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Water challenges in Central-South Asia

Michael Renner

Executive Summary

Water issues play a crucial role in Central-South Asia, both in the quantity of water available and its quality. Access to clean drinking water is a major, though largely unmet, objective. While much of the region is experiencing water shortages, poor water management lies at the heart of many problems. Climate change — in the form of glacier melt, drought, rising temperatures, and changes to the monsoon cycle — will increasingly exacerbate water scarcity. Although the region's water challenges do not necessarily or inevitably lead to armed conflict, they increasingly threaten to undermine human security. Cooperation will be critical for the region to meet its water challenges in the years and decades ahead.

Inefficient water use plagues Central Asian agriculture and water use in the region is several times higher than in countries like Spain, Turkey or Egypt. Hydropower projects conflict with irrigation needs which, in the absence of regional agreements, could lead to transborder disputes.

Millions of Afghans are food insecure and these desperate conditions have triggered local-level conflicts over land and water. In Pakistan, a combination of rising temperatures and population growth could reduce water availability to a critically low level by 2020. Water pollution is a leading cause of death in both Pakistan and Afghanistan.

Solutions must address efficient water use and international funding is urgently needed to improve agricultural production. Existing institutions can contribute to seeking solutions and promoting regional cooperation, especially if they engage with civil society.

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Background

Water issues play a crucial role in Central-South Asia, both in the quantity of water available and its quality. For the purposes of this brief, the region is defined as encompassing the Amu Darya and Indus water basins and their tributaries – Afghanistan and Pakistan in relation to their neighbours India, Tajikistan, Turkmenistan, and Uzbekistan. (See maps on pages 3 and 5.) Competing water use plans pose critical challenges under conditions of environmental degradation, demographic pressure and rising demand for water. Both within and among the riparian states, there is fierce competition between irrigated agriculture and energy generation (hydropower).

Access to clean drinking water is a major, though largely unmet, objective. While much of the region is arid or semi-arid, poor water and watershed management lie at the heart of many problems. Much of the region is already experiencing physical water shortages or approaching such a state. (See table below.)[1] Climate change – in the form of glacier melt, drought and shifting precipitation patterns, rising temperatures, and changes to the monsoon cycle – will increasingly exacerbate water scarcity.

The region's water challenges do not necessarily or inevitably lead to armed conflict. Unalleviated, however, they increasingly threaten to undermine human security and to bring different communities and regions into dispute with each other. While there are some positive regional experiences in managing transboundary resources – the Indus Water Treaty between India and Pakistan most prominent among them – cooperative approaches have been sparse and institutional structures remain fragmented and weak. Yet cooperation will be critical for the region to meet its water challenges in the years and decades ahead.

Water Resources and Usage in Central and South Asia

	Precipitation (mm/year)	Total Renewable Water Resources per Capita (m^3/year) [a]		Dependency Ratio [b] (%)	Proportion of Renewable Water Resources Withdrawn [c] (%)
	Long-term Avg	1990	2006		
Afghanistan	350	5,135	2,492	15	36
India	1,100	2,205	1,647	34	34
Pakistan	500	1,994	1,400	76	75
Tajikistan	700	2,896	2,407	17	75
Turkmenistan	150	6,363	5,045	97	100
Uzbekistan	200	2,344	1,868	77	116

[a] The sum of internal and external renewable water resources. It corresponds to the maximum theoretical yearly amount of water actually available for a country at a given moment.
[b] Water resources originating from outside the national territory, relative to total water resources.
[c] Water used for all purposes.

Some 178 million people in the densely-populated Indus basin inhabit an area of 1.1 million km^2 (145 people per km^2). Recent studies estimate per capita water availability at around 1,000 m^3 per year. Population size and density in the 535,000 km^2 Amu Darya basin are much lower (21 million people; 33 people per km^2), and water availability runs to more than 2,000 m^3. Both basins have suffered heavy loss of original forests and the majority of the watershed areas are arid.

1. FAO Aquastat, "Water Resources by Country/Territory and by Inhabitant, and MDG Water Indicator", http://www.fao.org/NR/WATER/AQUASTAT/maps/AQUASTAT%20water%20resources%20and%20MDG%20water%20indicator%20-%20March%202009.pdf, accessed 9 December 2009.

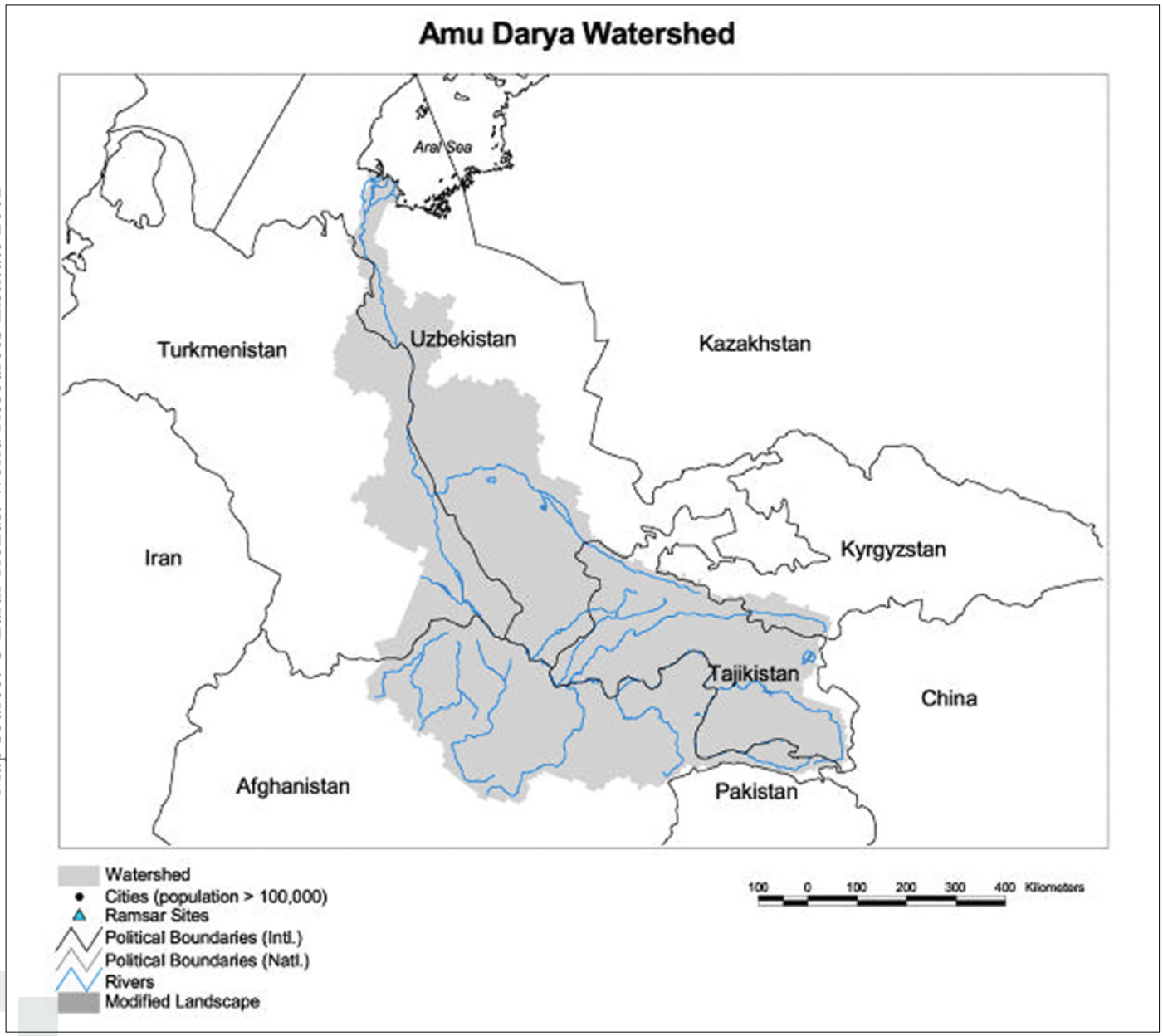
Afghanistan and the Amu Darya Basin

The Amu Darya, which carries more water than any other Central Asian river, rises in the mountains of Tajikistan and Afghanistan. Downstream, Turkmenistan and Uzbekistan withdraw by far the largest quantities of water. The Amu Darya river basin contributes 57% of Afghanistan's total river flow (and a similar share of irrigated arable land), compared with 26% and 11%, respectively, from the Kabul and Helmand river basins.

The livelihoods of at least 80% of Afghans are based on agriculture and related occupations. Given low and erratic rainfall in much of the country, spring and summer runoff from snow-melt is the lifeblood of much Afghan agriculture. The fertile plains of the Amu Darya basin account for about 40% of Afghanistan's irrigated lands. But poorly constructed or maintained irrigation canals translate into water losses as high as 70%. And droughts and dry years since 1999 have substantially reduced cultivated areas in the south and east.

The livelihoods of 80% of Afghans are based on agriculture, yet agricultural produce has fallen by half.

Three decades of armed conflict have displaced a large portion of the population, impeded access to farmland because of landmines, and destroyed many irrigation systems or rendered their maintenance impossible. Buffeted by recurring

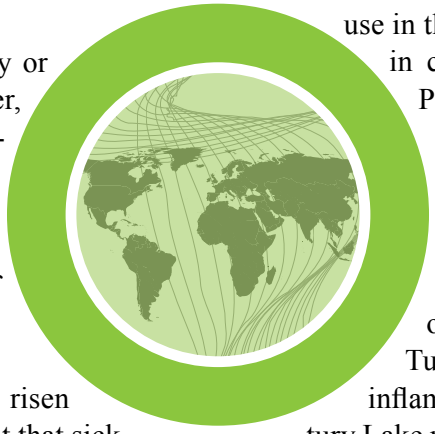


drought and floods, and by the population's desperate coping strategies, the net result has been a severe degradation of Afghanistan's natural environment and its water and farming infrastructure. Massive deforestation and heavy pressure on grazing lands has led to erosion and reduced flood resistance, causing large agricultural areas near the Amu Darya in Balkh and Jawzjan provinces to be submerged or damaged. The loss of rural livelihoods in turn has triggered migration to cities.

Food shortages and unsafe water

Oxfam UK observed that "in recent years Afghanistan's overall agricultural produce has fallen by half. Over the last decade in some regions Afghanistan's livestock population has fallen by up to 60% and over the last two decades, the country has lost 70% of its forests."[2]

Millions of Afghans are either seasonally or chronically food insecure. Beyond hunger, these desperate conditions have also triggered local-level conflicts. In an Oxfam survey in six provinces across Afghanistan, nearly half the respondents regarded land and water issues as major causes of disputes.



Water contamination in Afghanistan has risen to the level of a severe public health threat that sickens or kills people, owing to poor household and industrial waste management practices, and the lack of modern sanitation and sewage systems. A 2003 United Nations Environment Programme (UNEP) assessment concluded that "reliable access to a safe water supply … is virtually non-existent in Afghanistan's urban areas." Access to safe water is estimated at no more than 12 to 23% of the urban population.[3] Similarly, only one-third Afghans in urban areas have access to improved sanitation, and only one-tenth in rural areas.

The Central Asian context

The nations sharing the Amu Darya are locked into seemingly irreconcilable sets of interests. Tajikistan and Afghanistan look to the Amu Darya for hydropower as well as irrigation. Turkmenistan and Uzbekistan depend heavily on the river to irrigate their cotton, rice, and wheat fields. Overall, the Amu Darya waters are already heavily utilized, and all these countries have plans to increase their water extraction. Given the pervasive lack of cooperation among them, current trends may lead to rising tensions.

Central Asian agriculture continues to be characterized by extremely inefficient water use, a legacy of Soviet times. Evaporation, siltation of canals, and leaks from pipes and other decaying water infrastructure mean that less than 40% of water diverted from rivers actually reaches the fields. And about 20% of irrigation water is wasted directly in the field. Per capita water use in the region is several times higher than in countries like Spain, Turkey, Egypt, Pakistan, or Mexico.

Downstream, Uzbekistan and Turkmenistan have similar economic interests, yet their relationship is nonetheless conflictive. Tensions over shared irrigation systems near Tuyamuyun Reservoir could be further inflamed by Turkmenistan's Golden Century Lake project – an artificial lake in the Karakum desert due to be completed in 2010.

Upstream, Tajikistan releases water in the winter months from several reservoirs to generate hydropower for heating purposes – thus substituting imports. But these releases frequently cause downstream flooding and damage to infrastructure. In the summer months, Tajikistan builds up its reservoirs – at precisely the time when the irrigation needs of Turkmenistan and Uzbekistan are most acute.

Hydropower vs agriculture

Upstream-downstream antagonisms are likely to sharpen to the extent that Tajikistan and Afghanistan succeed in boosting their hydropower capacity – which could be a major source of income for these poverty-stricken countries. With ample hydropower potential, Tajikistan could produce almost 20 times as much electricity as it currently does. The government wants to

2 Oxfam UK, Afghanistan: Development and Humanitarian Priorities, January 2008, pp 9-10, http://www.oxfam.org.uk/resources/policy/conflict_disasters/downloads/afghanistan_priorities.pdf, accessed 9 December 2009.

3 United Nations Environment Programme (UNEP), Afghanistan Post-Conflict Environmental Assessment, Nairobi, 2003, p 34, http://postconflict.unep.ch/publications/afghanistanpcajanuary2003.pdf, accessed 9 December 2009.

complete unfinished Soviet-era hydropower projects at Rogun and Sangtuda on the Vakhsh River, with Russian and Iranian investment. Uzbekistan worries about these developments, not only because of the potential direct impact on summer irrigation water flows (it has objected to the planned height of the Rogun dam), but also because it stands to lose income (and leverage) from selling natural gas to Tajikistan. In addition, Tajikistan's reduced dependence on imported energy could make it even less interested in coordinating water flows.

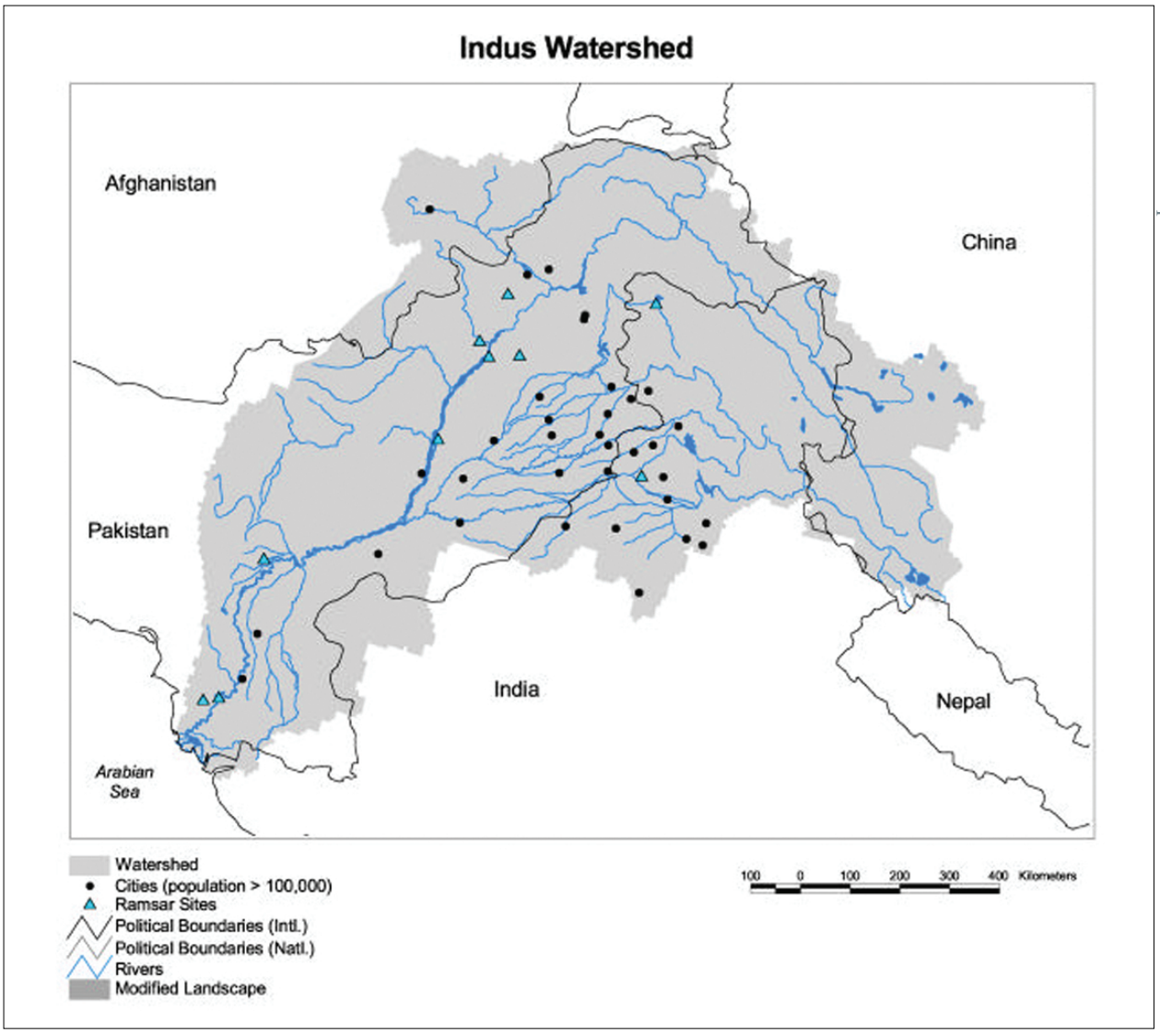
Rising temperatures and population growth could reduce Pakistan's water availability to a critically low level by 2020.

Because of its ongoing war, Afghanistan never developed more than about 10% of its considerable hydropower potential along the Amu Darya. But should greater stability in the future enable water diversion projects to be undertaken in northern Afghanistan, the region's existing water and energy conflicts could intensify. (Because of a lack of contemporary water data, there is no consensus among observers as to how large Afghanistan's future water demand may be).

Even though Afghanistan's proposals are far less ambitious than Tajikistan's, they nonetheless have aroused opposition from Turkmenistan and Uzbekistan. Afghanistan has not been included in any of the post-Soviet water management structures and institutions in Central Asia. There are no bilateral water agreements, and only Tajikistan has (since 2006) engaged in serious dialogue with Afghanistan.

Pakistan and the Indus Basin

Agriculture offers a livelihood for over 40% of Pakistan's labour force and accounts for a quarter of GDP. Agriculture is also the dominant water user with 69% of the total, while industries use 23% and households

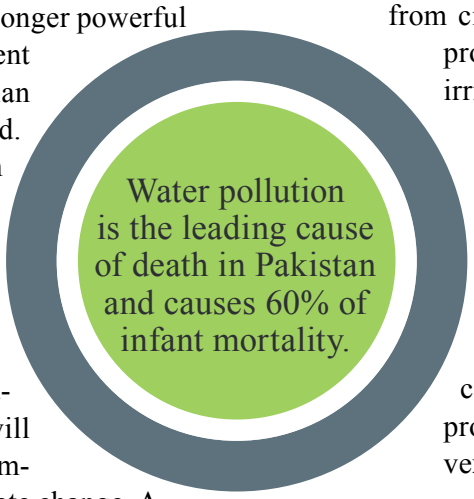


Map source: © Earth Trends. World Resources Institute 2002

the remaining 8%. Water from the Indus and its tributaries irrigate 80% of the country's 21.5 million hectares of farmland. The upper reaches of the Indus are almost exclusively fed by glacier melt from the Himalayan and Karakorum ranges (on the borders with China and India), as well as the Hindu Kush (on the border with Afghanistan). The remainder – a little more than 10% - comes from (monsoon) rainfall.

Extensive irrigation in Pakistan and India places Indus water resources under heavy stress, with about 90% of the basin's available water flow utilized. Overpumping and inefficient irrigation techniques have led to sharply declining groundwater levels, loss of wetlands and salinization of agricultural lands. Because of soaring, yet inefficient, agricultural and urban water use in Punjab, farming in the southern Sindh province is becoming precarious – stoking ethnic tensions.

The flow of the Indus is no longer powerful enough year-round to prevent saltwater from the Arabian Sea from seeping inland. More than half a million hectares of arable land have been lost to seawater intrusion and salinization. In the future, sea-level rise will place coastal areas at increasing risk of inundation. Water availability will decline dramatically in coming years as a result of climate change. A combination of rising temperatures and population growth could reduce Pakistan's per capita water availability to a critically low level of just 800 m3 annually by 2020.[4]



Poverty and pollution

Highly unequal land distribution and water policies that benefit large wealthy farmers are behind growing rural poverty and migration to urban areas. According to a 2008 report, levels of hunger in Pakistan are "alarming."[5] The government's decision to offer long-term farmland leases to foreign investors for export production threatens to intensify land and water problems.

An estimated 40-55 million Pakistanis do not have access to safe drinking water, yet the government spends 47 times as much on the military budget as on water and sanitation. According to Unesco's World Water Development Report, only 2% of Pakistan's cities have wastewater treatment facilities; and less than 30% of wastewater receives treatment in these cities. Water pollution is the leading cause of death in Pakistan and causes 60% of infant mortality.[6]

Sugarcane-based industries, tanneries, and the textile industry are the principal industrial water polluters, causing high levels of coliform, fluorites, iron, sulphur, and sulphates in drinking water. Untreated sewage from cities adds to the contamination. And in Punjab province, many people depend on contaminated irrigation water for domestic use.

Pakistan vis-à-vis Afghanistan and India

Population growth and increasing urbanization and industrialization continue to drive up water demand for drinking, irrigation, and hydropower purposes. There are many internal water conflicts between vidual communities or provinces. But transborder issues have also posed vexing problems.

Pakistan does not have an agreement with Afghanistan governing the water of the Kabul River, an important tributary of the Indus. Afghan plans for irrigation, fishing and hydropower generation could eventually

4 Iftikhar Gilani, "Pakistan on brink of "water disaster", International Rivers, 15 January 2009, http://www.internationalrivers.org/en/node/4272, accessed 9 December 2009.

5 Welthungerhilfe, International Food Policy Research Institute, and Concern Worldwide, Global Hunger Index: The Challenge of Hunger 2008, Bonn, Washington, DC, and Dublin, October 2008, http://www.ifpri.org/sites/default/files/publications/ghi08.pdf, accessed 9 December 2009.

6 UNESCO, The 3rd United Nations World Water Development Report: Water in a Changing World, Paris and London, March 2009, p 141; "Pakistan: water pollution named as biggest killer," IRC International Water and Sanitation Centre, 20 April 2005, at http://www.irc.nl/page/17834, accessed 9 December 2009.

trigger tensions between the two countries in the absence of an accord, especially given their unresolved, decades-long border dispute.

Pakistan does, however, have an important agreement with India. The Indus Water Treaty, signed in 1960, divides the waters of the Indus and its eastern tributaries. India has exclusive use of the Ravi, Beas and Sutlej rivers, while the waters of the Indus itself, as well as those of the Jehlum and Chenab, were allocated to Pakistan. India is permitted some non-consumptive "run of the river" uses, including the generation of hydroelectric power, but the treaty barred the construction of storage facilities (dams or reservoirs).

A 2008 joint UNEP / Asian Institute of Technology report notes that the Indus Waters Treaty does not address "transboundary pollution of the water resources, which is a significant contributor to the vulnerability of the basin's freshwater resources."[7]

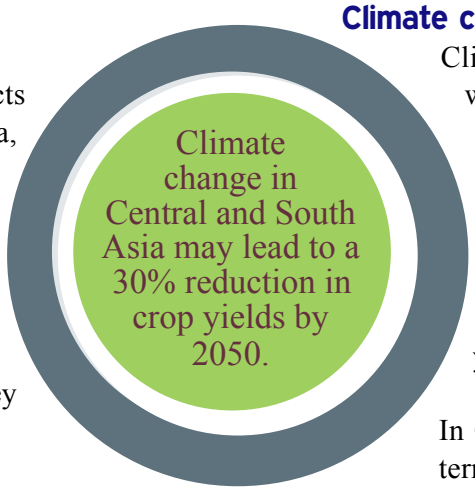
Water disputes

A number of contentious projects undertaken upstream, by India, in Kashmir – in response to growing water needs, falling groundwater tables and power shortages – have served as reminders that water disputes between the two neighbours are never far from the surface. They include the following:

- Baglihar Hydroelectric Dam: Pakistan has objected to this dam on the Chenab River since India began construction in 1999. A 2005 World Bank adjudication requires that the dam can only be filled between June 21 and Aug 31, with Pakistan's prior consent, and specifies minimum river flows. But in 2008, India continued to fill the dam well into September, considerably reducing the Chenab's flow and causing crop damage. A World Bank tribunal subsequently asked India to lower the height of the dam.
- Kishanganga Hydroelectric Dam: The proposed 103 meter-high reservoir threatens to displace some 25,000 people. A channel connected to the reservoir would divert the Neelum river from Muzaffarabad, in Pakistani-controlled Kashmir, to Wullar Lake and the Jhelum river near Bandipur instead.
- Tulbul Navigation Project: India is considering reviving this project on Wullar Lake, which it first initiated in the 1980s but scrapped following objections from Pakistan. Pakistan fears that India could use Tulbul to disrupt its triple canal system (Upper Jhelum Canal, Upper Chenab Canal, and Lower Barri Doab Canal).

Rising demand and reduced availability of water make it increasingly important for India and Pakistan to improve their water management and ensure that diplomacy, rather than threat of force, governs their water relations.

Climate change



Climate change will dramatically raise the water challenges in Central and South Asia through rising temperatures and drought, more variable rainfall and glacier melt, sea-level rise, as well as changes to the monsoon cycle. By the middle of the century, increasing temperatures and growing water stress may lead to a 30% reduction in crop yields in the region.

In Central Asia, climate impact will be felt in terms of reduced rainfall and runoff, leading to increased heat stress, drought and desertification, thus amplifying the region's existing problems. A 2009 Asian Development Bank report bleakly concludes: "It is difficult to see anything other than an increase in migration in the region as climate change adds to economic, social, and political pressures."[8] Yet no mitigation and adaptation strategies are in place.

7 United Nations Environment Programme and Asian Institute of Technology, Freshwater under threat: South Asia, 2009, www.roap.unep.org/pub/southasia_report.pdf, accessed 9 December 2009.

8 University of Adelaide, et al., Climate Change and Migration in Asia and the Pacific. Executive Summary, Mandaluyong City, Philippines: Asian Development Bank, 2009, pp 17, 23, http://www.preventionweb.net/files/11673_ClimateChangeMigration.pdf.

Melting glaciers and storms

The melting of the Hindu Kush-Karakorum-Himalaya glaciers will have serious consequences for hundreds of millions of people. The warming trend in these mountain ranges has been much greater than the global average. As a result of rising temperatures, more precipitation falls as rain instead of snow, leading to shrinking glaciers. Two thirds of the Himalayan glaciers are reported to be receding. Glaciers in Tajikistan have shrunk by a third in the second half of the 20th century.

The Kolahoi, Indian-controlled Kashmir's biggest glacier, is melting faster than other Himalayan glaciers, from 11 km^2 to 8.4 km^2 over the past three decades. Kolahoi is the principal source of water for the Jhelum River, which is the main source of water for agriculture in Pakistan's Punjab province. The Siachen glacier – site of an Indian-Pakistani military standoff for 25 years – has shrunk to half its size.

Glacier melt at first results in increased water flow in the summer months. The International Centre for Integrated Mountain Development (ICIMOD) – a regional knowledge development and learning centre – warns: "It is not unlikely that this will appear as a positive, comforting sign, deterring and delaying required emergency initiatives." However, receding and eventually disappearing high-altitude reservoirs of snow and ice will over time reduce downstream runoff, and increase its variability.[9] As the water flow declines, it compromises hydropower generation. In the agricultural sector, the result is falling production of foodstuffs and commodities like cotton, which in turn may lead to growing poverty and social disparities, escalating rural-urban migration, and rising food prices in cities. There is also potential for conflict between up- and downstream states.

Climate change is also expected to cause significant changes to monsoon patterns and increase unpredictability. While much of South, East, and South-East Asia may see increased intensity of these storms and greater rainfall by century's end, for most parts of Pakistan and southeastern Afghanistan a reduction in precipitation of up to 20% is projected. Low-lying coastal areas such as the Indus delta will likely see an increase in the number and intensity of cyclones due to warmer seas. The resulting destructive storm surges and greater saltwater intrusion could drive migration from major coastal urban centers such as Karachi. Flooding is expected to increase across the Himalayas, as well as northern Pakistan and India.

Funding for agriculture

International donor support is needed to adequately finance infrastructure maintenance, greater water efficiency, and diversification toward less thirsty and more drought-resistant crops – in part by scrutinizing and reprioritizing existing funds. In Afghanistan, for instance, Oxfam observes that donor support for agriculture has been modest. "Donors have spent less than $300-400m directly on agricultural projects over the last six years – a fraction of overall assistance to Afghanistan."[10]

The governance system for Central Asia's water that emerged in the post-Soviet era – principally the International Fund for the Aral Sea (IFAS) and the Interstate Coordinating Water Commission that was integrated into IFAS in 1997 – remains largely dysfunctional, limited by conflicting interests, mutual suspicions, and a reluctance to cooperate.

Institutions and security

Over the past few years, the UN Economic Commission for Europe (UNECE) has intensified its engagement in Central Asia. Its Special Programme for the

9 International Centre for Integrated Mountain Development (ICIMOD), The Changing Himalayas. Impact of Climate Change on Water Resources and Livelihoods in the Greater Himalayas, Kathmandu, January 2009, p 6, http://books.icimod.org/index.php/search/publication/593

10 Oxfam UK, Afghanistan: Development and Humanitarian Priorities, 2008, pp 9-10, http://www.oxfam.org.uk/resources/policy/conflict_disasters/downloads/afghanistan_priorities.pdf, accessed 9 December 2009.

Economies of Central Asia (SPECA) has sought to strengthen cooperation and transboundary water and energy resource management among members, which include Afghanistan. UNECE's Water Convention provides a legal framework for transboundary water cooperation in the region, but Kazakhstan and Uzbekistan are so far the only regional signatories.

The Environment and Security Initiative (ENVSEC) – established to promote better environmental management and capacity building as a way to reduce insecurity in southeastern Europe and Central Asia – has relevant expertise. In 2008, ENVSEC undertook a detailed assessment of the water management and quality situation in the Amu-Darya river basin, with a particular focus on the environment and security implications of projected developments. Now under review, the report is targeting opportunities to strengthen basin-wide cooperation. [11]

The East-West Institute launched a series of Preventive Diplomacy Initiatives in April 2009 bringing officials and experts from Afghanistan, its neighbours, Nato, and the UN together for policy dialogues on regional water cooperation, agricultural development, and energy production. Sessions focused on Afghanistan's major rivers – including the Amu Darya, Kabul, and Helmand. In early 2010, a high-level international conference aims to facilitate agreement on steps to implement policy recommendations. Regarding the Kabul River, data-sharing and technical cooperation could eventually pave the way toward a bilateral Afghan-Pakistani water resources commission and perhaps even a treaty governing the river's resources.

Water and energy

Central Asia's hydropower resources are the object of ongoing great power rivalries among Russia, the United States, China, and India. The United States has sought to turn Central Asia into a supplier of electricity in South Asia, limiting Russian influence; India is keen to secure energy supplies from Central Asia. Within the Eurasian Economic Community (EAEC) that it dominates, Russia attempted to create a Central Asian hydropower consortium to govern the region's interconnected water and energy problems. However, Uzbekistan's withdrawal from the EAEC in 2008 undermined these plans.

Because it groups together Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, Russia and China (with India and Pakistan as observers and Afghanistan as an invited guest), the Shanghai Cooperation Organization, in principle, could play an important role in addressing the water and energy challenges of Central and South Asia. At the October 2008 SCO summit, the issue was overshadowed, however, by efforts to address the impacts of the world financial crisis.

In relations between Pakistan and India, the bilateral Indus Water Treaty represents a valuable core mechanism for consultation and conflict resolution. When the South Asian Association for Regional Cooperation was established in the 1980s, contentious topics like water were excluded from its mandate. But the International Centre for Integrated Mountain Development (ICIMOD) does address water issues in the context of transborder environmental problems in the Hindu Kush-Himalayas region (including, among others, Afghanistan, China, India, and Pakistan).

11 "Assessment of Environment and Security Linkages and Impact in the Amu Darya River Basin." ENVSEC Central Asia Newsletter, June 2009, p. 4, at http://www.envsec.org/docs/central_asia_2009_1_eng.pdf.

Seeking solutions

As great as the water challenges in the region are, there are multiple avenues for addressing them. One of the most pressing needs is for much greater efficiency in water use, including drip irrigation techniques and canals that lose less water. By 2015, Afghanistan's Ministry of Energy and Water hopes to boost efficiency by 45% by 2015.[12] In Pakistan, improvements in yields for rain-fed cereal crops – which are just over 10% of achievable yields –could help relieve overall water pressures. Their neighbours can and must similarly boost water productivity. Better watershed management, rainwater harvesting, urban water conservation, investments in improved sanitation facilities, and more integrated planning to deal with competing water needs are also vitally important.

The countries of the region have little influence over global greenhouse emissions trajectories, and hence will need to focus principally on adaptation measures. It is essential to build environmental, social, economic, and political resilience, as well as improve institutional capacities to cope with growing water scarcity and climate impacts. Water cooperation across national boundaries offers important benefits but may not be realized without disinterested, innovative third-party facilitation.

There is no single institution or arrangement that at present has the political wherewithal or mandate to address the region's water challenges and the connections to energy, developmental, and environmental concerns in an integrated manner. Political rivalries and inertia are difficult to overcome. However, initiatives like ENVSEC or ICIMOD can play a useful role, especially if they engage with civil society.

12 Running Dry: the humanitarian impact of the global water crisis, IRIN, "Afghanistan: Water crisis a growing human tragedy," 2006, http://www.irinnews.org/InDepthMain.aspx?InDepthId=13&ReportId=60533&Country=Yes, accessed 9 December 2009.

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