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Managing transboundary waters

“War over water would be an ultimate obscenity”

Queen Noor of Jordan

**“Whisky is for drinking,
water is for fighting over”**

Mark Twain

Managing shared water can be a force for peace or for conflict, but it is politics that will decide which course is chosen

For any country water is at the core of human interdependence—a shared resource that serves agriculture, industry, households and the environment. National water governance is about striking a balance among these competing users. But water is also the ultimate fugitive resource. Countries may legislate for water as a national asset, but the resource itself crosses political boundaries without a passport in the form of rivers, lakes and aquifers. Transboundary waters extend hydrological interdependence across national frontiers, linking users in different countries within a shared system. Managing that interdependence is one of the great human development challenges facing the international community.

The challenge is partly institutional. Competition for water within a country can create conflicting demands, confronting policy-makers with choices that have ramifications for equity, human development and poverty reduction. National institutions and legislative bodies provide mechanisms for addressing these choices. For water that flows across borders, there is no equivalent institutional structure. This has implications. As water becomes scarce relative to demand, transboundary competition for shared rivers and other water resources will grow. Without institutional mechanisms to respond to these transboundary problems, competition has the potential to lead to disruptive conflicts.

The spectre of growing competition for water between states has generated a sometimes polarized public debate. Some predict a future of “water wars” as states assert rival claims to water. Others point out that there have been no wars over water since an event some 4,000 years ago in what is now southern Iraq—and that countries have usually responded to transboundary water competition through cooperation rather than conflict. From this more optimistic perspective,

rising competition is seen as a catalyst for deeper cooperation in the future.

This Report argues that water has the potential to fuel wider conflicts but also to act as a bridge for cooperation. Throughout history governments have found innovative and cooperative solutions to transboundary water management tensions, even in the most difficult political environments. From the Indus to the Jordan and the Mekong Rivers states in political and even military conflict have found ways of maintaining cooperation over water. When states go to war it is usually over something far less important than water. But complacency is not the appropriate antidote to water war pessimism. Cross-border waters almost always create some tension between the societies they bind. These tensions cannot be considered in isolation. They are tied up in wider factors than relations between states, including concerns over national security, economic opportunity, environmental sustainability and fairness. Managing shared water can be a force for peace or for conflict, but it is politics that will decide which course is chosen.

Because water is a flowing resource rather than a static entity, its use in any one place is affected by its use in other places, including other countries

One problem with the polarized debate generated by water war rhetoric is that it has diverted attention from more pressing and more relevant human security concerns. Co-operative approaches to transboundary water management can yield real gains for human development. They can strengthen water security for vulnerable people on both sides of a border, enhancing the quality, quantity and predictability of flows across countries. Water sharing is not a zero sum game: one country's gain is not another's loss. Just as interdependence through trade can expand the economic benefits for all, so can cooperative interdependence in water. That is true not just in the economic sphere, where trade in hydropower or environmental services offers a potential win-win strategy—but also in wider political, social and environmental policy.

The opposite is also true. Where cooperation fails to develop or breaks down, all countries stand to lose—and the poor stand to lose the most. Failures in cooperation can cause social and ecological disasters, as in Lake Chad

and the Aral Sea. They also expose smaller, vulnerable countries to the threat of unilateral actions by larger, more powerful neighbours. Above all, the absence of cooperation makes it impossible for countries to manage shared water resources to optimize conditions for human progress.

Two overarching challenges define transboundary water governance strategies at the start of the 21st century. The first is to move beyond inward-looking national strategies and unilateral action to shared strategies for multi-lateral cooperation. To some degree, this is already happening, but the governance response has been fragmented and inadequate. The second is to put human development at the centre of transboundary cooperation and governance.

This chapter looks first at what hydrological interdependence means in the lives of nations and people. It then considers the ecological, economic and wider human costs of failure to cooperate in transboundary water management and looks at the corollary of these costs: the case for cooperation.

Hydrological interdependence

Water is unlike other scarce resources in important respects. It underpins all aspects of human society, from ecology to agriculture to industry—and it has no known substitutes. Like air, it is fundamental to life. It is also an integral part of the production systems that generate wealth and well-being. Because water is a flowing resource rather than a static entity, its use in any one place is affected by its use in other places, including other countries. Unlike oil or coal, water can never be managed for a single purpose—or in the case of transboundary water, for a single country.

The way any one country uses water transmits effects to other countries, usually through one of three mechanisms:

- *Competition for a finite supply of water.* When countries rely on the same source of water to support their environments, sustain livelihoods and generate growth, transboundary water becomes a link between their citizens and their environments. Use in one place restricts availability in another. For example, the retention of water upstream for irrigation or power generation in one country restricts flows downstream for farmers and the environment.
- *Impacts on water quality.* The way an upstream country uses water affects the environment and the quality of water that arrives in a downstream country.

Uncoordinated dam development can cause silting in reservoirs, preventing the rich sediment from reaching low-lying plains. Similarly, industrial or human pollution can be transported through rivers to people in other countries. In November 2005, when an industrial accident caused an 80-kilometre-long chemical slick in China's Songhua River, it threatened not only the 3 million citizens of Harbin but also the residents of the Russian city of Khabarovsk across the border.

- *Timing of water flows.* When and how much water is released by upstream users has crucial implications downstream. For example, agricultural users in a downstream country may need water for irrigation at the same time as an upstream country needs it for hydropower generation—a common problem today in Central Asia (see below).

Just as tensions in each of these areas can generate competition and conflict within countries (see chapter 5), so interdependence transmits consequences of different patterns of water use across borders.

Sharing the world's water

Shared water is an increasingly important part of human geography and the political landscape. International rivers, lakes, aquifers and wetlands bind people separated by international borders, some of which follow the course of waterways. This shared water is what supports the hydrological interdependence of millions of people.

International water basins—catchments or watersheds, including lakes and shallow groundwater, shared by more than one country—cover almost half of Earth's land surface. Two in every five people in the world today live in these basins, which also account for 60% of global river flows. The number of shared basins has been growing, largely because of the breakup of the former Soviet Union and former Yugoslavia. In 1978 there were 214 international basins. Today there are 263.

The depth of interdependence implied by these figures is revealed by the number of countries in shared basins—145, accounting for more than 90% of the world's population.¹ More than 30 countries are located entirely within transboundary basins.

The depth of interdependence is illustrated by the number of countries that share some international basins (table 6.1). For example, 14 countries share the Danube (another 5 have marginal shares), 11 the Nile and the Niger and 9 the Amazon. No region better demonstrates the realities of hydrological interdependence than Africa. The political maps drawn up at conferences in Berlin, Lisbon, London and Paris more than a century ago have left more than 90% of all surface water in the region in transboundary river basins, which harbour more than three-quarters of its people.² Some 61 basins cover about two-thirds of the land area (map 6.1).

Governments can choose whether or not to cooperate in managing transboundary waters. Whatever the decision, rivers and other transboundary water systems bind countries into environmental resource-sharing arrangements that shape livelihood opportunities.

Upstream use determines downstream options in water management, setting the stage for dispute or cooperation. Nowhere is this more apparent than in irrigation. Among countries with highly developed irrigation systems, Egypt, Iraq, Syria, Turkmenistan and Uzbekistan depend on rivers flowing from their neighbours for two-thirds or more of their water. Changed water use patterns in upstream countries can seriously affect agricultural systems and rural livelihoods downstream. The Tigris-Euphrates Basin, to take one illustration, serves Iraq, Syria and Turkey, with a combined population of 103 million. Turkey's Southeast Anatolia Project, which encompasses the creation of 21 dams and 1.7 million hectares of irrigated land, could reduce flows in Syria by about a third, creating winners and losers within the basin area.³

In any country allocating water among users is a politically challenging task. Adding national borders to the equation complicates

International rivers, lakes, aquifers and wetlands bind people separated by international borders

Table 6.1 International basins link many countries

River basin	Number of basin countries	Basin countries
Danube	19	Albania, Austria, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Italy, Macedonia, Moldova, Montenegro, Poland, Romania, Serbia, Slovakia, Slovenia, Switzerland, Ukraine
Congo	13	Angola, Burundi, Cameroon, Central African Republic, Congo, Democratic Republic of the Congo, Gabon, Malawi, Rwanda, Sudan, Tanzania, Uganda, Zambia
Nile	11	Burundi, Central African Republic, Democratic Republic of the Congo, Egypt, Eritrea, Ethiopia, Kenya, Rwanda, Sudan, Tanzania, Uganda
Niger	11	Algeria, Benin, Burkina Faso, Cameroon, Chad, Côte d'Ivoire, Guinea, Mali, Niger, Nigeria, Sierra Leone
Amazon	9	Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname, Venezuela and French Guiana
Rhine	9	Austria, Belgium, France, Germany, Italy, Liechtenstein, Luxembourg, Netherlands, Switzerland
Zambezi	9	Angola, Botswana, Democratic Republic of the Congo, Malawi, Mozambique, Namibia, Tanzania, Zambia, Zimbabwe
Lake Chad	8	Algeria, Cameroon, Central Africa Republic, Chad, Libya, Niger, Nigeria, Sudan
Aral Sea	8	Afghanistan, China, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan
Jordan	6	Egypt, Israel, Jordan, Lebanon, Occupied Palestinian Territories, Syria
Mekong	6	Cambodia, China, Lao People's Democratic Republic, Myanmar, Thailand, Viet Nam
Volta	6	Benin, Burkina Faso, Côte d'Ivoire, Ghana, Mali, Togo
Ganges-Brahmaputra-Meghna	6	Bangladesh, Bhutan, China, India, Myanmar, Nepal
Tigris-Euphrates	6	Iran, Iraq, Jordan, Saudi Arabia, Syria, Turkey
Tarim	5 (+1)	Afghanistan, China, Chinese control claimed by India, Kyrgyzstan, Pakistan, Tajikistan
Indus	5	Afghanistan, China, India, Nepal, Pakistan
Neman	5	Belarus, Latvia, Lithuania, Poland, Russia
Vistula	5	Belarus, Czech Republic, Poland, Slovakia, Ukraine
La Plata	5	Argentina, Bolivia, Brazil, Paraguay, Uruguay

Source: Adapted from Wolf and others 1999.

governance, especially when competition for water is intensifying. In theory the optimal approach is to manage water in an integrated way across the whole basin, with countries trading agricultural resources, hydropower and other services according to their comparative advantage in water use. To take an obvious example, hydropower is more cost-effective in sloping mountainous upper reaches, while irrigation produces better results in valleys and plains: trading hydropower for agricultural goods is one way of tapping into this comparative advantage. In practice most river basins lack institutions for resolving differences and coordinating resource sharing, and factors such as trust and strategic concerns weigh heavily in government policy.

Basin-sharing gives only a partial picture of hydrological interdependence. Countries vary in their dependence on shared systems. In some cases states that represent a small part of a basin in geographic terms are highly

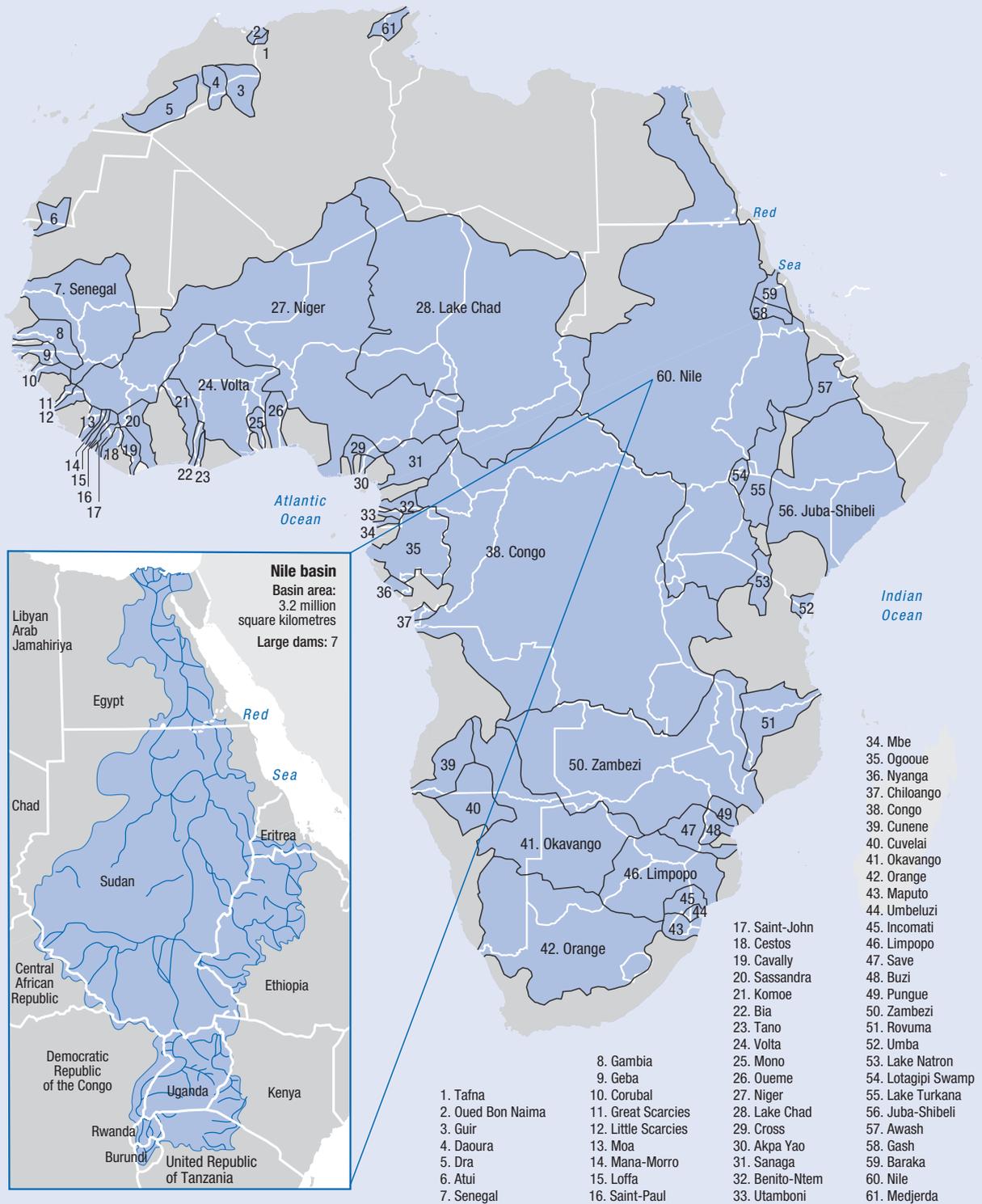
dependent in hydrological terms, while the opposite is also true. For example, Bangladesh accounts for only 6% of the Ganges-Brahmaputra-Meghna Basin, yet the basin occupies three-quarters of the country.⁴ And while one-fifth of the Mekong Basin lies in China, the basin represents less than 2% of China's territory. Farther downstream, more than four-fifths of Lao People's Democratic Republic and nearly 90% of Cambodia are within the basin.

Following the river

Most people are unaware of the human consequences of the hydrological interdependence that binds countries. Yet this is part of a reality that shapes lives and opportunities.

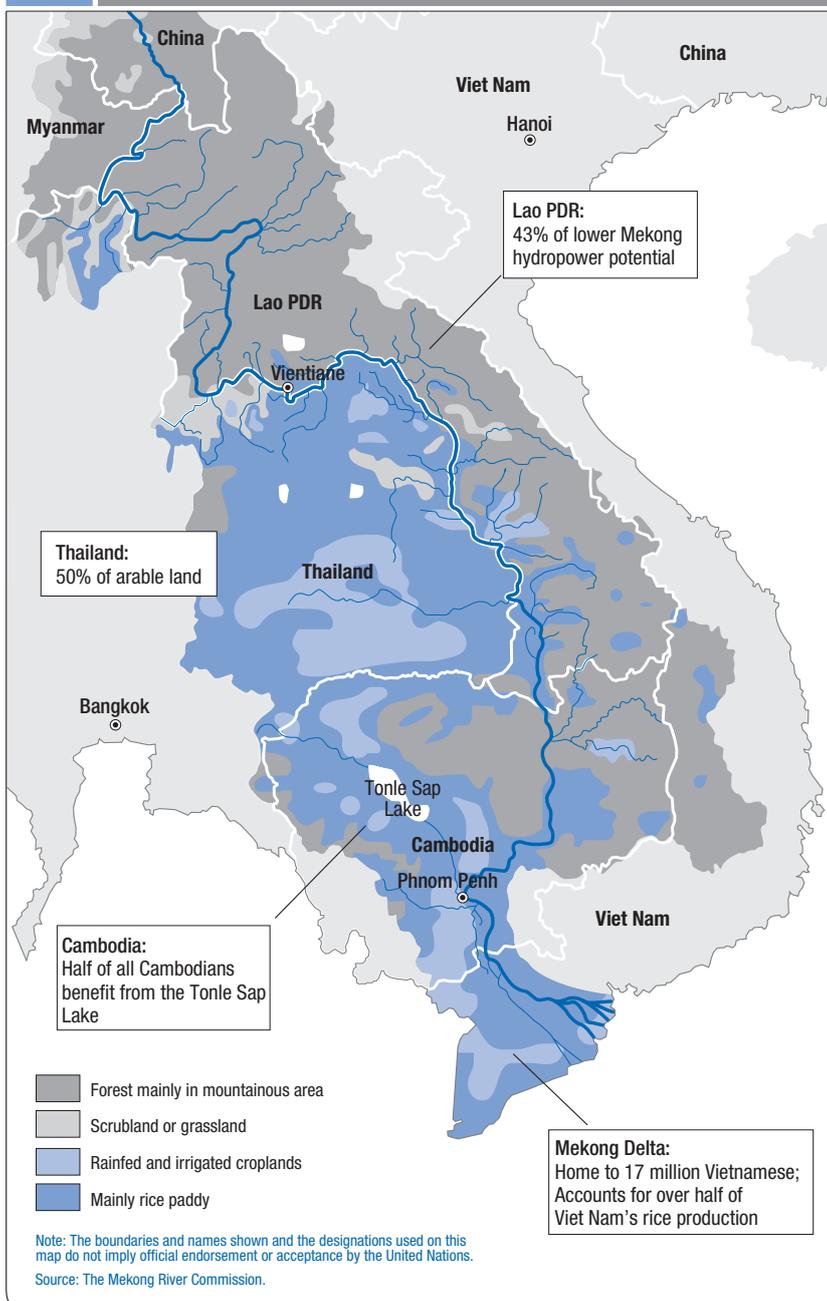
The Nile is one example of this reality. Some 150 million people live in the Nile Basin—a water system that links the 96% of Egyptians who live in the Nile Valley and Delta with

Map 6.1 Africa's rivers and lake basins cross many borders



Note: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.
 Source: Wolf and others 1999; Revenga and others 1998; Rekacewicz 2006; Jägerskog and Phillips 2006.

Map 6.2 The Mekong binds livelihoods across borders



Perhaps the easiest way to understand what hydrological interdependence means at a human level is to follow the course of a river. Consider the Mekong, one of the world's major water systems (map 6.2). From its source on the Tibetan Plateau it drops 5,000 metres and flows across six countries before reaching its delta. More than a third of the population of Cambodia, Lao PDR, Thailand and Viet Nam—some 60 million people—live in the Lower Mekong Basin,⁶ using the river for drinking water, food, irrigation, hydropower, transportation and commerce. Millions more in China and Myanmar and beyond the boundaries of the basin benefit from the river.

In the plains the river basin accounts for half the arable land in Thailand. Further downstream in Cambodia the Tonle Sap Lake, one of the world's largest freshwater fisheries, is replenished by the Mekong. Nearly half of Cambodia's people benefit directly or indirectly from the lake's resources.⁷ As the river approaches the sea, the Mekong Delta yields more than half of Viet Nam's rice production and a third of its GDP.⁸ Some 17 million people live in the Mekong Delta in Viet Nam. Beyond these human connections the river also powerfully demonstrates the scope for shared interest—and competition.

Rivers are just one of the webs of water interdependence. In many countries shared lakes are crucial for water security—and livelihoods. An estimated 30 million people depend on Lake Victoria—one-third of the combined population of Kenya, Tanzania and Uganda.⁹ Another 37 million live in the Lake Chad Basin.¹⁰ Although Lake Victoria is the world's most productive freshwater fishery and Lake Chad yields three-quarters of the fish in the entire region, poverty rates among these populations are exceptionally high.¹¹ It follows that lake management has important implications for poverty reduction efforts. The same holds true for the Lake Titicaca Basin in Latin America. More than 2 million people live in the basin which spans Bolivia and Peru. Poverty levels there are estimated at more the 70%. Two Bolivian cities in the basin—El Alto and Oruro, with a quarter of the country's population—depend on the lake for their water needs.¹²

people living on the Ethiopian highlands and in northern Uganda, among other countries.⁵ Water and silt, mainly from Ethiopia, have made a long ribbon of desert habitable and have sustained the Nile Delta. In a similar way the Jordan River links the people, livelihoods and ecosystems of Israel, Jordan and the Occupied Palestinian Territories through a common water source.

Lakes pose specific challenges for cooperation. They are less renewable than rivers, adding to competitive pressures. As “closed” but interdependent ecosystems they are even more sensitive to pollution and water withdrawals than rivers, with implications for the transmission of poor water quality. Other difficulties arise from classification disputes. The five states that share the Caspian cannot agree whether it is a sea or a lake. This legal dispute has implications for the management of the shared resource because of the different rules that apply.

Unlike rivers and lakes, aquifers are invisible. They are also the repositories for more than 90% of the world’s fresh water—and like rivers and lakes they span borders.¹³ Europe alone has more than 100 transboundary aquifers. South America’s Guaraní aquifer is shared by Argentina, Brazil, Paraguay and Uruguay. Highly water-stressed Chad, Egypt, Libya and Sudan share the Nubian Sandstone aquifer. The Great Man-Made River, a system of two major pipelines buried under the sands of the Sahara, transfers water from this fossil aquifer to the Libyan coast to irrigate fields around Benghazi and Tripoli. The Mountain Aquifer that traverses Israel and the Occupied Palestinian Territories is critical to the water security of both sets of users. It is the main source of water for irrigation on the West Bank and an important source of water for Israel.

Cooperation over groundwater confronts governments with some obvious challenges. Measurement problems make it difficult to monitor withdrawal rates for aquifers. Even when governments cooperate, groundwater can be exploited through private pumps, as witnessed by the rapid depletion of water tables in South Asia. The ecological footprint of unregulated extraction of groundwater has implications for people across national boundaries. Excessive extraction by individual users can lead to a “tragedy of the commons”, the overexploitation of a common resource past the point of sustainability.

Within any country the overuse of groundwater by one set of users can undermine the resource base for all. Overextraction of groundwater in the Indian state of Gujarat, for example, has posed a twin threat to agricultural producers by reducing water availability and increasing soil salinity (see chapter 4). Similar problems can emerge across borders. As aquifers sink because of overextraction on one side of a border, the gradual intrusion of sea water and arsenic, nitrates and sulphates, if left unchecked, can make groundwater unusable in neighbouring countries. This is what has happened to large parts of the aquifer in the Gaza Strip, where pollution exacerbates already extreme problems of water scarcity.

Much of what is perceived as “national water” is in fact shared water

The costs of not cooperating

Why is transboundary water governance a human development issue? The answer to that question mirrors the answer to the same question applied at a national level. How any one country navigates through competing interests in the management of scarce water resources has profound implications for poverty, for the distribution of opportunity and for human development within its frontiers. Those implications are no less profound beyond the frontier.

Transmitting tensions down the river

Dependence on external flows is one obvious link between water and human development. Governments and most people think of the water that flows through their countries as a national resource. Legally and constitutionally, that may be accurate. But much of what is perceived as “national water” is in fact shared water.

Table 6.2 Thirty-nine countries receive most of their water from outside their borders

Region	Countries receiving between 50% and 75% of their water from external sources	Countries receiving more than 75% of their water from external sources
Arab States	Iraq, Somalia, Sudan, Syrian Arab Republic	Bahrain, Egypt, Kuwait
East Asia and the Pacific	Cambodia, Viet Nam	
Latin America and the Caribbean	Argentina, Bolivia, Paraguay, Uruguay	
South Asia		Bangladesh, Pakistan
Sub-Saharan Africa	Benin, Chad, Congo, Eritrea, Gambia, Mozambique, Namibia	Botswana, Mauritania, Niger
Central and Eastern Europe and CIS	Azerbaijan, Croatia, Latvia, Slovakia, Ukraine, Uzbekistan	Hungary, Moldova, Romania, Serbia and Montenegro ^a , Turkmenistan
High-income OECD	Luxembourg	Netherlands
Others	Israel	

a. While Serbia and Montenegro separated into independent states in June 2006, disaggregated data on external water resources were not available for the two countries at the time of printing.

Source: FAO 2006.

For some 39 countries, with a population of 800 million people, at least half their water resources originate beyond their borders (table 6.2). Iraq and Syria rely for most of their water on the Tigris and Euphrates Rivers flowing out of Turkey. Bangladesh depends for 91% of its water on flows from India—to irrigate its crops and replenish its aquifers. The country's farmers and agricultural labourers living in the Ganges-Brahmaputra-Meghna Basin are the end users

of water that has traversed thousands of miles and the borders of five countries. Similarly, Egypt depends almost entirely on external water sources delivered through the Nile but originating in Ethiopia.

In all these cases even modest changes in water use upstream can profoundly affect all aspects of human development. Water priorities can look very different from different sides of the border. One-fifth of Turkey's irrigable land is in the eight southeastern provinces where the Tigris and Euphrates Rivers originate. Against this backdrop it is not difficult to appreciate the Southeast Anatolia Project's importance to Turkey. But one in five Syrians also live in the area surrounding the Euphrates, and the two rivers flow past Iraq's two most populous cities, Baghdad and Basra. Managing rival claims in a way that balances national interests with wider responsibilities requires a high order of political leadership.

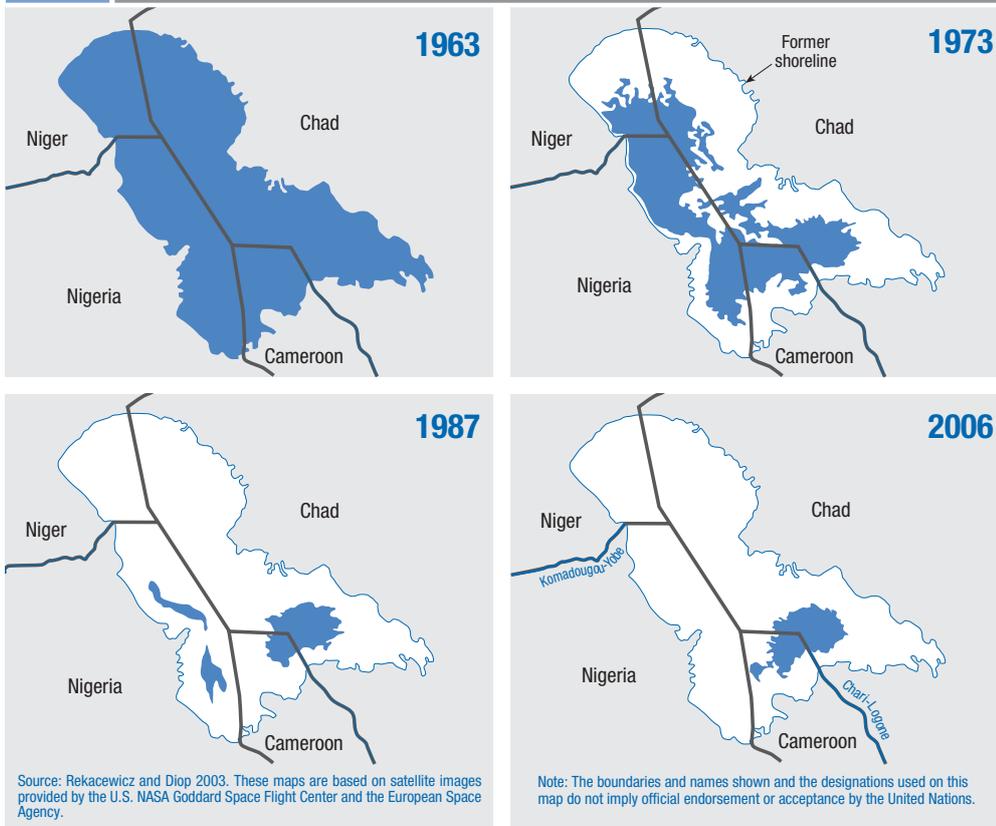
Growing demands on shared rivers have clear spillover effects. When the Ili and Irtysh Rivers that flow from China to Kazakhstan shrink because of diversions to agriculture and industry in China, downstream Kazakhstan sees a threat to its national interests. That threat was partly addressed through an agreement on the Irtysh between the two countries signed in 2001. However, the agreement is weak and does not address the core problem of how to manage annual variations in water flow.

Table 6.3 Countries are withdrawing water faster than it is replenished

Country	Total water withdrawal as a share of total renewable water resources (%)	Total external water resources as a share of total renewable water resources (%)
Kuwait	2,200	100
United Arab Emirates	1,553	0
Saudi Arabia	722	0
Libyan Arab Jamahiriya	711	0
Qatar	547	4
Bahrain	259	97
Yemen	162	0
Oman	138	0
Israel	123	55
Egypt	117	97
Uzbekistan	116	68
Jordan	115	23
Barbados	113	0
Malta	100	0
Turkmenistan	100	94

Source: FAO 2006.

Map 6.3 The vanishing Lake Chad



Competition is not restricted to developing countries. As the Colorado and Rio Grande Rivers have shrivelled in their lower reaches through diversions for industry, agriculture and towns, Mexico receives almost none of their water. This has been a long-running source of tension in negotiations between Mexico and the United States.

Nowhere is the problem of transboundary water management as evident as in countries facing scarcity. Fifteen countries, most in the Middle East, annually consume more than 100% of their total renewable water resources. Groundwater and lake depletion cover the deficit, often placing pressure on transboundary water resources (table 6.3). Some of the most densely populated transboundary basins—in South Asia, parts of Central Asia and the Middle East—also encounter water stress. In these cases greater recourse to shared water to cover deficits can have major ramifications for human

development elsewhere—and for political relations between states.

Shrinking lakes, drying rivers

Mismanagement of international water basins threatens human security in some very direct ways. Shrinking lakes and drying rivers affect livelihoods in agriculture and fisheries, deteriorating water quality has harmful consequences for health, and unpredictable disruptions in water flows can exacerbate the effects of droughts and floods.

Some of the world's most visible environmental disasters bear testimony to the human development costs of noncooperation in transboundary water management. Lake Chad is one such case (map 6.3). Today the lake is one-tenth the size it was 40 years ago. Failed rains and drought have been major factors—but so has human agency.¹⁴ Between 1966 and 1975, when the lake shrank by a third, low rainfall

Some of the world's most visible environmental disasters bear testimony to the human development costs of noncooperation in transboundary water management

was almost entirely to blame. But between 1983 and 1994 irrigation demands quadrupled, rapidly depleting an already shrinking resource and setting in train rapid losses of water.

Weak cooperation among the Lake Chad basin countries offers part of the explanation. Environmental decline and the erosion of livelihoods and productive potential have gone hand in hand. Overfishing is now institutionalized, with scant regard to rules meant to regulate use among Chad, Cameroon, Niger and Nigeria.¹⁵ Badly planned irrigation projects have also contributed to the crisis. Dams on the Hadejia River in Nigeria have threatened downstream communities dependent on fishing, grazing and flood recession farming, and agreements to guarantee water flows have lagged in implementation.¹⁶ The Komadougou-Yobe River system shared by Niger and Nigeria used to contribute 7 cubic kilometres to Lake Chad. Today, with water impounded in reservoirs, the system provides less than half a cubic kilometre, severely affecting the northern part of the lake basin.¹⁷ Elsewhere, dykes built in the late 1970s on the Logone River in Cameroon disrupted small farmers' livelihoods in the downstream wetlands: within two decades cotton yields had fallen by a third and rice yields by three-fourths.¹⁸

The environmental consequences of unsustainable water use can eventually feed back to disrupt infrastructure investments. The Southern Chad Irrigation Project, an ambitious scheme started in 1974, barely accomplished a tenth of its target of irrigating 67,000 hectares in Nigeria. Over time, as water flows in the rivers declined, the drying canals became clogged with *typha australis* plants, the preferred nesting ground of the quelea, a bird that now destroys vast quantities of rice and other foodgrain crops. As the lake shrank competition intensified between nomadic herders and settled farmers, large-scale and small-scale users and upstream and downstream communities. Riparian communities have relocated closer to the water, crossing into areas formerly covered by the lake where national boundaries were unmarked, leading to further territorial disputes.

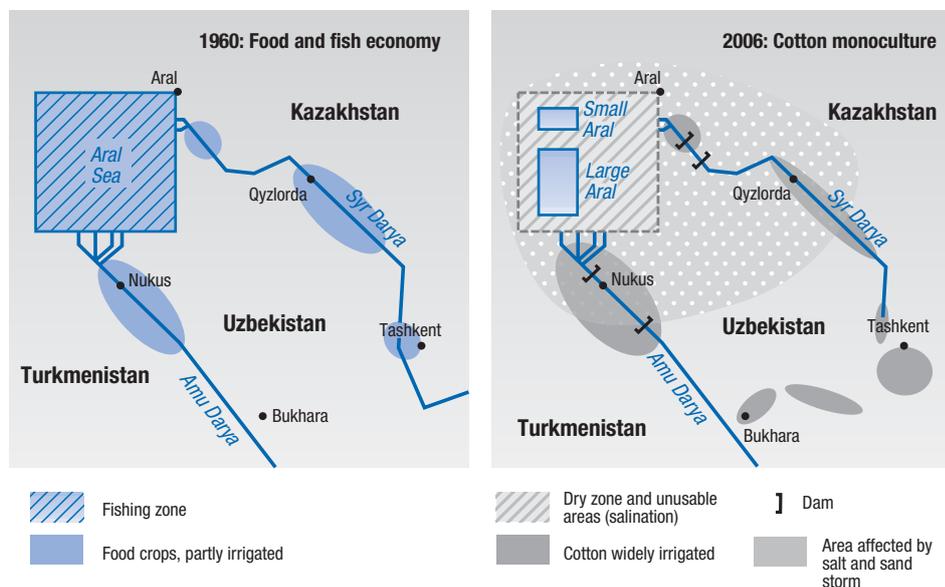
Dwarfing Lake Chad on the scale of human-caused environmental disasters is the Aral Sea. Half a century ago technological ingenuity, ideological zeal and political ambition persuaded Soviet planners that the Syr Darya and the Amu Darya, the great rivers of Central Asia, were being wasted. These rivers were carrying the snowmelt from high mountains into the closed basin of the Aral Sea, then the world's fourth largest lake. Diverting the water into production was seen as a route to greater wealth, with the loss of the Aral Sea a small price to pay. As one contemporary authority put it: "The drying up of the Aral Sea is far more advantageous than preserving it.... Cultivation of cotton alone will pay for the existing Aral Sea [and] the disappearance of the Sea will not affect the region's landscape."¹⁹

The diversion of water to support cotton through an inefficient irrigation system strangled the Aral Sea. By the 1990s it was receiving less than one-tenth of its previous flow—and sometimes no water at all. At the end of the decade it was some 15 metres below its 1960 level and had become two small, highly saline seas separated by a land bridge. The demise of the sea has been a social and environmental disaster (map 6.4).²⁰

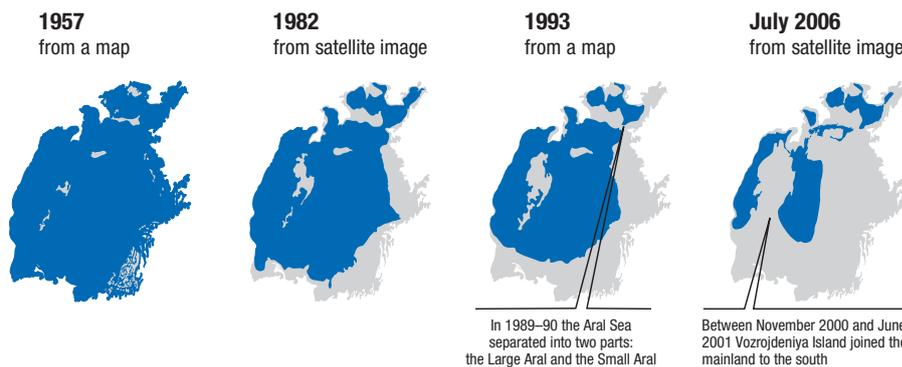
The independence of the Central Asian states has failed to stem the crisis. In fact, their noncooperation has sustained a steady deterioration in indicators of livelihoods, health and well-being. Cotton yields have fallen by a fifth since the early 1990s, but the overuse of water continues. The loss of four-fifths of all fish species has ruined the once vibrant fishing industry in downstream provinces.

The consequences for health have been just as bad. People in Qyzlorda in Kazakhstan, Dashhowuz in Turkmenistan and Karakalpakstan in Uzbekistan receive water contaminated with fertilizers and chemicals, unsuitable for human consumption or agriculture. Infant mortality rates have reached 100 per 1,000 live births in some regions—higher than the average for South Asia. Some 70% of the 1.1 million people in Karakalpakstan suffer from chronic maladies—respiratory illnesses, typhoid fever, hepatitis and oesophageal

Map 6.4 The shrinking Aral Sea: the environmental costs of cotton



Half a century of decline



Note: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.
Source: Scientific Information Center of Interstate Coordination Water Commission; International Fund for Saving the Aral Sea; World Bank; National Aeronautics and Space Administration; United States Department of the Interior 2001; European Space Agency; Rekacewicz 1993.

cancers. The Aral Sea is a stark reminder of how ecosystems can wreak revenge for human folly—rising wealth was a catalyst not for human progress but for a setback in regional human development.

But even here there is an embryonic good news story. Since 2001 in a joint project with the World Bank, Kazakhstan has built the Kok-Aral Dam and a series of dykes and canals to rehabilitate water levels in the northern (and eventually southern) parts of the Aral Sea. The project is already yielding benefits: the northern sea's area has expanded by a third, and water levels have risen from 98 feet to 125.²¹ If progress

continues, prospects for rehabilitating fishing communities and restoring sustainability are promising. If other basin countries also get involved, the scope for basinwide rehabilitation would increase greatly.

Lake Chad and the Aral Sea illustrate in an extreme way what happens when water flows are radically changed. In both cases water shortages have been a central part of the problem. However, water scarcity has been engineered—literally in the Aral Sea—through human intervention and diversion, highlighting the role of policies in fostering unsustainable water use patterns.

Central Asian countries are locked in a web of hydrological interdependence. The Syr Darya and Amu Darya basins link Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan in a water-energy nexus vital to their human development prospects—prospects severely undermined by weak cooperation.

That nexus can best be understood by following the flow of the rivers. The water in the Syr Darya's upper reaches flows rapidly down steep elevations. The huge Toktogul Reservoir in Kyrgyzstan was used in the 1970s to store water and even out flows of irrigation water between dry and wet seasons in Uzbekistan and southern Kazakhstan. In the Soviet era some three-quarters of the water would be released in the summer months and one-quarter in the winter. Electricity generated by releases in the summer months was also exported, with Kyrgyzstan receiving gas in exchange from Kazakhstan and Uzbekistan to help meet winter energy demands.

Since independence this structure of cooperation has broken down. After the liberalization of markets energy trade was put on a commercial footing, with Kyrgyz authorities having to pay world prices for fuel imports. The authorities began to increase winter releases from the Toktogul Reservoir to generate electricity, reducing the flow available for irrigation in Kazakhstan and Uzbekistan in the summer months. During the 1990s summer releases declined by half, leading to acute irrigation water shortages.

Negotiations for sharing water and energy began in 1992 but have achieved little. While downstream and upstream states acknowledge that upstream storage is an economic service and that a barter exchange of water for electricity and fossil fuels has to be developed, it has proven difficult to reach agreement on volumes and prices. In 2003 and 2004 governments were unable to agree even on minimal annual plans.

What has noncooperation meant for national policies? In Uzbekistan it has led to policies to increase self-reliance and reduce dependence on the Toktogul Reservoir. The construction of reservoirs capable of storing 2.5 billion cubic metres of water is part of the strategy. Kazakhstan has also developed a national response to

a regional problem and is exploring the option of building a 3 billion cubic metre reservoir at Koserai.

With abundant water Kyrgyzstan is pursuing self-sufficiency in energy. Authorities are exploring the construction of two new dams and hydropower plants that would generate enough electricity for national self-reliance plus a surplus for export, but the \$2.3 billion price tag is 1.2 times the country's GNI. An alternative is to develop a lower cost thermal power plant to meet winter energy needs. A more economic option, it cuts against the grain of national policies for energy self-sufficiency. The plant would increase Kyrgyz dependence on natural gas supplies from Uzbekistan, which are periodically suspended unilaterally. Weak cooperation in this case is a barrier to enhanced efficiency through trade.

The inability to agree on cooperative solutions has created a "lose-lose" scenario for all parties. It has forced countries into suboptimal strategies for developing alternative infrastructure, with potentially large economic losses. The World Bank estimates that Uzbekistan would gain \$36 million and Kazakhstan \$31 million from operating the Toktogul Reservoir for irrigation instead of power. The incremental costs borne by Kyrgyzstan would amount to \$35 million. The simple cost-benefit story is that the basin as a whole would gain \$32 million from cooperation, with all countries gaining if the downstream states compensate Kyrgyzstan.

Elsewhere, Tajikistan has the potential to become the world's third largest producer of hydropower. But it is held back because lack of cooperation between countries makes international financial institutions reluctant to lend for hydropower projects.

So, if the drive for self-sufficiency is inflicting heavy economic costs across the basin, and if the economic benefits of cooperation are so substantial, what is holding back the Central Asian countries? In a word, politics. Effective transboundary water management requires constructive dialogue and negotiations to identify "win-win" scenarios and to develop the financing and wider cooperative strategies to achieve them. That dialogue has been conspicuously absent in the region.

Source: Greenberg 2006; Micklin 1991, 1992, 2000; Peachey 2004; UNDP 2005a; Weinthal 2002, 2006.

Like lakes, rivers are a source of life. But they can also export pollution to other countries. The dumping of effluents from metal and chemical plants in the Ili and Irtysh Rivers has made the waters almost unfit for human consumption in large parts of Kazakhstan. Similarly, problems have emerged in the Kura-Araks Basin, within the territories of Armenia, Azerbaijan and Georgia. The basin supports 6.2 million people in the densest concentration of municipal and industrial areas in the Trans-

Caucasus region. Underdeveloped legislation at a regional level, fragmented water monitoring and the lack of regional cooperation mechanisms—none of which can be resolved independently—make water pollution a severe problem for all three countries.²²

Disaster can be a catalyst for cooperation. Ukraine occupies more than half the Dnieper Basin, which it shares with Belarus and Russia. Rapid industrialization has brought the third largest river in Europe under intense pressure:

less than a fifth of the water flow entering Ukraine now reaches the Black Sea. Pollution is endemic, with excessive use of fertilizers, unregulated waste dumping from uranium mining and wastewater all contributing. It was not until the Chernobyl disaster, which led to radioactive caesium deposits in reservoirs and increased risk of exposure to radioactivity all the way down to the Black Sea, that governments responded to the challenge of improving river quality.²³ In both the Dnieper and Kura-Araks Basins steps have been taken to promote cooperation, starting with environmental diagnoses and action programmes, but rehabilitating the rivers will take a long time.

The timing of water flows is another transboundary issue for human development. Secure livelihoods depend on a predictable supply of water. The use of water in one country can affect the timing of delivery for downstream users, even if the volume of water is unchanged. Upstream hydropower is an example. In Central Asia Kyrgyzstan can control the timing and availability of water downstream, while Uzbekistan and Kazakhstan depend on releases for irrigation. The breakdown of an old Soviet system

for transferring gas from Kazakhstan and Uzbekistan led Kyrgyzstan to pursue self-sufficiency in winter electricity generation. To generate hydropower it now restricts the flow of water from the Toktogul Reservoir in the summer months but causes floods downstream in the winter—a central concern in regional water negotiations (box 6.1).

Transboundary water management can influence water availability in other ways. Israel, Jordan and the Occupied Palestinian Territories are located in one of the world's most water-scarce areas—and share a large proportion of their water. The Palestinian population relies almost totally on transboundary water, most of it shared with Israel (box 6.2). But the common resources are unequally shared. The Palestinian population is half the size of Israel's, but consumes only 10%–15% as much water. On the West Bank Israeli settlers consume an average of 620 cubic metres per person annually and Palestinians less than 100 cubic metres. Water shortages in the Occupied Palestinian Territories, a major constraint on agricultural development and livelihoods, are also a source of perceived injustice because current water use rules lock in unequal access to shared aquifers.

The starting point for any consideration of the scope for cooperation has to be a recognition that sovereign countries have obvious, rational and legitimate agendas for deriving maximum benefits from water

The case for cooperation

Shared water always has potential for competition. The English language reflects this: the word *rival* comes from the Latin *rivalis*, meaning one using the same river as another. Riparian countries are often rivals for the water they share. Considering the importance of water to national development, each country will have its own national agenda for using an international river. The starting point for any consideration of the scope for cooperation has to be a recognition that sovereign countries have obvious, rational and legitimate agendas for deriving maximum benefits from water.

The rules of the game

Within countries water use is governed through institutions, laws and norms developed through political processes of varying degrees of transparency. The institutions, laws and norms for governing water that crosses borders are less well defined.

One of the most important facets of transboundary water management is state sovereignty. In disputes over shared rivers with Mexico the United States adopted the Harmon Doctrine in 1895. An absolutist

Nowhere are the problems of water governance as starkly demonstrated as in the Occupied Palestinian Territories. Palestinians experience one of the highest levels of water scarcity in the world. Physical availability and political governance of shared water both contribute to scarcity.

On a per capita basis people living in the Occupied Palestinian Territories have access to 320 cubic metres of water annually, one of the lowest levels of water availability in the world and well below the threshold for absolute scarcity. The unequal distribution of water from aquifers shared with Israel, a reflection of asymmetric power relations in water management, is part of the problem. With rapid population growth declining water availability is a tightening constraint on agriculture and human use.

Unequal sharing is reflected in very large discrepancies in water use between Israelis and Palestinians. The Israeli population is not quite twice the size of the Palestinian population, but its total water use is seven and a half times higher (figure 1). In the West Bank Israeli settlers use far more water per capita than Palestinians and more than Israelis in Israel (figure 2): nearly nine times as much water per person as Palestinians. By any standards, these are large disparities.

What explains the inequalities? Palestinians do not have established rights to the waters of the Jordan River—the main surface water source. This means that nearly all of the water needs in the Occupied Palestinian Territories are met by groundwater aquifers. The rules governing extraction from these aquifers have a major influence on access to water.

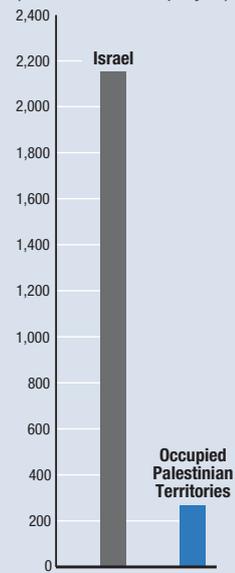
Management of the western and coastal aquifers demonstrates the problem. Part of the Jordan Basin, the western aquifer is the single most important source of renewable water for the Occupied Palestinian Territories. Nearly three-quarters of the aquifer is recharged within the West Bank and flows from the West Bank towards the coast of Israel. Much of this water is unused by the Palestinians. One reason: Israeli representatives on the Joint Water Committee stringently regulate the quantity and depth of wells operated by Palestinians. Less stringent rules are applied to Israeli settlers, enabling them to sink deeper wells. With only 13% of all wells in the West Bank settlers account for about 53% of groundwater extraction. Water not used in the Occupied Palestinian Territories eventually flows under Israeli territory and is extracted by wells on the Israeli side (see map).

There are similar problems with the waters of the Coastal Basin. These barely reach the Gaza Strip because of high rates of extraction on the Israeli side. The result: extraction rates from shallow aquifers within the Gaza Strip far exceed the recharge rates, leading to increasing salinization of water resources.

Limitations on access to water are holding back development of Palestinian agriculture. Although the sector represents a shrinking share of the Palestinian economy—estimated at roughly 15% for income and employment in 2002—it is nonetheless crucial to the livelihoods of some of the poorest people. Irrigation

Figure 1 Water use is unequal between Israel and the Occupied Palestinian Territories

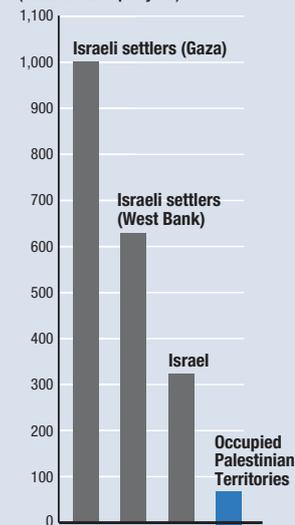
Total consumption, 2005
(million cubic metres per year)



Source: Jägerskog and Phillips 2006.

Figure 2 Water is scarcer for some than for others

Per capita consumption, 2005
(cubic metres per year)



Note: Moving population-weighted average; Israeli settlements in the Gaza Strip were evacuated in August and September 2005.

Source: Jägerskog and Phillips 2006.

is currently underdeveloped, with less than a third of potential area covered because of the lack of water.

The underdevelopment of water resources means that many Palestinians depend on water deliveries from Israeli companies. This is a source of vulnerability and uncertainty because supplies are frequently interrupted during periods of tension.

The construction of the controversial Separation Wall threatens to exacerbate water insecurity. Construction of the wall has resulted in the loss of some Palestinian wells and the separation of farmers from their fields, especially in highly productive rainfed areas around the Bethlehem, Jenin, Nablus, Qalqilya, Ramallah and Tulkarem governorates.

Conditions in the Occupied Palestinian Territories stand in contrast to the more cooperative arrangements that have emerged elsewhere. Since the peace agreement of 1994 Israel and Jordan have collaborated to build water storage facilities in Lake Tiberias, which has improved water allocation for Jordanian farmers. The institutional structure has also helped in arbitrating disputes arising over seasonal and annual variations in water flow, even though this was not originally covered by the agreement. Elsewhere, the Middle East Desalination Research Centre, based in Muscat, Oman, has been successfully promoting multilateral research into effective desalination techniques for more than a decade. Its council has representatives from the European Commission, Israel, Japan, Jordan, the Republic of Korea, the Netherlands, the Palestinian National Authority and the United States.

Perhaps more than in any other setting, water security in relations between Israel and the Occupied Palestinian Territories is bound up in wider problems of conflict and perceptions of national security. Yet water is also a powerful symbol of the wider system of hydrological interdependence that links all parties. Managing that interdependence to enhance equity could do much for human security.

Source: Elmusa 1996; Feitelson 2002; Jägerskog and Phillips 2006; MEDRC 2005; Nicol, Ariyabandu and Mtisi 2006; Phillips and others 2004; Rinat 2005; SUSMAQ 2004; SIWI, Tropp and Jägerskog 2006; Weinthal and others 2005.

Managing the aquifers – Palestinians and Israelis share groundwater unequally



sovereignty model, the Harmon Doctrine advocated that, in the absence of contrary legislation, states should be free to use the water resources in their jurisdiction without regard to effects beyond their borders. Variants of this approach survive in the national legislation of many countries. The 2001 Parliamentary Law in Kazakhstan declares that

all water resources originating within its territory are its property.

The essentially competing principle of absolute territorial integrity suggests that downstream riparians have the right to receive the natural flow of a river from upstream riparians. Downstream states sometimes cite the allied principle of “prior appropriation”, or the idea

One helpful framework for thinking about transboundary water governance identifies four layers of potential gains from cooperation: benefits to the river, benefits from the river, benefits because of the river and benefits beyond the river

that past use establishes a right to future use of the same amount of water, to contest absolute sovereignty approaches.²⁴

In practice most governments accept that absolutist approaches to water rights are an unhelpful guide to policy design. After decades of consideration principles for sharing water were codified in the 1997 UN Convention for the Non-Navigational Use of Shared Watercourses, building on the 1966 Helsinki Rules. The core principles are “equitable and reasonable utilisation”, “no significant harm” and “prior notification of works”. The broad idea is that governance of international watercourses should be developed by taking into account the effects of use on other countries, the availability of alternative water sources, the size of the population affected, the social and economic needs of the watercourse states concerned, and the conservation, protection and development of the watercourse itself.

The application of these principles is fraught with difficulty, partly for the obvious reason that they do not provide tools for resolving competing claims. Upstream users can cite social and economic needs as grounds for constructing dams for hydropower, for example. Downstream states can oppose these measures, citing their own social and economic needs and existing use. The difficulty associated with competing principles and the concern over national sovereignty help explain why only 14 countries are party to the UN convention. Nor is there a practical enforcement mechanism—in 55 years the International Court of Justice has decided only one case on international rivers.

Yet for all its limitations the 1997 convention does set out principles central to human development. It provides a framework for putting people at the centre of transboundary water governance. Equally important is the 1992 UN Economic Commission for Europe Convention on Protection and Use of Transboundary Watercourses and International Lakes (ECPUTW). This convention focuses more on water quality, explicitly considering the river basin as a single ecological unit. The 1992 convention also emphasizes member states’ responsibilities based on current water needs rather than historical water

use—an important human development principle. The ECPUTW is already in force and has the potential to become global if 23 countries that are not members of the Economic Commission for Europe sign up: 4 have already done so. Yet for all the intuitive appeal of both conventions the political challenge is to operationalize these frameworks amid the real world problems of water governance.

On the river and beyond the river

The case for cooperation, along with the mechanisms for achieving it, will inevitably vary across international shared water systems. At its most basic level cooperation implies acting in a manner that minimizes the adverse consequences of competing claims while maximizing the potential benefits of shared solutions. Taking the principle that states seek to pursue rational and legitimate self-interest as a starting point, cooperation will occur only if the anticipated benefits exceed the costs of noncooperation. Enlightened self-interest can help identify and broaden the range of potential benefits.

One helpful framework for thinking about transboundary water governance has identified four layers of potential gains from cooperation:²⁵

- Benefits *to* the river.
- Benefits *from* the river.
- Benefits *because* of the river.
- Benefits *beyond* the river.

Benefits to the river

Conserving, protecting and developing rivers can generate benefits for all users. In Europe the Rhine Action Plan, launched in 1987, marks the latest phase in cooperation to enhance the quality of the river in the interests of all users. The plan marks the culmination of more than half a century of incremental change, with France, Germany, the Netherlands and Switzerland gradually developing a response commensurate with the scale of the threat to their shared interests (box 6.3).

In poorer regions of the world maintaining the integrity of river systems can generate profound benefits for livelihoods. One illustration

Rivers connect people and livelihoods across national borders. Clean rivers are a public good—polluted rivers are vehicles for the transfer of public bads across borders. European history shows the benefits of investing in rivers as regional public goods.

The Rhine. The Rhine River, one of Europe's great river systems, flows down from the Swiss Alps and tracks through eastern France into Germany's Ruhr Valley and the Netherlands. Even in the early 19th century the river was a byword for pollution. In 1828 a visit to the city of Cologne prompted Samuel Coleridge to write:

The river Rhine, it is well known

Doth wash your city of Cologne

But tell me, Nymphs, what power divine

Shall henceforth wash the river Rhine?

No power, divine or terrestrial, washed the river. As industrialization developed, the Rhine became a vast sink for pollution. It carried off the wastes from Switzerland's chemical industries, France's potash industry and Germany's metallurgical and coal industries, transferring them to the Netherlands. Between 1900 and 1977 concentrations of chromium, copper, nickel and zinc rose to toxic levels. Fish almost disappeared from the middle and upper Rhine by the 1950s. Apart from poisoning the river, pollution from French and German industry was threatening drinking water and the flower industry in the Netherlands.

The clean-up began after the Second World War. In 1950 France, Germany, Luxembourg, the Netherlands and Switzerland established the International Commission for the Protection of the Rhine (ICPR). It focussed initially on research and data collection, but in the mid-1970s two agreements were concluded on chemical pollution and chlorides. These were aimed at reducing pollution in France and Germany, though early cooperation was difficult. Germany, the Netherlands and Switzerland agreed to contribute 70% of the costs of reducing chloride emissions in France. But facing strong domestic opposition, the French government refused to place the convention before Parliament for ratification.

An environmental crisis in late 1986—a fire in a Swiss chemical plant—spurred the next round of cooperation. By May 1987 the Rhine Action Plan had been developed. Targets were set for deep cuts in pollution. When floods occurred in 1993 ICPR activities expanded to include flood protection. The following year a new Rhine Treaty was signed, and in 2001 the 2020 Programme for Sustainable Development of the Rhine was adopted.

The ICPR is now an effective intergovernmental body to which member states must report their actions. It has a plenary assembly, secretariat and technical bodies—and considerable political

Source: Barraqué and Mostert 2006.

authority through a ministers conference, which can make politically binding decisions. Nongovernmental organizations have observer status, which facilitates public participation. Such cooperative structures and institutions take time to develop, and they work best with high-level political leadership.

The Danube. Perhaps more than any other river the Danube reflects the turbulent history of 20th century Europe. On the eve of the First World War the major basin country was the Austro-Hungarian Empire. At the end of the Second World War most of the Danube riparians became part of the Soviet bloc. With the breakups of Czechoslovakia, the Soviet Union and Yugoslavia the Danube became the most internationalized basin in the world.

The end of the cold war and the later accession of several basin countries to the European Union made possible a basinwide approach to international cooperation. In February 1991 all the basin states agreed to develop the Convention on the Protection and Management of the River. In 1994 the Danube Convention was signed, and the International Commission for the Protection of the Danube River (ICPDR) was established, coming into force in October 1998. Serbia and Montenegro acceded to the treaty in 2002, Bosnia and Herzegovina in 2004.

The institutional foundation for the ICPDR is a conference of all involved countries, a plenary commission, nine expert and working groups and a permanent secretariat in Vienna. The commission's 11 observers include several professional organizations, the Danube Environment Forum, the Worldwide Fund for Nature and the International Association of Water Supply Companies in the Danube River Catchment Area.

Since 2001, when the Danube-Black Sea Strategic Partnership for Nutrient Reduction commenced, the Global Environment Facility's investment of about \$100 million has leveraged nearly \$500 million in cofinance with additional investments in nutrient reduction by the European Union, the European Bank for Reconstruction and Development and others totaling \$3.3 billion. The Black Sea and Danube River ecosystems are already showing signs of recovery from the serious eutrophication of the 1970s and 1980s. Oxygen depletion has been almost nonexistent in recent years. And the diversity of species has roughly doubled from 1980 levels. The Black Sea ecosystem is well on its way to conditions observed during the 1960s.

The Danube shows how deep institutional cooperation can unlock a wide range of mutually reinforcing benefits across borders. As governments and the public in riparian countries have seen the benefits of cooperation emerging, so the authority and legitimacy of these institutions have strengthened. But successful cooperation has taken large investments of both financial and political capital.

is the prevention or reversal of problems such as the degradation of upstream watersheds and the mining of groundwater that expose downstream users to risks of floods or water

shortages. The 2000 and 2001 flooding of the Limpopo and Save Rivers had harsh impacts on poor people living in the most vulnerable parts of the floodplains in Mozambique. Soil

Increasing the benefits from the river and decreasing the costs arising because of the river can unlock a wider potential for human development, economic growth and regional cooperation

erosion, the loss of tree cover on slopes and excessive water use upstream contributed to the severity of the floods. Cooperation between states to address these problems reflects the perception of shared risk and mutual benefits offered by river systems.

Benefits from the river

The fact that water is a finite resource gives rise to a general perception that sharing is a zero sum game. That perception is flawed in important respects. The management of water in river basins can be developed to expand the size of the overall benefit, with water use optimized to increase irrigated land, power generation and environmental benefits.

Cooperation at the basin level can promote efficient techniques for water storage and distribution, expanding irrigation acreage. The Indus Waters Treaty of 1960 was the precursor to the massive expansion of irrigation works in India, which in turn played an important role in the green revolution. On the Senegal River Mali, Mauritania and Senegal are cooperating to regulate river flows and generate hydropower through co-owned infrastructure. In Southern Africa Lesotho and South Africa are cooperating in the construction of infrastructure on the Orange River in the Lesotho Highlands Project, providing South Africa with low-cost water and Lesotho with a flow of finance to maintain watersheds.²⁶ In South Asia India financed the Tala hydroelectric plant in Bhutan, gaining a source of energy while Bhutan gained guaranteed access to the Indian energy market.

Brazil and Paraguay provide an example of the potential benefits to be unlocked through trade and cooperation. The Itaipu Accord of 1973 ended a 100-year long boundary dispute with an agreement to jointly build the giant Guairá-Itaipu hydroelectric complex. Financed largely by Brazilian public investment, the Itaipu Dam in the Paraná-La Plata Basin has 18 generators with a capacity of 700 megawatts each, making it one of the largest hydropower plants in the world. Managed through Itaipu Binacional, a company jointly owned by the two governments, the plant meets almost all of

Paraguay's energy needs, maintains an industry that is now the single largest source of foreign exchange earnings and accounts for a quarter of Brazil's electricity consumption.²⁷ Both countries have gained through cooperation. The contrast with Central Asia, where a failure to cooperate has generated large losses, is striking.

Benefits because of the river

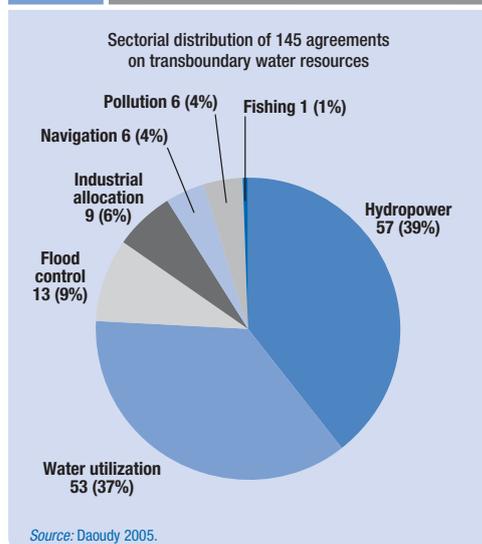
Gains from cooperation can include the costs averted by reducing tensions and disputes between neighbours. Strained interstate relations linked to water management can inhibit regional cooperation across a broad front, including trade, transport, telecommunications and labour markets. As two commentators put it, "in some international river basins, little flows between the basin countries except the river itself."²⁸ It is always difficult to distinguish the effects of water governance from the wider dynamics shaping relations between states, but in some cases the costs of noncooperation can be high, especially in environments marked by overlapping concerns over water scarcity and national security. Obvious examples include the Euphrates, Indus and Jordan Basins. Benefits from cooperation because of the river are inherently difficult to quantify, but the human and financial costs of noncooperation can be very real.

Benefits beyond the river

Increasing the benefits from the river and decreasing the costs arising because of the river can unlock a wider potential for human development, economic growth and regional cooperation. To some degree this is happening through river basin initiatives.

Cooperative approaches to river systems can also generate less tangible political benefits. The Nile Basin Initiative links Egypt politically and economically to poor countries in Sub-Saharan Africa. These links have the potential to create spillover benefits. For example, the political standing that Egypt has acquired through the Nile Basin Initiative could reinforce its emergence as a partner and champion of African interests at the World Trade Organization. Apart from the economic and security benefits of cooperation, the international standing of

Figure 6.2 Beyond quantity—water agreements cover many areas



between Israel and Jordan began under UN auspices in the early 1950s, when the countries were formally at war. In 1994 they created a Joint Water Committee for coordination, sharing and dispute settlement—an arrangement that has survived some acute tensions.

One clear message from the record is that even the most hostile enemies have a capacity for cooperation on water. Most governments recognize that violence over water is seldom a strategically workable or economically viable option. The institutions that they create to avert conflict have shown extraordinary resilience. The considerable time taken to negotiate the establishment of these institutions—10 years for the Indus Treaty, 20 years for the Nile Basin Initiative, 40 years for the Jordan agreement—bears testimony to the sensitivity of the issues.

If conflict is the exception to the rule, how do countries cooperate? Extensive analysis of 145 international treaties provides some insights (figure 6.2). Perhaps surprisingly, in only about a third of cases does cooperation include volumetric allocations. Hydroelectricity, flood and pollution control and navigation are more common.³⁰ In recent years benefit-sharing has received greater emphasis, perhaps because the requirements for negotiating volumetric allocations are so challenging. And from a future water security perspective, there are problems in not dealing with volumetric flow.

One of the most serious is that it creates the potential for conflict over the adjustment of claims on rivers and other shared water resources when availability declines, whether from seasonal factors or long-run depletion. The 1994 Israel-Jordan accord allows Jordan to store winter runoff in Israel's Lake Tiberias. The accord also allows Israel to lease from Jordan a specified number of wells to draw water for agricultural land. As part of the agreement a Joint Water Committee was created to manage shared resources. But the accord did not detail what would happen to the prescribed allocations in a drought. In early 1999 the worst drought on record led to tensions as water deliveries to Jordan fell. But the agreement itself remained intact—an outcome that demonstrated the commitment of both sides to cooperate.

While conflict is rare and cooperation common, most cooperation is quite shallow. Governments tend to negotiate agreements on very specific benefit-sharing projects, such as hydropower or information sharing. In many cases external factors served to push governments into minimalist cooperation strategies. A 1999 EU ban on Lake Victoria fish, with severe implications for foreign exchange earnings, persuaded the basin countries to begin regulating commercial fishing through the Lake Victoria Fisheries Organization. But the response was designed principally to restore commercial revenues, rather than to deal with the wider impacts of pollution and overfishing on livelihoods.

To date, there has been little in-depth cooperation to achieve the wider ranging human development goals set out in the Helsinki Rules or the 1997 UN Convention for the Non-Navigable Use of Shared Watercourses. And the geographical scope of cooperation is also limited: of 263 international water basins, 157 have no cooperative framework at all.³¹

Where such frameworks do exist they tend to be bilateral rather than multilateral. Of the 106 basins with water institutions about two-thirds have three or more riparian states, yet fewer than a fifth of the accompanying agreements are multilateral. Often even multilateral basins are managed through sets of bilateral agreements. In the Jordan basin, for example,

agreements exist between Syria and Jordan, Jordan and Israel, and Israel and the Occupied Palestinian Territories.

What are the obstacles to deeper cooperation? Four stand out:

- *Competing claims and perceived national sovereignty imperatives.* Many countries remain deeply divided in the way they view shared water. India sees the flows of the Brahmaputra and Ganges Rivers as a national resource. Bangladesh sees the same water as a resource that it has claim to on the grounds of prior use patterns and needs. The differences are more than doctrinal: they relate directly to claims that both countries see as legitimate and necessary to their national development strategies. Elsewhere, the reality of water sharing has little impact on national strategies. The countries of Central Asia are heavily dependent on shared water. Since independence each country in the region has developed national economic plans that will draw on the same water resources. Yet national plans, drawn up outside of any coherent regional strategy for resource-sharing, take no account of real water availability. Were the plans themselves to be aggregated, the combined demands for irrigation and power generation would reflect an unsustainable resource use path. An obvious danger is that rival national plans could become a source of tension and a barrier to cooperation on shared ecological problems, such as restoration of the Aral Sea.
- *Weak political leadership.* Political leaders are accountable to domestic constituencies, not to basin-sharing communities and the governments that represent them. In countries where water figures prominently on the political agenda, domestic factors can create disincentives for water sharing and

associated benefits: more equitable water sharing might be good for human development in a basin, but it might be a vote loser at home. There are also time-horizon problems: the domestic benefits of sharing are unlikely to come onstream during the term of office of any one government. Incentives for cooperation are strengthened when leaders can see some immediate political gain (for example, side payments to finance irrigation projects in Pakistan) or when there is a crisis (such as the chemical spill in the Rhine).

- *Asymmetries of power.* Rivers flow through countries marked by large disparities in wealth, power and negotiating capacity. It would be unrealistic to assume that these disparities do not shape the willingness to cooperate, negotiate and share benefits. There is also stark asymmetry across many shared water sources, in some cases with one overwhelmingly dominant actor: Egypt in the Nile Basin, India in the Ganges catchment area, Israel on the Jordan River, South Africa in the Incomati Basin and Turkey in the Tigris-Euphrates watershed are all examples. Unequal power relationships can have the effect of undermining trust.
- *Nonparticipation in basin initiatives.* Perceptions of the benefits of participating in multilateral basinwide initiatives are influenced by membership. That China is not a party to the Mekong River Commission is seen by some parties as a source of potential weakness of the commission. Downstream countries such as Cambodia and Viet Nam see upstream dams constructed by China as a threat to the “flood pulse” of the river and the livelihoods it sustains. The Mekong Commission is not a useful forum for negotiating on the problem because of China’s absence.

More equitable water sharing might be good for human development in a basin, but it might be a vote loser at home

River basin cooperation for human development

More governments now recognize that the realities of hydrological independence require basinwide and broader multilateral governance frameworks

Each river system, from its headwaters in the forest to its mouth on the coast, is a single unit and should be treated as such.

—Theodore Roosevelt³²

of any part of these systems depends on the integrity of the whole. So the logical step is to manage water at the basin level, even when it crosses borders.

Given the acute political sensitivities surrounding water, it would be unrealistic to assume that a new internationalist ethos will transform water governance in the years ahead. Perceptions of national interest will continue to weigh heavily. But national interest can be pursued in more—or less—enlightened terms. As more governments now recognize, the realities of hydrological independence require basinwide and broader multilateral governance frameworks. Recognition of two principles should guide future efforts in transboundary water management.

- *Human security in shared water management is part of national security.* Water can be a national security concern, especially for countries that rely on cross-border sources for a significant proportion of their water needs. But human security provides a powerful rationale for new approaches to governance. Shared water management can reduce the unpredictable risks and vulnerabilities created by dependence on a shared water resource. Cooperation offers a route to greater predictability and reduced risks and vulnerabilities, with wide-ranging benefits for livelihoods, the environment and the economy. Moreover, shared water governance can open up a wider set of benefits to enhance human security through expanded opportunities for cross-border cooperation.
- *Basins matter as much as borders.* Most governments now embrace the principle of integrated water resources management and recognize the need for planning strategies that cover all uses. However, integrated planning cannot stop at the border. River and lake basins are ecosystems that stretch across national frontiers, and the integrity

Basin-level cooperation

Basin-level cooperation is now well established in many regions. The range of cooperation stretches from coordination (such as sharing information) to collaboration (developing adaptable national plans) to joint action (which includes joint ownership of infrastructure assets). In some cases cooperation has resulted in the establishment of standing institutional structures through which governments can interact regularly (box 6.4).

One way of thinking about cooperation is as the exchange of baskets of benefits that add to the aggregate welfare of both sides. This approach goes beyond bargaining over volumetric allocations to identifying multiple benefits for all sides. An example is the dialogue between India and Nepal on the Bagmati, Gandak and Kosi Rivers (all tributaries of the Ganges). The treaties that emerged included provisions for a variety of water-related projects, including irrigation, hydropower, navigation, fishing and even afforestation, with India supporting the planting of trees in Nepal to contain downstream sedimentation. Although the treaties have been amended to take account of Nepalese concerns, their broad structures are good examples of how large baskets of benefits can be part of creative solutions.

Cooperative management powerfully demonstrates the potential to open up benefits beyond the river. More than 40% of transboundary water treaties include provisions that go beyond narrowly defined shared water management.³³ Some examples:

- *Financial resource flows.* Several agreements include investment provisions, such as Thailand's financing of a hydroelectric project

Cooperative institutions exist in numerous river basins, although their impact has varied greatly. The examples here illustrate that governments can come together in many different contexts to manage shared water resources. The challenge is to strengthen and deepen the sense of shared interests that underpins cooperation and to develop effective, transparent and accountable institutions to meet the challenges of the future.

Mekong River Commission. The Mekong River Commission was formed in 1995 as an intergovernmental agency of the four countries of the lower Mekong Basin: Cambodia, Lao PDR, Thailand and Viet Nam. The commission replaced the Mekong Committee (1957–76) and the Interim Mekong Committee (1978–92), setting a new stage for cooperation in the Mekong Basin. It has three permanent bodies: the secretariat, the technical joint committee and the ministerial-level council. National Mekong committees have been established in each member country to coordinate national ministries and line agencies and to liaise with the commission secretariat. Since 2002 selected civil society representatives have also been invited to attend joint committee and council meetings.

Nile Basin Initiative. The Nile Basin Initiative has a similar structure: a council of ministers, a technical advisory committee and a secretariat. But the initiative is much more recent and has little experience in joint programmes. Until recently, water issues were limited to volumetric allocations between Egypt and Sudan. But the initiative now focuses on a range of benefits that can be reaped across the entire basin, from hydropower to flood control to environmental sustainability, and a Strategic Action Programme is under way to identify cooperative projects. Some donors are trying to promote the participation of civil society groups through the Nile International Discourse Desk.

Senegal River Development Organization. The Senegal River Basin has witnessed a steady progression in integrated water management among Mali, Mauritania and Senegal. Guinea has joined recently. Cooperation started soon after the riparians gained independence, when in 1964 the river was declared an international

waterway. By 1972 the Senegal River Development Organization had been established with a conference of heads of state, a council of ministers, a high commissioner, three advisory bodies and respective national offices. Strong political leadership ensured that funds were raised in time to finance the construction of two jointly owned dams, which were managed by separate companies.

Alongside the infrastructure and institutional development, plans for basinwide integrated water resources management schemes have been scaled up. A Permanent Water Commission meets thrice a year to determine the best use of water from the two dams. The dams supply electricity to all three countries and irrigation water to farmers in areas where there is greatest fluctuation of rainfall. Efforts are also made to control floods in the upper valley and delta regions. Programmes have begun to address adverse environmental impacts such as the spread of water hyacinth and increasing soil salinity.

The Lesotho Highlands Water Project in the Orange River Basin. The 1986 arrangement transfers water from the Senqu River in water-rich Lesotho to the Vaal River in South Africa. Lesotho receives hydropower and royalties in return. In line with integrated water resources management principles the water project is also linked to the Orange-Senqu River Basin Commission, established in 2000.

Limpopo River Basin Commission. The first multilateral agreement between Botswana, Mozambique, South Africa and Zimbabwe created the Limpopo Basin Permanent Technical Committee in 1986 to advise on improving water quantity and quality. But political tensions hampered close cooperation. After the end of apartheid negotiations were renewed, starting with the 1997 permanent commission for cooperation between Botswana and South Africa. In 2003 a Limpopo Watercourse Commission was created, with the objective of implementing the Southern African Development Committee protocol on water. That same year the Limpopo River Basin Commission was established to manage the entire basin holistically.

Source: Amaaral and Sommerhalder 2004; Lindemann 2005.

in Lao PDR, India's contribution to Pakistan for irrigation infrastructure under the Indus Waters Treaty and South Africa's role in developing water resources in the Lesotho highlands.

- *Trade in energy resources.* The creation of markets in hydropower can create benefits for importers and exporters. Illustrations include Brazil's purchasing of electricity from Paraguay's Itaipu Dam in the Paraná-La Plata Basin and India's purchasing of hydropower from the Tala Dam in Bhutan.
- *Data sharing.* Information is a critical part of integrated water resources management at the basin level. The Mekong Committee's first five-year plan consisted almost entirely of data-gathering projects aimed at creating the conditions for more effective basin management.
- *Political linkages as part of general peace talks.* Agreements on water can contribute to wider political negotiations. The Israel-Jordan water accord was part of the peace agreement between the two countries in 1994. A final political settlement between

Table 6.4 Potential benefits in the Kagera subbasin

Geographic extent of benefit	Benefit
Region	<ul style="list-style-type: none"> • Stability and "peace dividend" • Economic integration (East African Community, Burundi, Rwanda and the Democratic Republic of Congo) • Regional infrastructure assets
Riparian countries	<ul style="list-style-type: none"> • Sediment control • Watershed management • Energy supply and rural electrification • Irrigation and agribusiness • River regulation • Biodiversity conservation • Commercial development • Private sector development
Downstream riparians	<ul style="list-style-type: none"> • Water quality control • Water hyacinth control • Sediment reduction • Regional stability • Growing trade markets

Source: Jägerskog and Phillips 2006; World Bank 2005f.

Israel and the Occupied Palestinian Territories would also need to include an agreement on their shared water resources.

Some river basin initiatives could generate significant benefits for human development across a large group of countries. Consider the Nile Basin Initiative. Five of the 11 countries that share the Nile are among the poorest countries in the world. All 11 see Nile resources as central to their survival. In a noncooperative environment this could be a source of conflict and insecurity. But cooperative management helps in sharing benefits throughout the basin and averting risks. Cooperation can identify pathways to reduce losses due to floods, tap hydropower and irrigation potential and conserve an ecosystem stretching from Lake Victoria to the Mediterranean.

Looking beyond national borders to the sub-basin level offers a wider lens to view options for cooperation. The Kagera subbasin in the Nile system, shared by Burundi, Rwanda, Tanzania and Uganda, is the main contributor of water to Lake Victoria and the source of the White Nile.³⁴ The basin's alluvial deposits, swamps, forests and fauna constitute an ecosystem that has come under pressure from increasingly dense human settlements. Attempts at institutional cooperation through the 1970s and 1980s suffered from severe financial and capacity con-

straints. In its first five years the Kagera Basin Organization raised only a tenth of its budgeted finances.³⁵ By the 1990s civil wars in Burundi and Rwanda rendered the cooperative process almost defunct. Only recently, under the aegis of the Nile Basin Initiative and the Nile Equatorial Lakes Subsidiary Action Programme, have a number of more sustainable projects been launched. If successful, Kagera could become a model for more integrated cooperation throughout the Nile Basin (table 6.4).

Southern Africa provides another striking example of regional cooperation. Water is a major area of cooperation and integration in the Southern African Development Community. During the apartheid era few countries in the region were willing to cooperate with South Africa. Since the end of apartheid shared water management has been on an integral part of regional cooperation, with political leaders playing an important role in defining new rules and developing new institutions. The high level of cooperation reflects the fact that all countries in the region stand to gain together or lose together (box 6.5). Taking a cue from this initiative, the African Union adopted the Sirte Declaration in February 2005, encouraging member states to enter into appropriate regional protocols to promote integrated water management and sustainable development of agriculture in Africa.

The basket of benefits approach to cooperation is more than an analytical framework. It can help countries look beyond narrowly focussed goals of self-reliance, and it presents political leaders with options that they can "sell" to their constituencies. It allows smaller countries to negotiate with a stronger hand, offering concessions but also getting a range of benefits in return. It can also help generate financial resource flows, expand the scope of cooperation and open up new linkages beyond water. Towards these ends, however, strong institutions are needed.

Weak institutional structures for water management

International water institutions have multiple uses. They can serve as neutral forums for discussion, undertake fact-finding missions and

Southern Africa has 15 major international rivers. In the decade since the end of apartheid South Africa has used water to support regional integration. Improved political relations are a factor: past attempts to cooperate on the Zambezi River were unsuccessful without South Africa's involvement. So is the size of the South African economy, which drives the economic incentives for cooperation in the region. The process of forming basin partnerships was triggered by an operational requirement to augment water supply to the economic heartland of South Africa. Since then, however, basin cooperation has been consolidated by improved political relations among the basin states.

Legislative innovation. The Southern African Development Community (SADC) protocol signed in August 1995 drew on the Helsinki Rules, which had a strong focus on state sovereignty. When both Mozambique and South Africa signed the 1997 UN Convention for the Non-Navigable Use of Shared Watercourses, Mozambique pushed for further revisions. A revised protocol, signed in 2000, gave greater influence to downstream states and to environmental needs. It also established formal procedures for notification, negotiation and conflict resolution. The stronger protocol also had a basis in national legislation. The South African Water Act of 1998 states that one of its purposes is to meet international obligations in regional water management. South Africa's credibility in the process increased as a result.

Source: Lamoree and Nilsson 2000; Leestemaker 2001; Nakayama 1998; SADC 2000, 2005a,b; UNEP 2001; van der Zaag and Savenije 1999; Conley and van Niekerk 2000.

Strengthening the institutional framework. The objective of the revised protocol was to promote the SADC agenda of regional integration and poverty alleviation. The member states adopted water-course agreements and institutions, encouraging coordination and harmonization of legislation and policies and promoting research and information exchange. Several programmes were initiated towards these aims such as professional training in integrated water resources management, joint work on data collection and changes since 2001 to centralize management.

Regional strategic action plan. A 2005–10 regional strategic action plan for water management is under way. It focuses on water resource development through monitoring and data collection, infrastructure development (to increase energy and food security as well as water supply schemes to small border towns and villages), capacity building (to strengthen river basin organizations) and water governance. Each area has its own projects, involving SADC national committees, a technical committee, river basin organizations and implementing agencies.

Several challenges remain. There is no long-term regional water policy, so projects are implemented basin-by-basin. Seasonal variations continue to put competitive pressure on water availability. There are also lags in implementing the progressive national laws and uncertainties about conflict resolution procedures.

research on behalf of member states, monitor compliance with treaties and enforce sanctions on erring states. Given the weakness of treaties as stand-alone documents, investing energy in creating sustainable institutions is deeply beneficial. Sustainability is a critical need because basins are regularly subject to stresses, whether biophysical, geopolitical or socioeconomic. Institutions are thus the shock absorbers that increase a basin's resilience to sudden changes.

There is no dearth of river basin initiatives or of institutions. Most have two things in common. Their day-to-day operation is dominated by technical experts doing critically important work, and they lack high-level political engagement. The upshot is an institutional structure for river basin cooperation with a focus on discrete projects rather than the bigger picture of gains on and beyond the river. Among the symptoms:

- *Limited mandates.* In most cases river basin organizations are expected to work

on narrow technical areas, such as collecting data or monitoring flows across the border. This limits their ability to cope with basinwide socioeconomic and environmental challenges—or to develop broader systems of benefit sharing to promote human development.

- *Constrained autonomy.* Most river basin cooperation takes place within highly circumscribed institutional autonomy. This is a weakness, because a degree of autonomy can increase both the objectivity and legitimacy of institutions. The Binational Autonomous Authority of Lake Titicaca set up by Bolivia and Peru in 1996 shows how full autonomy over technical, administrative and financial decisions can make institutions more effective. The authority has prepared a 20-year strategy to manage water availability and monitor water quality. While not independent of the governments, the institution looks beyond competing national inter-

Given the different strategic, political and economic contexts in international basins, it makes sense to promote and support cooperation of any sort, no matter how slight

ests and is seen by both parties as a source of credible advice on lake management. By contrast, the Interstate Coordination Water Commission in the Aral Sea Basin and the International Fund for the Aral Sea, with limited capacity and autonomy, have become a locus for interstate rivalry, reflected in disputes about staffing patterns and country representation.

- *Weak institutional capacity.* River basin organizations often suffer from a lack of technical expertise, poor staffing and poor executive direction in programme objectives and project design. The Niger Basin Authority, created in 1980, remained largely ineffective through several rounds of restructuring. Lacking financial or political support, it was unable to develop strategies for integrated socioeconomic development and environmental conservation, as envisaged in its remit. Only recently have basin countries begun to acknowledge their interdependence in the basin and to contribute their financial shares to the authority.
- *Insufficient financing.* The process of negotiation in the development of river basin institutions can be as important as the outcome. Balanced negotiations are costly because they often stretch over long periods and because of the need for technical data and legal expertise. Initiatives in Sub-Saharan Africa in particular have suffered from inadequate funding, holding back institutional cooperation. For the past 15 years the Lake Chad Basin Commission has been talking about diverting water from the Ubangi River to the Chari River, which feeds into the lake. This is an urgent priority in view of the lake's rapid shrinkage. To date, however, the five member countries have only managed to raise \$6 million for a feasibility study. On current trends, the scheme itself could take another 10–20 years to achieve, which might be too late.³⁶ Similarly, the International Fund for the Aral Sea, meant to serve as a funding mechanism for Aral Sea programmes, failed to elicit adequate contributions from the five Central Asian states.

- *Lack of enforcement.* The ability of institutions to enforce agreements is important, not least because enforcement failures weaken credibility and incentives for compliance with negotiated agreements. Weak enforcement can undermine even the most imaginative treaties. In 1996 and 1997, after years of dispute, two treaties were signed to find equitable water-sharing solutions on the Syr Darya and to exploit energy resources. Implementation has suffered from noncompliance and the absence of enforcement. By contrast, the Israel-Jordan experience during the drought of 1999 shows how institutions can resolve conflicts that might otherwise have major political repercussions. The difference: the Jordan-Israel agreement included enforcement mechanisms.

Creating the conditions for cooperation

A wide range of cases have included cooperation. Cooperation need not always be deep—in the sense of agreeing to share all resources and engaging in all types of cooperative ventures—for states to derive benefits from rivers and lakes. Indeed, given the different strategic, political and economic contexts in international basins, it makes sense to promote and support cooperation of any sort, no matter how slight. There are, however, a few clear steps that states, civil society bodies and international organizations can take to create the conditions for initial cooperation and to move towards wider benefit-sharing systems. Among the requirements:

- Assessing human development needs and goals.
- Building trust and increasing legitimacy.
- Strengthening institutional capacity.
- Financing transboundary water management.

Assessing human development needs and shared goals. The management of cross-border water cannot be separated from wider international development goals, including the Millennium Development Goals. Most river basin initiatives focus on river sharing arrangements

Set up in 1991 and receiving strong support at the 1992 Earth Summit, the Global Environment Facility (GEF) has become the largest source of multilateral aid for global environmental issues. The GEF was established as a partnership of the United Nations Development Programme, with its strength in capacity-building projects; the United Nations Environment Programme, with its strength in identifying regional priorities and action plans; and the World Bank, with its strength in financing.

On international waters, one of six focal areas, the GEF sees itself as a facilitator for ecosystem-based action programmes for transboundary water bodies. Their growing importance can be gauged by the various roles in promoting cooperation.

- *Setting priorities and building partnerships.* In each international basin the GEF supports a multicountry fact-finding process to prepare a transboundary diagnostic analysis as the basis for a strategic action programme, adopted at a high level and implemented over several years. The process has several benefits: producing scientific knowledge, building trust, analysing root causes, harmonizing policy, breaking down complex water resource and environmental concerns into manageable problems and promoting water resource management at the regional level. It also draws attention to the links between social, economic and environmental concerns. For instance, in Lake Victoria connections were drawn between invasive species, deforestation, biodiversity, navigation, hydropower, migration and disease.

- *Promoting regional water governance.* Almost two-thirds of GEF projects have helped create or strengthen treaties, legislations and institutions. Since 2000 as many as 10 new regional water treaties have been adopted or are in an advanced stage of development. Perhaps the most successful examples are the International Commission for the Protection of the Danube River and the Black Sea Commission. In 2000 a cyanide spill was reported to the International Alarm Centre for the Danube in time to avert a potentially tragic environmental disaster.
- *Building national capacity.* A key to ensuring sustainable programmes is building the capacity to respond to local demands and concerns. Although there are numerous training workshops, financial constraints impose limits on the participation of local stakeholders. In the Mekong Basin non-governmental organizations are active in Thailand but not in Cambodia, Lao PDR or Viet Nam. In Lake Victoria, poverty and illiteracy are barriers to the effective spread of environmental knowledge.
- *Catalysing investment.* Over the last 15 years the GEF has provided more than \$900 million in grants, leveraged by more than \$3.1 billion in cofinance, for transboundary water management programmes in more than 35 water bodies involving 134 countries. About three-quarters of its funding is directed towards regional (rather than country) projects.

Source: Gerlak 2004; Sklarew and Duda 2002; Uitto 2004; Uitto and Duda 2002.

negotiated by technical experts. That process provides a foundation for cooperation. But political leaders could build on this foundation by identifying at a basin level shared goals for human development—in poverty reduction, employment creation and risk management—and make this an integral part of river basin planning.

The first step towards effective cooperation for human development is to create a common pool of information. Information is necessary for riparian countries to recognize the inefficiencies in unilateral programmes that fail to account for interdependencies. It can also help to identify shared interests. Many instances of conflict arise more from mistrust and poor information about the use and abuse of water resources than from substantive differences. Joint research and information exchanges can provide timely notification of infrastructure initiatives, identification of shared interests and development potential, increased chances of reaching

agreements and, most important, the foundations of long-term trust.

This is one area where international support can make a difference. The Global Environment Facility (GEF) has taken the lead in assisting legal and institutional reform in water governance (box 6.6). Since 1991 the GEF has supported fact-finding missions in more than 30 transboundary basins, achieving successes to varying degrees in the Aral Sea, Lake Victoria, Lake Tanganyika, the Danube (including the Black Sea) and the Mekong. Alongside the GEF, the Global International Waters Programme has identified 66 subregions for evaluating the causes and effects of environmental problems in transboundary water bodies.

But it is also important that fact-finding studies go beyond the technical. Community-based data collection and survey activities are one vehicle for identifying human development problems. River basin communities derive direct benefits from shared water resources and

As river basin cooperation evolves, political leaders must raise the bar to an appropriate level of ambition

are directly in the line of risks. They are thus an important source of information on environmental hazards and livelihood impacts. Here, too, aid can help build institutional capacity. Communities in the Rio Bermejo Basin, shared by Argentina and Bolivia, face high levels of poverty. Excessive deforestation has created acute environmental problems, prompting the governments of the two countries to develop a binational strategy for basin management. As part of that strategy more than 1,300 civil society participants were consulted in a GEF project to identify problems and solutions in areas such as soil erosion, land reclamation and sediment control. Community voices ensured that a project to build several dams was scaled down and required to adopt environmentally sustainable practices.

As river basin cooperation evolves, political leaders must raise the bar to an appropriate level of ambition. The Helsinki Rules and the 1997 UN Convention for the Non-Navigable Use of Shared Watercourses identify social and economic needs as a priority. Yet current approaches have evolved out of negotiating approaches aimed at increasing economic exchanges, sharing information or resolving conflicts. All these tasks are critical—a foundation for success. But river basin bodies also provide political leaders with an opportunity to look to human development beyond their borders. To some degree, this is starting to happen in the Nile Basin Initiative and in Southern Africa. But far more could be done, including a human development needs assessment for each river basin.

Building trust and increasing legitimacy. Misinformation or a lack of information is an obstacle to close cooperation in many river basins. Cross-border cooperation on water depends on the willingness of riparian states to share governance. Here too international support can help create an environment for successful cooperation.

As in any process of mediation, parties perceived as impartial can build trust and legitimacy. The World Bank has supported basin management processes over a long period, from the Indus Treaty negotiations in the

1950s to the current Nile Basin Initiative. The World Bank also brings political weight and capacity to the formulation of objectives and development of institutions. The United Nations Development Programme (UNDP) has provided capacity-building inputs to the Nile River Basin Cooperative Framework Agreement. To fill this type of role, third parties must be perceived as neutral facilitators without any geopolitical ambition linked to water governance.

One requirement for successful cooperation is long-term political engagement. Negotiations over shared waters are invariably lengthy, requiring support from donors over the long haul. In 1993 the World Bank and other donors launched the Aral Sea Basin Programme to stabilize the environment, rehabilitate the disaster zone and improve management capacity. A year later the European Union's Technical Assistance for the Commonwealth of Independent States initiated the Water Resources Management and Agricultural Production project to support the International Commission for the Aral Sea. The UNDP has since launched the Aral Sea Basin Capacity Development project. The US Agency for International Development was crucial in linking water and energy concerns in the Syr Darya agreements. Despite the persisting problems in the Aral Sea Basin, interventions by international organizations since the early 1990s have averted a potentially acute conflict over water resources.

Strengthening institutional capacity. Strengthened river basin organizations must chart a practical course for the future. Although the design of institutions will differ by region and circumstances, the problem of inadequate technical capacity is common to many of them. Cooperation in this area could be scaled up through the transfer of institutional knowledge. The European Union, with its extensive experience in transboundary water management, for example, could do far more to support institutional development in poor countries, working with agencies such as the World Bank and UNDP to develop programmes for training and capacity building.

There is also scope for working towards regional legislation. The absence of harmonized or structured water policies in riparian countries can undermine efforts at integrated water management across borders. However, harmonization of legislation on water is technically challenging and often politically difficult. Given its experience in the area, the United Nations Environment Programme could take the lead in assessing national legislative frameworks and identifying overlaps. These could become the basis for developing regional water policies, as happened in the Southern African Development Community.

Financing transboundary water management. Transboundary water management generates important international public goods. With more than 40% of the world's people now living within transboundary basins, managing these basins has implications for regional peace and security, as well as for poverty reduction and environmental sustainability. Some of the public bads that flow from mismanagement include environmental refugees, pollution and poverty, all of which cross national boundaries—like water itself. This context provides a strong case for financing through development assistance programmes.

Transboundary management has attracted very little international aid financing. Of total development assistance spending on water and sanitation of about \$3.5 billion, less than \$350 million is allocated for transboundary water resources.³⁷ Donors should aim to substantially increase aid for transboundary waters. Running costs for water management institutions are fairly modest. Trust funds could provide a predictable source of financing and support the participation of poor member states; they are also a useful funding source for project implementation. Experience shows that this type of financial support could be especially useful in Sub-Saharan Africa and Central Asia. Relative to the number of countries that share international water basins and the large environmental costs and development losses, financial support to effective river basin institutions would be a high-yield investment. But creating an environ-

ment for cooperation and sustaining a dialogue over many years can be expensive—an area for innovative international financing.

In the interests of ownership the riparian countries have to bear a substantial part of the financial burden for managing transboundary institutions and approaches. A danger of aid financing is that it can create a supply-led approach to setting priorities, with donor priorities defining the agenda. Where aid is critical is in financing start-up costs, training and capacity development. Financing aid is best done through grants rather than loans, because the costs of coordination between countries are high and attributing responsibility for loan repayments is difficult. The GEF remains one of the main financing instruments for directing aid towards transboundary resources. In the past 15 years it has committed \$900 million in grant financing, with three times that amount leveraged in cofinancing. Similar financing models could tap into financial markets to fund large infrastructure projects, for example. Risk financing and contractual arrangements that tie in river basin organizations can attract private capital while adding to the stability of transboundary cooperation.

* * *

Beyond the rhetoric on the threat of water wars two things are certain. First, for a large group of countries, transboundary water management will figure as an increasingly important issue in bilateral and regional dialogue. Second, increasing competition for water will have marked human development consequences that spill across borders.

Beyond these givens much is uncertain. Will water become an increasing source of tension between neighbours? That will depend partly on wider peace and security issues that have nothing to do with water, and partly on whether governments choose to resolve differences through cooperation. What is clear is that people living in areas marked by water stress will continue to have a strong human security interest in more ambitious and less fragmented approaches to water governance.

Donors should aim to substantially increase aid for transboundary waters but in the interests of ownership the riparian countries have to bear a substantial part of the financial burden for managing transboundary institutions and approaches