments have been evaluated by the rate of return of single-purpose schemes without considering the additional benefits possible from multipurpose projects.[8] Increasingly, evidence is emerging of the direct economy-wide benefits of investments in water (see chapter 6). For example, there is evidence that local action on water management in China has delivered measurable improvements in local GDP.[9] In the 335 counties in China with primary electrification from hydropower, annual average income per

Figure 1.2 The costs of disasters as a share of GDP are much higher in poor countries than rich countries



a. Annual GDP per capita above $9,361.
b. Annual GDP per capita below $760.
Source: Delli Priscoli and Wolf 2009.

Figure 1.3 US government investments in water infrastructure during 1930-96 yielded $6 in damages averted for each $1 invested



Source: Based on Delli Priscoli and Wolf 2009.

Box 1.2 Economic impacts of lack of adequate sanitation facilities in South-East Asia

Cambodia, Indonesia, the Philippines and Viet Nam lose an estimated $9 billion a year because of poor sanitation (based on 2005 prices), or approximately 2% of their combined GDP, according to the first regional study on the economic impacts of poor sanitation, undertaken in South-East Asia by the World Bank Water and Sanitation Project. The highest economic costs ($4.8 billion for the four countries combined) are from sanitation- and hygiene-related diseases. Poor sanitation also contributes substantially to water pollution, adding to the cost of providing safe water for households and reducing the production of fish in rivers and lakes ($2.3 billion). There are also environmental losses (loss of productive land, $220 million) and tourism losses ($350 million). Universal sanitation would lead to an annual gain of $6.3 billion in the four countries. Implementing ecological sanitation approaches (latrines separating urine and fæces for use as fertilizer) would be worth an estimated $270 million annually.

Source: Hutton, Haller, and Bartram 2007.

farmer rose 8.1% a year, nearly 3 percentage points more than the national average. In those communities 30 million people upgraded their livelihoods from marginalized farming to off-farm labourers in the industrial and services sector without any negative impact on agricultural production.

Evidence is also growing of the macroeconomic returns to investments in water management – and the costs of failures to invest. Disasters such as floods (resulting from typhoons and hurricanes and from rainfall exceeding the carrying capacity of channels) and droughts hurt poor economies more than wealthy ones, which are better prepared to cope with such disasters (figure 1.2).

Investments in environmental sustainability and water management to prevent water-related disasters can have large payoffs, so countries need not wait to invest until they have achieved middle- or high-income status. Investments in water infrastructure by the US Army Corps of Engineers between 1930 and 1999, for example, yielded returns of $6 for each $1 spent and controlled flood damage despite rising population numbers and property value at risk over the period (figure 1.3). The World Health Organization (WHO) estimates returns of $3-$34, depending on the region and technology, for each $1 invested in safe drinking water and basic sanitation.[10] There is thus a strong case that improved coverage of drinking water and sanitation contributes to economic growth. Policy-makers can use these data to justify their actions, identify areas of deficiency and better prioritize actions.[11]

Policy-makers also need to better understand the benefits for national development that result from sustainable water management and provision of safe water. Expanding safe drinking water and sanitation services would drastically cut the loss of life from water-related illness and free up scarce health resources in developing countries. Five thousand children die each day from diarrhoea alone – one every 17 seconds.[12] Upgrading water supply and sanitation services can also improve education, allowing more girls to attend school instead of spending hours each day collecting water. Improved access would also save millions of work days. The overall economic loss in Africa alone due to lack of access to safe water and basic sanitation is estimated at $28.4 billion a year, or around 5% of GDP.[13] Box 1.2 estimates the

costs of lack of access to adequate sanitation facilities for four South-East Asian countries.

Environmental degradation from water pollution and excessive withdrawals also has negative economic impacts. For example, the damage cost of environmental degradation in the Middle East and North Africa has been estimated at some $9 billion a year, or 2.1%-7.4% of GDP.[14] Industrial countries are learning the enormous costs associated with restoring essential ecosystems. In the United States the costs have been estimated at more than $60 billion and continue to rise as more becomes known (box 1.3).

Investing in water

Investment flows to uses with the highest economic rate of returns. Currently, water often gives very low returns for very long payback periods primarily because of the way it is governed (see chapter 4). Much political interaction in the water sector drives operations to 'structural bankruptcy'. It is not surprising that new investors are not eager to enter the water sector. Yet public investment in infrastructure is declining. And so the needs of the water sector go unmet.

The challenges in financing water services have been well described in recent years. Proposed solutions and innovative responses are presented in the reports of the World Panel on Financing Water Infrastructure[15] and the Task Force on Financing Water for All.[16] Ultimately, there are only three sources of financing: user tariffs, public expenditure and external aid (official or philanthropical). Recourse to these sources should be preceded and accompanied by efficiency measures to control operating costs and by careful project selection and design to ensure the best return to scarce resources.

Many studies have attempted to estimate the total investments that would be required to provide adequate infrastructure for water supply and sanitation. Typically presented as global or regional estimates, they often ignore the essential precondition of investments in institutions, reform, and implementation and management capacities and in replacement of ageing infrastructure. Because water can be managed only locally, investments must also be managed locally. Investing in water requires a holistic approach (figure 1.4). Sound financial management, as illustrated in figure 1.4, will make it possible for water authorities and governments to attract loans or external aid to supplement their own sources of capital.

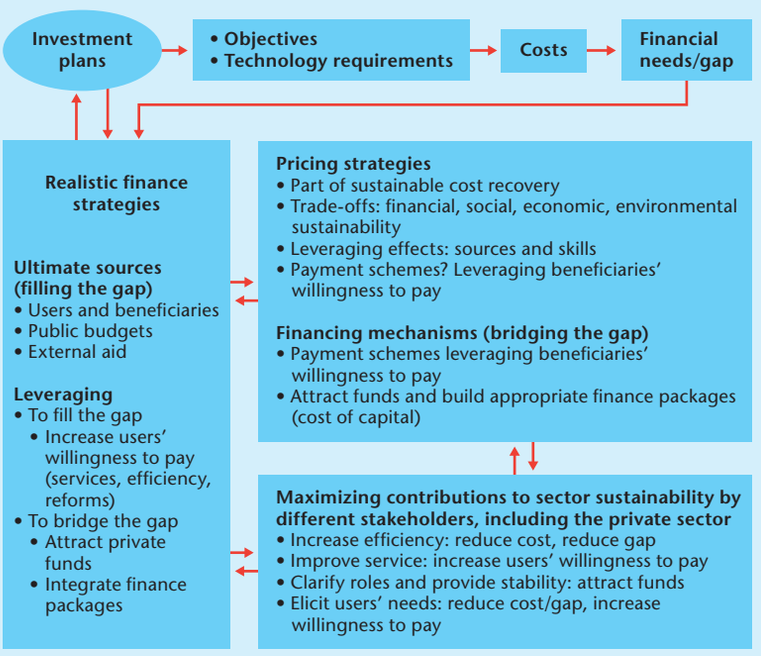
Nonetheless, many developing countries, having applied all of the measures implied by such a process, will still lack the capital required to meet basic needs through

Box 1.3 Estimated costs of restoring essential ecosystems in the United States

The following are estimates for restoring major essential ecosystems in the United States. The cost exceeds $60 billion, and the total is likely to be higher still as more information becomes available.

- Everglades Restoration: $10.9 billion. Groundwork laid for Everglades restoration, but projects are experiencing delays (www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=11754).
- Restoration of the Upper Mississippi River: $5.3 billion for a 50-year ecosystem restoration plan (www.nationalaglawcenter.org/assets/crs/RL32470.pdf).
- Restoration of Coastal Louisiana: $14 billion towards a Sustainable Coastal Louisiana by 2050 (www.coast2050.gov/2050reports.htm).
- Restoration of Chesapeake Bay: $19 billion for the Chesapeake Bay Program (www.chesapeakebay.net/fundingandfinancing.aspx?menuitem=14907).
- Restoration of Great Lakes: $8 billion for Great Lakes restoration and protection priorities (www.cglg.org/projects/priorities/PolicySolutionsReport12-10-04.pdf).
- Restoration of California Bay Delta: $8.5 billion (first seven years) for large-scale ecosystem restoration initiatives (www.nemw.org/calfed.htm).
- Restoration of Missouri River – to be determined.

Figure 1.4 Water investment requires a holistic approach – links between pricing, financing and stakeholders



Source: Authors' construction.

Today, poverty reduction strategies still offer only the prospect of aligning action on water with poverty reduction, as few current poverty reduction strategies give anything but superficial attention to action on water

water resources development and service delivery. In those cases it is relevant to question how much external aid is available, where it is applied and whether the amount can or should be increased.

Distributing the benefits of growth

The 2007 U.K. Department for International Development policy paper 'Growth and Infrastructure' stated that 'Growth is the single most important way of pulling people out of poverty'.[17] It cites empirical literature attributing more than 80% of recent poverty reduction worldwide to growth and less than 20% to redistribution (social protection). It gives the examples of China, where 450 million people have been lifted out of poverty since 1979, helped by exceptionally high growth rates, and Viet Nam, which experienced the most rapid reduction in poverty rates on record, from 75% in the late 1980s to less than a third in 2002, thanks to high growth rates.

That poverty reduction is the overriding policy concern is evidenced by the primacy of poverty reduction strategies and national development plans as the governing mechanisms for partnerships and finance from the international community. As of mid-2008, 59 countries had prepared full poverty reduction strategies and 11 more had completed preliminary poverty reduction strategies. This represents a significant change. For many years action on water that could deliver benefits to the poor lacked government frameworks that prioritized poverty reduction and mobilization of financing. Today, poverty reduction strategies still offer only the prospect of aligning action on water with poverty reduction, as few current poverty reduction strategies give anything but superficial attention to action on water.

Public expenditure reviews are another tool to help decision-makers allocate public funds. These reviews of government spending can boost efficiency and equity, development impact and the accountability of public spending. They can also increase the accountability and transparency of results and support governance reforms and anticorruption programs.

Economic justification for water investments come from their translation into economy-wide growth through employment, capital and labour productivity, taxes, government expenditure, revenue control, debt, purchasing power, balance of payments, foreign exchange reserves, trade balances, accelerator impacts on capital investment, business confidence and the stock market.

In India water development evened out the seasonal demand for labour, resulting in major gains for the country.[18] Forecasts by the New Partnership for Africa's Development concerning African agriculture's contribution to growth and poverty reduction are founded on the economic justifications of reduced food import bills, more predictable import profiles, increased export revenues and reduced poverty at the household level.[19]

To attract development-oriented finance, the growth-increasing and poverty-reducing contributions of water resources must be made explicit and specific at the country level. Such specifics will influence the sources, costs, viability, sustainability and instruments of finance. National, basin and local action plans are needed to align water resources, economic growth and poverty reduction. Making such alignments and other essential connections will be more successful within frameworks such as a round of poverty reduction strategies, public expenditure reviews and national development plans.

Reducing poverty, which limits access to water

The world must acknowledge the crisis of persistent underdevelopment and poverty. Since the end of the Second World War more than 3 billion people have benefited from economic development, but at least 2 billion people remain in need. Some 1.4 billion people lived in 'absolute poverty' in 2005,[20] a number that does not take into account the recent wave of increases in energy and food prices.[21] These women, men and children daily face the consequences of poverty – disease, malnutrition and hunger. They have no capacity to prepare for natural disasters, such as earthquakes and floods, or to respond when they strike. The world community has set the Millennium Development Goal target of halving the proportion of people living in poverty by 2015. But we are far from being on track, particularly in regions where the need is highest.

Human Development Report 2006 considers the experience of water and sanitation as reinforcing the 'long-standing human development lesson' that rates of coverage in access to water and sanitation rise with income on average (figure 1.5).[22] *Global Monitoring Report 2005* notes that in South Asia an improving investment climate and

stronger policies, along with gains in basic service delivery, have sustained rapid economic growth since 1990 and contributed significantly to poverty reduction and to reaching the Millennium Development Goals in some countries.[23]

The case for investing in Africa

Where investment in water has been weak, GDP growth has been constrained – by as much as 10% where the effects of droughts, floods and natural hydrologic variability are compounded in less developed economies. Where weak economic growth has been accompanied by inadequate investment in social protection, the gap in achieving the Millennium Development Goals has worsened in many countries, with devastating social impacts.

Africa, in particular, remains mired in poverty (figure 1.6) despite recent economic growth trends in some countries. In developed countries water storage ensures reliable sources of water for irrigation, water supply and hydropower as well as a buffer for flood management. Countries in Africa store only about 4% of annual renewable flows, compared with 70%-90% in many developed countries. About 340 million Africans lack access to safe drinking water, and almost 500 million lack access to improved sanitation facilities. The First African Water Week, convened in Tunis in March 2008, opened with a call for greater efforts to ensure water security nationally and regionally. Donald Kaberuka, president of the African Development Bank Group, emphasized that

> it is no longer acceptable that the African continent continues to utilize only 4% of its water resources, when a huge proportion of the people do not have access to safe water, and when large populations are faced with frequent floods and drought, in addition to food and energy shortages. Action is urgently needed.[24]

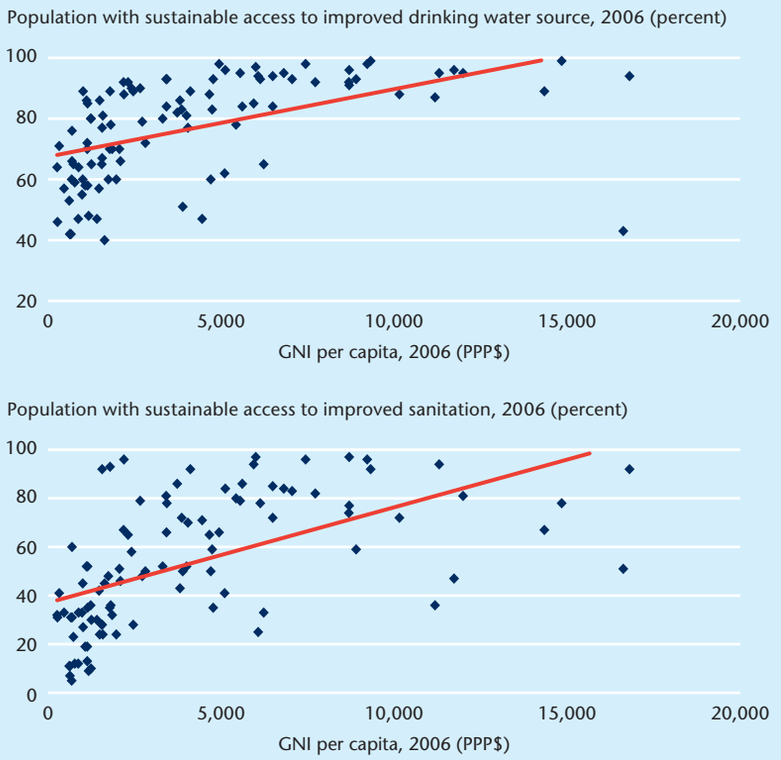
In June 2008 the MDG Africa Steering Group published a number of concrete recommendations for scaling up opportunities to address poverty in Africa.[25] Their recommendations related to achieving the Millennium Development Goals in Africa are summarized in table 1.1.

Investing in water to reach the Millennium Development Goals

This third edition of the United Nations *World Water Development Report* is being published just beyond the half-way point along the timeline from the Millennium Summit of 2000 and the 2015 target date for attaining the Millennium Development Goals. Making progress towards those goals will rise even higher on political agendas within the next six years.

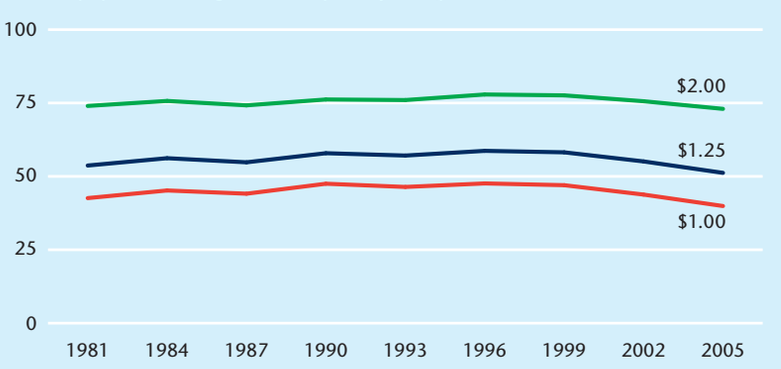
The Millennium Declaration placed safe drinking water and basic sanitation firmly among the development objectives, making it a target of Millennium Development Goal 7. But while adequate progress is

Figure 1.5 **Access to water and sanitation rises with income**



Source: Based on data from WHO Statistical Information System (www.who.int/whosis/en/).

Figure 1.6 **Poverty remains high in sub-Saharan Africa**



Note: Poverty lines in 2005 prices.
Source: Based on Chen and Ravallion 2008, p. 41.

Table 1.1 **Summary of scaling-up opportunities related to achieving the Millennium Development Goals in Africa**

Scaling-up opportunity	Summary of key results	Policy leadership	Key multilateral financing mechanisms (among several funding sources)	Estimated public external financing needs by 2010 from all funding sources
Achieving the Millennium Development Goals in Africa	Comprehensive cross-sector public expenditure programmes against clear quantitative targets	Secretary-General and MDG Africa Steering Group, G-8 leadership, African Union, private sector, foundations	All multilateral, bilateral and private mechanisms providing high-quality, predictable financing	Some $72 billion a year, of which $62 billion (in 2007 terms) from Development Assistance Committee members (following the Gleneagles G-8 meeting, Monterrey Consensus and EU official development assistance targets), with additional financing from non-Development Assistance Committee donors, developing country collaboration, private foundations and innovative private co-financing

Source: Based on MDG Africa Steering Group 2008, p. 32.

Box 1.4 **Progress in meeting the Millennium Development Goal target on water supply and sanitation**

The world is on track to meet the Millennium Development Goal target on drinking water. Current trends suggest that more than 90% of the global population will use improved drinking water sources by 2015.

The world is not on track to meet the Millennium Development Goal sanitation target. Between 1990 and 2006 the proportion of people without improved sanitation decreased by only 8 percentage points. Without an immediate acceleration in progress, the world will not achieve even half the sanitation target by 2015. Based on current trends, the total population without improved sanitation in 2015 will have decreased only slightly, from 2.5 billion to 2.4 billion.

Source: WHO and UNICEF Joint Monitoring Programme 2008, pp. 8 and 13.

being made towards the provision of safe drinking water, the sanitation target is far from being met (box 1.4).

And despite progress, the scale of the challenge remains massive. While the water supply target is being attained at a global level, large regions of the world and many countries are far from the target, and some risk backsliding. This is particularly the case in sub-Saharan Africa and low-income Arab states. In many places the sanitation targets will be missed by a wide margin.

Both the drinking water and sanitation targets are vitally important. The contribution of improved drinking water and sanitation to the achievement of all the Millennium Development Goals is now well established.[26] This report demonstrates this link throughout; others have elaborated the direct and indirect contributions of water management across all the Millennium Development Goals.[27] Figure 1.7 depicts these links graphically.

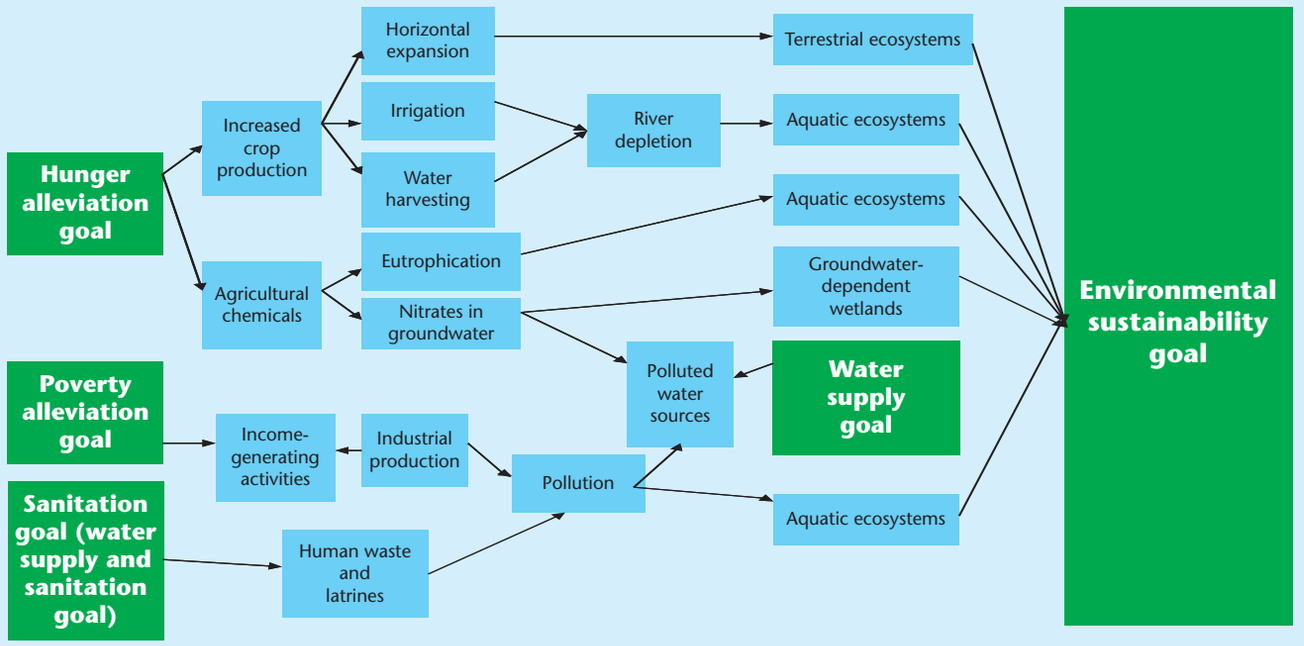
These links served as an important advocacy instrument during the International Year of Sanitation in 2008. High-profile international attention has focused on basic services in recent years, including declarations at Brasilia (2003), Beppu (2007), eThekwini (2008), Tunis (2008) and Sharm el-Sheik (2008). Gaps in drinking water and sanitation, in particular, have attracted political attention at the highest levels.

Development partnerships are helping countries that are off track for achieving the Millennium Development Goals get back on track. Intergovernmental efforts are working to maintain the momentum of the global commitments made since the Millennium Declaration and of water-specific processes such as the G-8 Evian Action Plan[28](box 1.5). New initiatives, such as the 2007 launch of the Millennium Development Goal Africa Initiative by the UN system, have sought to reinvigorate the efforts of countries that are off track in their progress towards achieving the Millennium Development Goals.

Sustaining the environment

Environmental sustainability, broadly, refers to the ability of the environment to continue to support progressive social and economic development and to provide many types of ecosystem services (table 1.2). Multistakeholder processes, such as the World Commission on Dams, have seen environmental sustainability rise in prominence as a factor influencing water development decisions. And such international conventions as the United Nations Convention to Combat Desertification and the United Nations Convention on Biodiversity have made water a global issue.

Figure 1.7 **Cause-effect chains and links between water and the Millennium Development Goals**



Source: Based on Cosgrove 2006, p. 38.

Today, water management crises are developing in most of the world. UN-Water reports that in just one week in mid-November 2006 national media sources reported local but high-profile shortages in parts of Australia, Botswana, Canada, China, Fiji, Kuwait, Liberia, Malawi, Pakistan, Philippines, South Africa, Uganda, the United Arab Emirates and the United States.[29]

Generally regional phenomena, water crises can emerge as water shortages and droughts, floods or both, now aggravated by the consequences of climate change. They may be natural or caused by demands that exceed supply, lack of infrastructure or poor water management. They may be the result of waste or abuse resulting in pollution. Together they threaten the lives and livelihoods of billions of people and risk irrevocably altering the planet's ecosystems.

Every year in developing countries an estimated 3 million people die prematurely from water-related diseases. The largest proportion of these deaths are among infants and young children, followed by women, from poor rural families who lack access to safe water and improved sanitation (box 1.6).[30] More than 1 million people die annually from malaria, the vast majority in poverty-stricken Africa. Another 1 million people die from air pollution in urban areas. And everywhere the poor suffer most.

Box 1.5 **High-Level Event on the Millennium Development Goals, United Nations, New York, 25 September 2008: Extract from compilation of partnership events and commitments**

The event [Water and Sanitation for All] reiterated the strong political and diplomatic support for international efforts needed to address the water and sanitation issues and enhance human security. It promoted good water cycle management and the application of Integrated Water Resources Management. It reaffirmed the importance of formulation and implementation of national assistance strategies building on the 'Paris Declaration on Aid Effectiveness', while considering the specific needs and resources of the recipient countries.

The event emphasized the importance of mobilizing adequate international and national financial resources for the implementation of the national strategies and the need to strive towards using sector-wide approaches; and developed partnerships with civil society organizations, local authorities and the private sector to implement national strategies and action plans to improve the accessibility and quality of water and sanitation services as well as initiatives to establish a 'Framework for Action' to focus on the off-track countries, including the possible consideration for a 'Fast Track Initiative' with catalytic funding to install a High-Level 'Task Force' to reach [Millennium Development Goal 7], and to make one annual global progress report and to hold one annual high-level review meeting.

Japan committed to establish a Water Security Action Team for Africa to provide safe drinking water for 6.5 million people and implement a water supply capacity-building program that would train 5,000 people over the next five years. Tajikistan said it would host the International Freshwater Forum in 2010 as a venue for a preliminary discussion of achievements, challenges and experiences within the International Decade Water for Life, 2005-15.

The Netherlands said it would help provide access to safe drinking water and sanitation for at least 50 million people by 2015 having already signed various agreements that will benefit almost 30 million people, at a cost of around €1.3 billion. Germany will continue to train Central Asian water experts. The Netherlands and the United Kingdom committed €106 million in joint funding for water and sanitation initiatives in developing countries over the next five years.

Source: UN 2008.

Table 1.2 **Types of ecosystem services**

	Forests	Oceans	Cultivated/ agricultural lands
Environmental goods	• Food • Freshwater • Fuel • Fibre	• Food • Fuel	• Food • Fuel • Fibre
Regulating services	• Climate regulation • Flood regulation • Disease regulation • Water purification	• Climate regulation • Disease regulation	• Climate regulation • Water purification
Supporting services	• Nutrient cycling • Soil formation	• Nutrient cycling • Primary production	• Nutrient cycling • Soil formation
Cultural services	• Aesthetic • Spiritual • Educational • Recreational	• Aesthetic • Spiritual • Educational • Recreational	• Aesthetic • Educational

Source: Based on MEA 2005.

Box 1.6 **Malnutrition attributable to environmental risks**

Experts estimate that poor water and sanitation services and hygiene practices and inadequate water resources management contribute to half of all cases of infant and child underweight, an estimate corroborated by a World Bank technical review of 38 recent cohort studies (confidence interval of 39%-61%). Evidence from several of those studies demonstrates that exposure to environmental health risks in early childhood leads to permanent growth faltering, lowered immunity and increased mortality. A recent large study from Bangladesh reveals that dysentery and watery diarrhoea together can retard weight gain by 20%-25% compared with periods of no infections.

Source: Prüss-Üstün and Corvalán 2006; World Bank 2008; Alam et al. 2000.

Box 1.7 **Water as capital**

Classical economists recognized land (all natural resources), labour and produced capital as the basic sources of wealth. Neoclassical economists focused only on labour and capital, treating 'land' as another interchangeable form of capital. Natural resources were considered abundant relative to demand and therefore not an important focus for economics, whose task was to allocate scarce resources – those whose use constrained alternative economic opportunities. There was little consideration of the environment's dual role as a source of valuable inputs and as a sink for the economy's waste and pollution. Nor was much thought given to the possibility that the world might reach a scale of resource exploitation at which the capacity of both the source and sink functions of the environment could become binding constraints on economic growth.

The focus on produced rather than natural capital is particularly misleading for water. Prices are typically related to the capital outlays required to deliver water (that is, for the infrastructure and operations and maintenance charges), with little or no value attributed to the resource itself. Not only do undervalued water resources tend to be overused, but undervaluation also induces distorted prices that provide poor information about whether investments make sense. Focusing only on capital costs provides no insight into whether economic activities are creating value or whether the resource is running out and needs to be conserved.

Water delivery is highly capital-intensive, so produced capital will remain a crucial focus for financial and economic analyses of water investments. But the value of water resources also matters, and water's availability, quality and timing cannot simply be assumed.

Source: Bergkamp and Sadoff 2008.

The value of water goes well beyond its productive value (box 1.7). Citizens who realize this are calling for action to protect water, joined by business people who recognize the importance of protecting the sources of the water on which they depend. Many are even paying for such protection.[31]

Also to be considered is the impact of climate change on environmental sustainability. At the High-Level Event on the Millennium Development Goals at the United Nations in September 2008 discussion focused on the need for new adaptation strategies and for climate-resilient national development plans, especially for the least developed countries:

> Linkages between financing for development and international climate change financing were discussed. It was also agreed that all countries, including donor countries, the UN system and the Bretton Woods institutions, need to clarify the budgetary implications of adaptation; ensure that adequate finance mechanisms are in place; and help meet the additional costs that climate-resilient development will entail.[32]

Global crises and water

While climate change will create important pressures on water, it is not currently the most important driver of these pressures outside the water sector. The most important drivers – forces and processes generated by human activities – are demographics and the increasing consumption that comes with rising per capita incomes (see chapter 2).

In the early stages of development population growth is the most important driver. But most of the projected growth in demand comes not from high-population-growth countries but from countries with high rates of economic growth and large current populations. As incomes permit, people consume more. To start with, there will be a requirement for more water to produce food for tens of millions of people moving from one meal to two meals a day. Later, still more water will be needed for food production as people include more meat in their diets. Changes in lifestyles will require large amounts of water to produce and process non-food goods and services (virtual water), further increasing pressures on the quantity and quality of water resources. Other demographic

drivers include rural-urban migration and migration in response to political conflict and environmental crises.

Other external forces that may create either positive or negative pressures on water resources include pricing policies and subsidies for water and water-related goods, trade patterns, developments in science and technology, consumption patterns, evolution of policies and laws, social movements and global and national politics.

Except for climate change, these forces will not create pressures directly (or only) on water management. The pressures will be felt first at the level of sector ministers, whose responses will translate into strategies that affect the water sector. These ministers will have to make decisions under conditions of risk and uncertainty. The better informed they are, the more likely they are to make the right decisions. For water managers this means being able to provide reliable information about where and when water is available, of what quality, where and how it is used, what happens to wastewater, how much water leaves the country in exports of goods that use water in their production (virtual water) and how much enters the country in imports. This will be a challenge for water managers in most countries, which lack the necessary measurements and do not systematically collect the necessary data. But when the information is available, it will be possible to calculate the country's water balance and the water footprints (volume of water used) of various users. Using this information, water managers can advise decision-makers in other sectors of the feasibility of their plans and the implications for water.

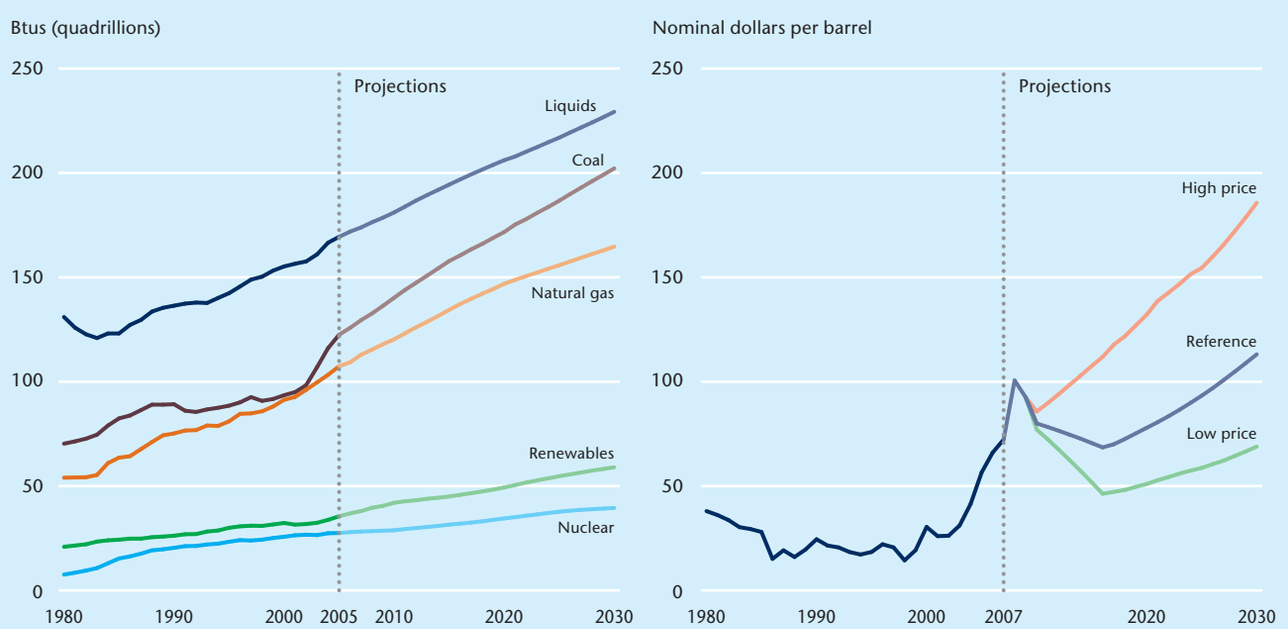
The Report provides ample evidence of all these facts. This is not the first time that professionals in the water sector have attempted to bring them to the world's attention. But this time the effort may be more successful, because this time the world is facing other global crises – in energy, food and climate change and global warming – that cannot adequately be addressed without considering the role of water.

The world is facing global crises in energy, food, and climate change and global warming that cannot adequately be addressed without considering the role of water

Water for energy

Demand for energy – for heat, light, power and transportation – is increasing rapidly (see chapter 7). The price of energy commodities has been rising as well. Volatile, the nominal price of oil – the benchmark commodity – rose from less than $25 a barrel eight years ago to about $100 early in 2008 and more than $140 in June 2008. Within two months it fell below levels projected for the longer term by the Energy Information Administration of the U.S. Department of Energy and was at $35 a barrel on December 19, 2008 (figure 1.8). Energy

Figure 1.8 **Historical and projected energy demand and oil prices show steadily rising demand and rapidly rising prices**



Note: The reference case assumes average GDP growth of 2.4% a year, the high case assumes 3.0% a year, and the low case assumes 1.8% a year.
Source: Based on EIA 2005, 2008a.

The number of countries without enough water to produce their food is rising. The situation can be remedied by investing in water infrastructure, markets, credit, agricultural technology and extension services

prices, particularly the oil prices that drive them, earlier reflected rising world demand and constraints. The recent financial crisis, which has slowed economic growth throughout the world, reducing anticipated demand, was largely responsible for the low price of oil at the end of 2008.

The combination of high prices and a desire to substitute other sources of fuel led to the recent increase in the production of bioenergy, which has potentially important impacts on water quality and availability. Hydropower may be a renewable and non-polluting source of energy in some countries. Water for cooling is needed for all thermal sources of power, including nuclear. In the United States water withdrawn for cooling (39%) equals agriculture's share of water use. At the same time energy is required to lift groundwater, pump it through pipes and treat both groundwater and wastewater. An estimated 7% of all energy produced is used for such purposes.[33] Increased demand for water through desalination may increase energy demand in some countries, although marginally on a global scale.

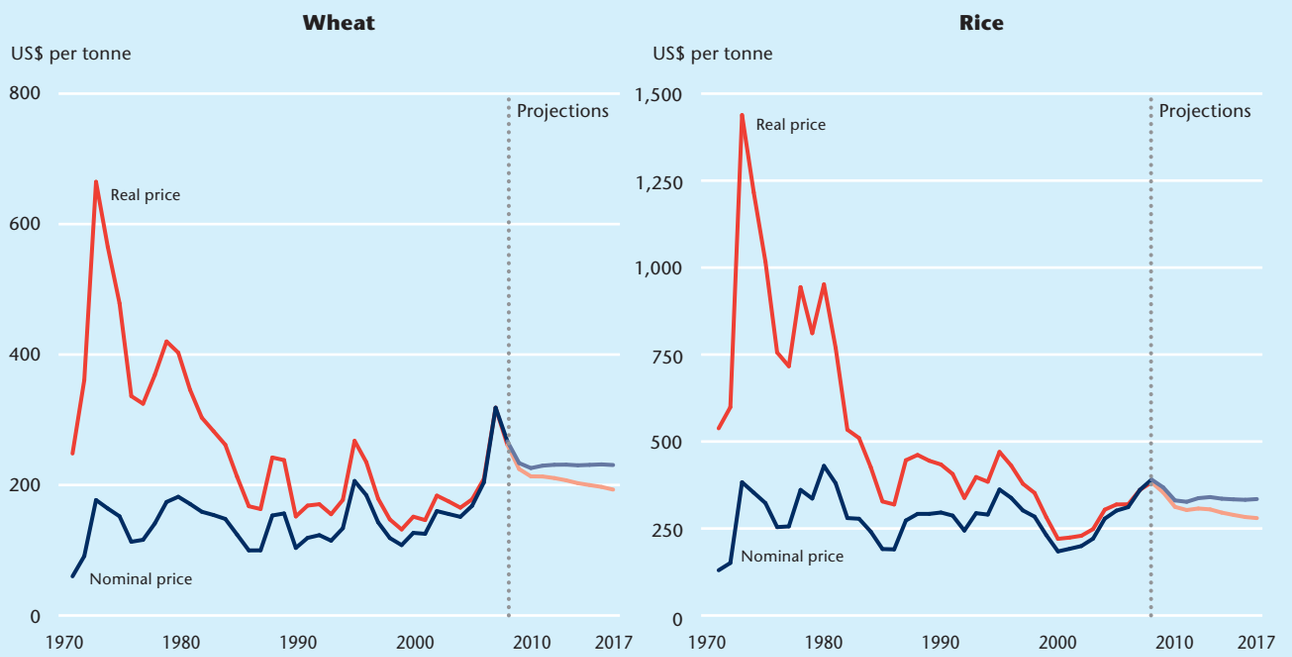
Water for food

Agriculture is by far the largest consumer of freshwater – about 70% of all freshwater withdrawals go to irrigated agriculture (see chapter 7). The recent steep rise in food prices (figure 1.9) has severely hurt many food-importing countries. Rising demand for food caused by growing populations and shifting diets, production shortfall in some countries, increased costs for key agricultural inputs such as fertilizers (driven in turn by energy costs), bioenergy-related incentives in some countries and possible financial speculation have all contributed to the problem. The High-Level Conference on World Food Security: The Challenges of Climate Change and Bioenergy, a Food and Agriculture Organization summit in Rome on 3 June 2008, adopted a declaration acknowledging 'an urgent need to help developing countries and countries in transition expand agriculture and food production, and to increase investment in agriculture, agribusiness and rural development, from both public and private sources'.[34] It calls on donors to provide balance of payments and budget support to low-income food-importing countries.

At the summit Robert B. Zoellick, president of the World Bank, said that the Bank recognizes that the energy-food nexus means that food prices will stay high and that the 'task is two-fold, to handle today's danger to those for whom securing food has become a daily struggle, and turn higher food prices into an opportunity for developing world agriculture, and

Figure 1.9 **Wheat and rice prices have risen sharply in recent years**

Historical and projected prices of wheat and rice, 1970-2017



Source: Based on OECD and FAO 2008.

for farmers in developing countries'.[35] The summit highlighted the strong links among food security, economic development, climate change, markets, development assistance and energy and how actions have implications for other sectors. While the role of water in agriculture was discussed at the summit, the final declaration did not mention water and water's strong links with these and many other issues.

Water scarcity may limit food production and supply, putting pressure on food prices and increasing countries' dependence on food imports. The number of countries and regions without enough water to produce their food is rising as populations increase. The situation can be remedied in many developing countries by investing in water infrastructure, markets, credit, agricultural technology and extension services.

Underinvestment in water

The energy and food crises are taking place during a time of global financial crisis. A credit crunch has followed the financial crises that began in the United States and Europe in 2007 and spread around the globe. The credit crunch has resulted in a slowdown in economic growth around the world. The International Monetary Fund forecast in 2008 that all industrial countries (except Canada) would face a period of recession and that some developing countries are more at risk than others (box 1.8).[36] According to the Commission on Growth and Development 'developing countries are most vulnerable to sudden stoppages of credit and sudden switches of international custom or supply.'[37]

Developing countries most at risk include those exporting directly to crisis-affected countries, those whose exports are experiencing falling world prices and those whose exports have high income elasticity (luxury goods, including tourism). Declining tourism revenues and employment will directly affect the poor. Countries dependent on foreign direct investment, remittances and development funds to finance the current account deficit will also be at risk. Oil-importing countries have already been hard hit by the period of high oil prices.

The high rates of global savings and strong productivity growth in the three decades before the financial crisis – when the stock of financial assets grew three times faster than GDP – were not accompanied by investments in physical assets, and their levels are below those in the last decade.

While other factors may also have contributed to these lower levels of investment, economic uncertainty is a major factor. Uncertainty about the policy environment in developing and emerging market economies has always been a concern, but its influence has strengthened in the currently highly competitive global markets.[38]

The impact on developing countries will vary. Budgetary spending on infrastructure is often cut during periods of financial tightening, although for governments that can afford it, investing in infrastructure can help counter an economic slowdown. Private investment may also suffer, but since the private sector's contribution to the water sector has been relatively small, the sector is less exposed to any financial tightening. Countries dependent on aid face uncertain times. Bilateral donors, important in funding water investments, may be tempted to reduce their aid budgets. Multilateral aid could be an important source of financing for the next few years, especially following recent record multiyear replenishments of the International Development Association, African Development Fund and European Development Fund. Yet both bilateral and multilateral aid donors still appear not to recognize the contribution of the water sector to growth, as indicated by the sector's small share of total official development assistance in recent years (less than 4%; see table 4.4 in chapter 4).

Inadequate information on water and water crises

Managing water is made more difficult by the lack of knowledge and information required for decision-making and long-term planning. Few countries know how much water is being used and for what purposes, the quantity and quality of water that is available and that can be withdrawn without serious environmental consequences and how much is being invested in water

Few countries know how much water is being used and for what purposes, the quantity and quality of water that is available and that can be withdrawn without serious environmental consequences and how much is being invested in water management and infrastructure

Box 1.8 International Monetary Fund economic forecast for 2008-09

The advanced economies were expected to be in or close to recession in the second half of 2008 and early 2009, and the anticipated recovery later in 2009 will be exceptionally gradual by past standards.

Growth in most emerging and developing economies would decelerate below trend. On the inflation front, the combination of rising slack and stabilizing commodity prices is expected to contain the pace of price increases, bringing inflation back below 2% in 2009 in advanced economies. In emerging and developing economies, inflation would ebb more gradually, as recent commodity price increases continue to feed through to consumers.

Source: IMF 2008, p. xvi.

Scarcity – low available water per capita – is forecast to worsen where population growth is still high, as in sub-Saharan Africa, South Asia and some countries in South America and the Middle East

management and infrastructure (see chapter 13).

Underfunding of observation, monitoring and information systems leads to weaknesses in infrastructure, research and development, and training and to reduced efficiencies. Less is known with each passing decade, despite the availability of new remote sensing and geographic information system technologies that can simplify monitoring and reporting and despite the growing need for such information in an increasingly complex and rapidly changing world. Such information is vital not only at a national scale but also at a global scale – to inform the construction of global models of the hydrologic cycle and decisions on where interventions, including external aid, would be most useful. One move in that direction is the United Nations Economic Commission for Europe Convention on the Protection and Use of Transboundary Watercourses and International Lakes, which requires signatories to exchange data on water quality and quantity and pollution sources and the environmental conditions of transboundary waters.

Climate change and water

Some parts of the world have no shortage of water. Others, such as North and Southern Africa, the Middle East and parts of South Asia, South-East Asia and South America, suffer scarcity because of low annual rainfall. Others suffer seasonal scarcity. Yet others suffer from extreme rainfall, causing floods. Some suffer from both low and extreme rainfall, at different times. In some large countries, such as Mozambique and the United States, parts of the country may experience damaging intensive rainfalls while other parts suffer prolonged drought. These variations matter most where they affect large populations. Scarcity – low available water per capita – is forecast to worsen where population growth is still high, as in sub-Saharan Africa, South Asia and some countries in South America and the Middle East.

Adapting to climate change adds a critical challenge to this picture for all countries, particularly for developing countries, whose capacity to adapt is low, and for cities in coastal areas (see chapter 5). Even if greenhouse gas concentrations stabilize in the coming years, some impacts from climate change are unavoidable. These include growing water stress, more extreme weather events, higher levels of migration and the disruption of international markets. Climate models show that extremes of rainfall are likely to worsen, resulting in more floods and droughts in regions already affected – often regions with low income levels per capita, widespread absolute poverty, high population growth and rapid urbanization. If climate change brings significant shifts in the availability of water resources, patterns of human migration could be affected.

These challenges cannot be separated from the challenges of sustainable development. For some developing countries the incremental costs of adapting to climate change will soon approach the current value of aid inflows. The leaders of the G-8, meeting in Hokkaido, Japan, in July 2008, committed to accelerating action on technology development, transfer, financing and capacity building to support adaptation (box 1.9). Such action must include water resources, which will be most affected by climate change. A recent United Nations Framework Convention on Climate Change document on adaptation noted that:

> sector-specific adaptation planning and practices were discussed in the areas of agriculture and food security, water resources, coastal zones and health. Those sectors were selected based on their importance to Parties and organizations as highlighted in their submissions.[39]

The world is right to be concerned about climate change, which poses major threats to humans and ecosystems. The 2007 United Nations Climate Change Conference in Bali, Indonesia, acknowledged that

Box 1.9 Extracts from Declaration of Leaders Meeting of Major Economies on Energy Security and Climate Change at the G-8 Hokkaido, Toyako, summit, 9 July 2008

Climate change is one of the great global challenges of our time. Conscious of our leadership role in meeting such challenges, we, the leaders of the world's major economies, both developed and developing, commit to combat climate change in accordance with our common but differentiated responsibilities and respective capabilities and confront the interlinked challenges of sustainable development, including energy and food security, and human health.

We will work together in accordance with our Convention commitments to strengthen the ability of developing countries, particularly the most vulnerable ones, to adapt to climate change. This includes the development and dissemination of tools and methodologies to improve vulnerability and adaptation assessments, the integration of climate change adaptation into overall development strategies, increased implementation of adaptation strategies, increased emphasis on adaptation technologies, strengthening resilience and reducing vulnerability, and consideration of means to stimulate investment and increased availability of financial and technical assistance.

Source: G-8 2008.

even the minimum predicted shifts in climate for the 21st century, at more than twice the 0.6° Celsius increase that has occurred since 1900, would be significant and disruptive. The intergovernmental response has focused primarily on mitigation of climate change, embracing wide-ranging measures, including reducing greenhouse gas emissions, transferring clean technologies and protecting forests. These measures may slow climate change. They will not halt or reverse it.

It will be two generations before these measures begin to have an effect. And even if successful, they imply a considerably changed future climate. (They are not aimed at reversing changes already under way.) In the meantime people must be protected from the consequences of global climate change through adaptation measures. Adaptation, as embodied in the Nairobi Work Programme of the United Nations Framework Convention on Climate Change, is based on gaining a better understanding of the impacts of climate change and making informed decisions on practical measures.[40]

The water situation and the vulnerability of poor communities present a strong case for action on climate change. Projections warn of changes in water availability and quality that could have disastrous consequences. Water is the principal medium through which climate change will affect economic, social and environmental conditions. Changes in water availability will have economy-wide impacts.

Yet while the world appears motivated to respond to the impacts of future climate change, it remains unmotivated to act on the water crises that are with us today. Even without climate change, development is threatened in many regions by factors that we have already failed to address time and again. The Intergovernmental Panel on Climate Change's April 2008 report on water points this out clearly (box 1.10).

Security and water

Climate change, especially its implications for scarce water resources, is a matter of collective security in a fragile and increasingly interdependent world. At a 2007 UN Security Council debate on the impact of climate change on peace and security UN Secretary-General Ban Ki-moon noted that climate change has implications for peace and security, as well as serious environmental, social and economic implications, especially 'in vulnerable regions that face multiple stresses at the same time – pre-existing conflict, poverty and unequal access to resources, weak institutions, food insecurity and incidence of diseases such as HIV/AIDS.'[41] He outlined 'alarming, though not alarmist' scenarios, including limited or threatened access to energy increasing the risk of conflict, a scarcity of food and water transforming peaceful competition into violence, and floods and droughts sparking massive human migrations, polarizing societies and weakening the ability of countries to resolve conflicts peacefully.

In Africa alone by 2020, 75-250 million people may be exposed to increased water stress due to climate change. If coupled with increased demand, this will hurt livelihoods and exacerbate water-related problems.[42] Research centres such as the Oxford Research Group[43] are underpinning the security concerns of the United Nations, the European Union[44] and national governments[45] about climate change and its impacts on water. The forces at work are global in scale, the aggregate result of the behaviour of all countries. Dealing with them will require international cooperation and coordination. Yet at the same time national leaders must continue to act and make decisions at a national level.

As climate change and adverse water impacts increase in politically charged areas, conflicts will likely intensify, requiring new and rapid adaptive security strategies. Hydrologic shocks that may occur through climate change increase the risk of major national and international security threats, especially in unstable areas (box 1.11). Adverse changes in internal, interjurisdictional and transboundary waters can put food, social, health, economic, political and military security at risk.

Some fragile states (map 1.1) have experienced widespread conflict that has resulted in the destruction of economic

While the world appears motivated to respond to the impacts of future climate change, it remains unmotivated to act on water crises that are with us today

Box 1.10 Intergovernmental Panel on Climate Change Technical Report on Water and Climate Change

Current water management practices may not be robust enough to cope with the impacts of climate change on water supply reliability, flood risk, health, agriculture, energy and aquatic ecosystems. In many locations, water management cannot satisfactorily cope even with current climate variability, so that large flood and drought damages occur. As a first step, improved incorporation of information about current climate variability into water-related management would assist adaptation to longer-term climate change impacts. Climatic and non-climatic factors, such as growth of population and damage potential, would exacerbate problems in the future. (*very high confidence*)

Source: IPCC 2008.

Box 1.11 UN Secretary General Ban Ki-moon warns that water shortages are increasingly driving conflicts

'The challenge of securing safe and plentiful water for all is one of the most daunting challenges faced by the world today.

'Until only recently, we generally assumed that water trends do not pose much risk to our businesses. While many countries have engaged in waste-water treatment and some conservation efforts, the notion of water sustainability in a broad sense has not been seriously examined.

'Our experiences tell us that environmental stress due to lack of water may lead to conflict and would be greater in poor nations.

'Ten years ago – even five years ago – few people paid much attention to the arid regions of western Sudan. Not many noticed when fighting broke out between farmers and herders, after the rains failed and water became scarce.

'Today everyone knows Darfur. More than 200,000 people have died. Several million have fled their homes.

'There are many factors at work in this conflict, of course. But almost forgotten is the event that touched it off – drought. A shortage of life's vital resource.

'We can change the names in this sad story. Somalia. Chad. Israel. The occupied Palestinian territories. Nigeria. Sri Lanka. Haiti. Colombia. Kazakhstan. All are places where shortages of water contribute to poverty. They cause social hardship and impede development. They create tensions in conflict-prone regions. Too often, where we need water we find guns. . . .'

Source: Ban Ki-moon 2008.

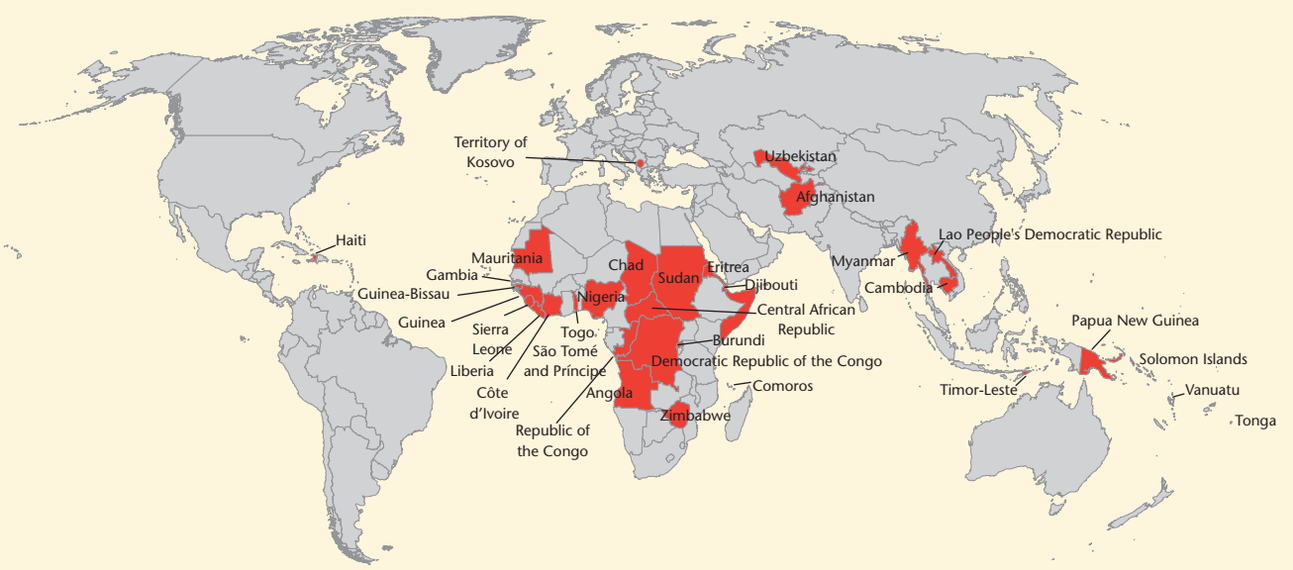
infrastructure. The vulnerability of affected populations is worsened by the state's loss of control over the forces of law and order and ultimately by its loss of political legitimacy. Installing infrastructure and renewing institutional capacity following conflict have the potential to set post-conflict nations on a path to recovery. For example, rehabilitation of damaged irrigation infrastructure and expansion of water supply and sanitation formed a significant part of the 2006 Somali Rehabilitation and Reconstruction Plan.[46] Similarly, rehabilitation of infrastructure after major natural disasters provides an opportunity to address long-standing infrastructure deficits.

The need for action – now

Water has remained too low on the list of political priorities for too long, a situation that cannot be allowed to continue. Action is required now. Lives and livelihoods depend on water for development. Changes in human behaviour and activity are accelerating, affecting demand for water and its supply. Because investments have been neglected, development is lagging, people are suffering and the environment is deteriorating. The resources needed to address the problems of water management are minuscule compared with the financial resources that have been pledged and secured to deal with carbon emissions or the current financial crisis. After decades of inaction, the problems are enormous. And they will worsen if left unattended.

Although substantial, the challenges are not insurmountable. In part 4 the Report shows how some countries and regional and local governments have solved similar challenges. The decisions on development objectives and the allocation of human and financial resources needed to meet

Map 1.1 Fragile states as defined by the International Development Association



Note: Fragile states are low-income countries that score below a threshold on the International Development Association's Country Policy and Institutional Assessment, a tool used to assess the quality of country policies. The list is prepared annually.
Source: Based on IDA 2007.

them are made or influenced by leaders in government, the private sector and civil society. They are the ones who must recognize the role of water in attaining their objectives – and demonstrate the will to act now.

Structure of the Report

The Report has four parts. Part 1 examines water drivers – or what drives the pressures on water. Externalities, mostly human-induced, create pressures on water. Human activities and processes of all types – demographic, economic and social – can exert pressures on water resources that need to be managed. These pressures are affected by a range of factors such as technological innovation, climate change, and policies, laws and financial conditions

Part 2 is about using water. History shows strong, mutual links between economic development and water development. Steadily increasing demand for agricultural products to satisfy the diverse needs of a growing population (for food, fibre and now fuel) has long been the main driver behind agricultural water use. In a situation of tight balance between food supply and demand, climate events – droughts in particular – have an increasingly strong impact on food price volatility. There is a growing need to protect ecosystems and the goods and services they produce and on which life and livelihoods depend. As competition among demands on water increases, society will need to respond more effectively through improved water management, policies and transparent and efficient water allocation mechanisms.

Part 3 explores the state of water resources. The uneven distribution over time and space of water resources, and how that distribution is being modified, are fundamental sources of the water crisis. Global warming is expected to result in an intensification, acceleration or enhancement of the global hydrologic cycle. There is some observational evidence that this is already happening. In many places climate extremes have become more frequent or more intense, with droughts and floods affecting increasing numbers of people. Worldwide, water observation networks are inadequate for current needs and are at risk of further decline. The data to understand and predict water quantity and quality are lacking.

Part 4 is on responses and choices. It shows that we can do what it takes to manage water resources properly to avert crises and promote sustainable socioeconomic development. Others have already shown the way. But there is no one-size-fits-all solution. The best mix of responses to a specific country's development objectives and policy priorities to meet various water challenges depends on the availability of water of acceptable quality for its intended use and the country's technical, financial, institutional and human capacities and its culture, political and regulatory frameworks and markets.

Leaders within the water domain can inform the processes outside their domain and manage water resources to achieve agreed socioeconomic objectives. But it is the leaders in government, the private sector and civil society who determine the directions that development will take. Recognizing this, they must act now!

The decisions on development objectives and the allocation of human and financial resources needed to meet them are made or influenced by leaders in government, the private sector and civil society – not by water managers or specialists

Notes

1. There were exceptions, such as the development of the Tennessee River in the United States beginning in the 1930s under the Tennessee Valley Authority.
2. Commission on Growth and Development 2008.
3. Phumpiu and Gustafsson 2007.
4. See www.pap.org.mz.
5. Speaking at the session Re-Thinking Social Responsibility on 25 January 2008, as cited in Maidmont 2008.
6. Commission on Growth and Development 2008, p. 1.
7. ADB 2007, p. vi.
8. The benefits of investing in water are presented in greater detail in chapter 6.
9. SIWI 2005.
10. Hutton and Haller 2004.
11. Schuster-Wallace et al. 2008.
12. UN-Water 2008.
13. WHO 2006.
14. Hussein 2008.
15. Winpenny 2003.
16. van Hofwegen 2006.
17. DFID 2007, p. 2.
18. World Bank 2003.
19. NEPAD 2002.
20. Originally defined as $1.00 per day and revised to $1.25 in 2005 to reflect evolving purchasing power parity
21. Chen and Ravallion 2008.
22. UNDP 2006, p. 6.
23. World Bank 2005.
24. Kaberuka 2008.
25. MDG Africa Steering Group 2008.
26. WELL 2005.
27. Poverty-Environment Partnership 2006.
28. G-8 2003.
29. UN-Water 2007.
30. World Bank 2008.
31. Worldwatch Institute 2008, pp. 117-21.
32. United Nations 2008.
33. Hoffman 2004.
34. FAO 2008.
35. Zoellnick 2008.
36. IMF 2008. Canada has since joined the other countries as recessions deepened.
37. Commission on Growth and Development 2008, p. 103.

38. Rajan 2006.
39. UNFCCC 2007.
40. UNFCCC 2005.
41. UN Security Council 2007.
42. IPCC 2008.
43. The Oxford Research Group, in a briefing paper on sustainable security, argues that the effects of climate change – displacement of peoples, food shortages, social unrest – have long-term security implications far greater than those of terrorism and notes that the U.S. Department of Defense's Office of Net Assessment takes the same view (Abott, Rogers, and Sloboda 2006, p. 7).
44. Such as the statement by the European Commission and the Secretary General/High Representative for Foreign and Security Policy Javier Solana (2006, p. 2): 'Investment in mitigation . . . as well as ways to adjust to the unavoidable should go hand in hand with addressing the international security threats created by climate change.'
45. Such as U.K. Foreign Secretary Margaret Beckett's statement in the 2007 UN Security Council debate on the impact of climate change on peace and security that climate change exacerbates many threats (UN Security Council 2007) and the testimony of Deputy Director of National Intelligence for Analysis (NIA) Thomas Finger before a Joint House committee that an NIA assessment found that sub-Saharan Africa, the Middle East and Central and South-East Asia are most vulnerable to warming-related drought, flooding, extreme weather and hunger (House Permanent Select Committee on Intelligence and U.S. House Select Committee on Energy Independence and Global Warming 2008, p.13).
46. UNDP and World Bank 2007.

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