

## INVESTMENT PERSPECTIVES

# Water report: Rising risks in South Asia

Water crisis is a top global risk that could have significant, long-term consequences for multiple countries and industries if no actions are taken.

South Asia's rising water risks could constrain the region's economic growth across multiple sectors.

We analyze water and climate-change risks/opportunities and consider this data in our process for evaluating emerging markets' sovereign debt.

## Water crises: A top global risk

In the World Economic Forum's (WEF's) "The Global Risks Report 2021,"<sup>1</sup> water crisis risk was again featured in the top-five global risks by impact, making the list for the eighth year in a row (Figure 1). In the report, the WEF shared the results of its latest Global Risks Perception Survey (GRPS), which captures respondents' varying perceptions regarding the evolution of global risks. The report describes a *global risk* as an uncertain event or condition that, if it occurs, can cause significant negative impacts for several countries or industries within the next 10 years. Respondents were asked to score each global risk on a scale of 1–5, from two different perspectives: first, on the likelihood that the risk would occur during the next 10 years, and second, on the severity of its impact at a global level should it occur.

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1.. The Global Risks Report 2021 (<https://www.weforum.org/reports/the-global-risks-report-2021>)

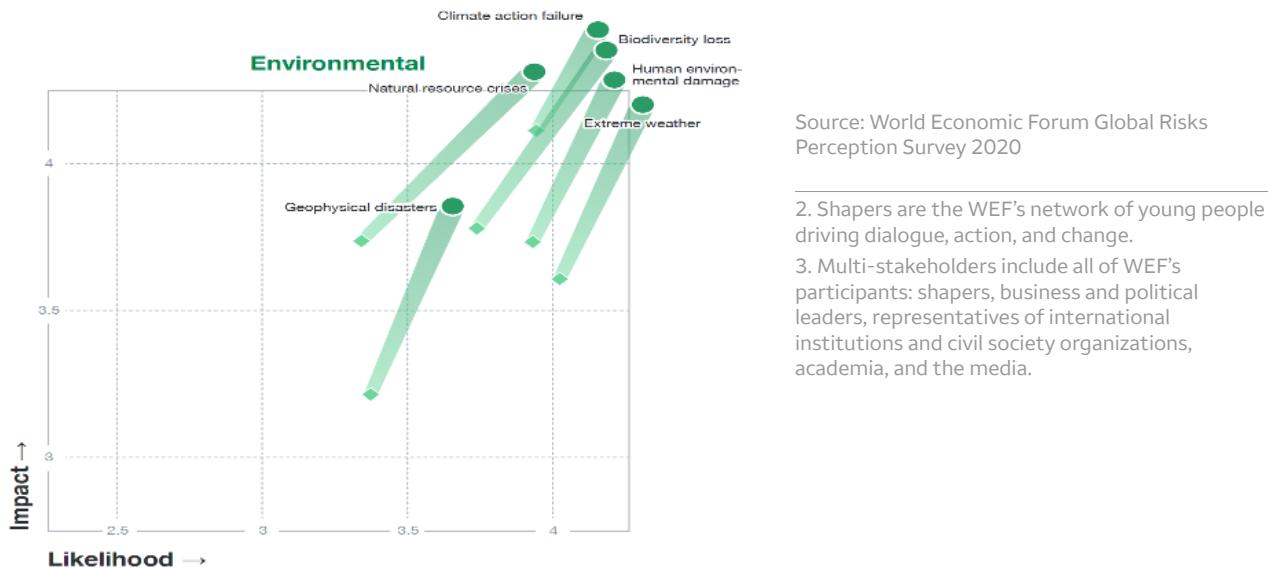
**Figure 1. Evolving global risks: Top global risks by impact**



Source: World Economic Forum Global Risks Perception Survey 2020. Water risk was categorized as “Environmental” in 2014 and re-categorized as “Societal” in 2015.

The survey results also highlighted a stark difference in the perception of environmental risks between WEF’s youth respondents (global shapers community)<sup>2</sup> and multi-stakeholders.<sup>3</sup> Figure 2 shows that the youth respondents rated climate-related risks (including water risk, a component of “natural resource crisis”) as the most likely and most impactful long-term risks.

**Figure 2. Environmental risk assessment: Shapers (youth) vs. multi-stakeholders**

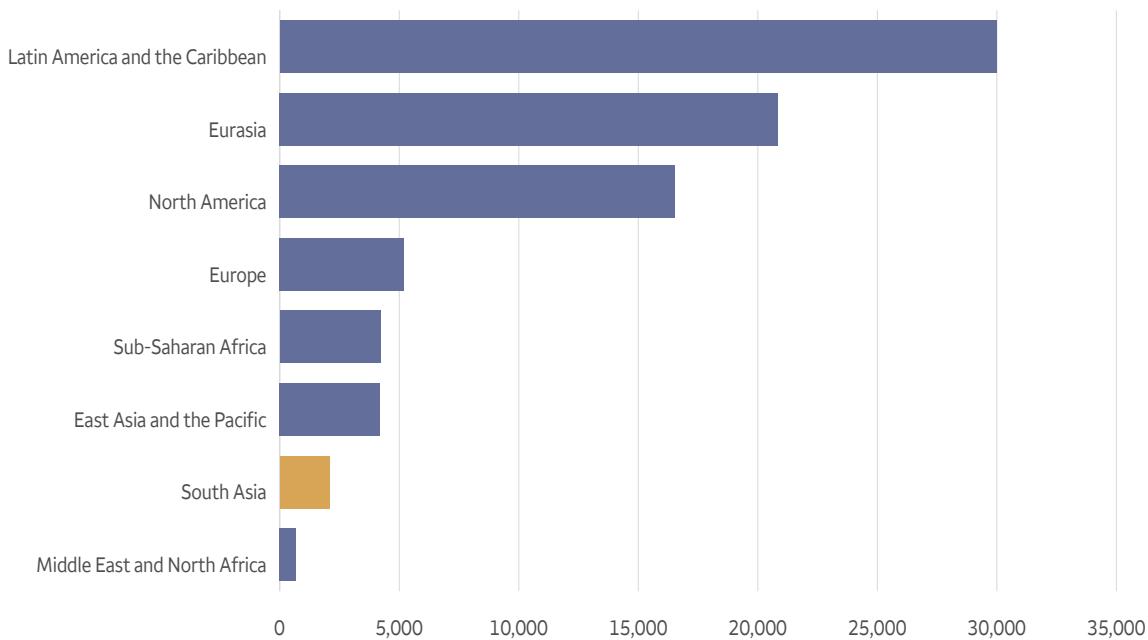


# South Asia: Rising water risks

In February 2012, the U.S. intelligence community produced a report to assess global water security related to water shortages, poor water quality, and floods.<sup>4</sup> The report warned that by 2040, fresh water availability would not keep up with demand unless effective water management approaches were adopted by key countries. It also stated that water problems would hinder the ability of these countries to produce food and generate energy, posing a risk to global food markets and weighing on economic growth. The report concluded that as a result of demographic and economic development pressures, North Africa, the Middle East, and South Asia would face major challenges coping with water problems that would lead to regional tensions, social unrest, and eventually state failure.

South Asia consists of Afghanistan, Pakistan, India, Nepal, Bhutan, Bangladesh, the Maldives, and Sri Lanka. This region comprises about 2 million square miles, representing 11.7% of the Asian continent and 3.5% of the world's land surface area. The population of South Asia is about 1.9 billion—approximately one-fourth of the world's population—making South Asia both the most populous and the most densely populated geographical region in the world. Astoundingly, even though the region is home to around a quarter of the global population, it has less than 5% of the world's renewable water resources. South Asia's fresh water resources (roughly 2,000 cubic meters per person per year) are less than any other region's with the exception of the Middle East and North Africa (Figure 3).

**Figure 3. Total renewable water resources per capita (m<sup>3</sup>/person/year)**



Source: FAO 2017 and AQUASTAT database. AQUASTAT website accessed on Nov. 5, 2020.

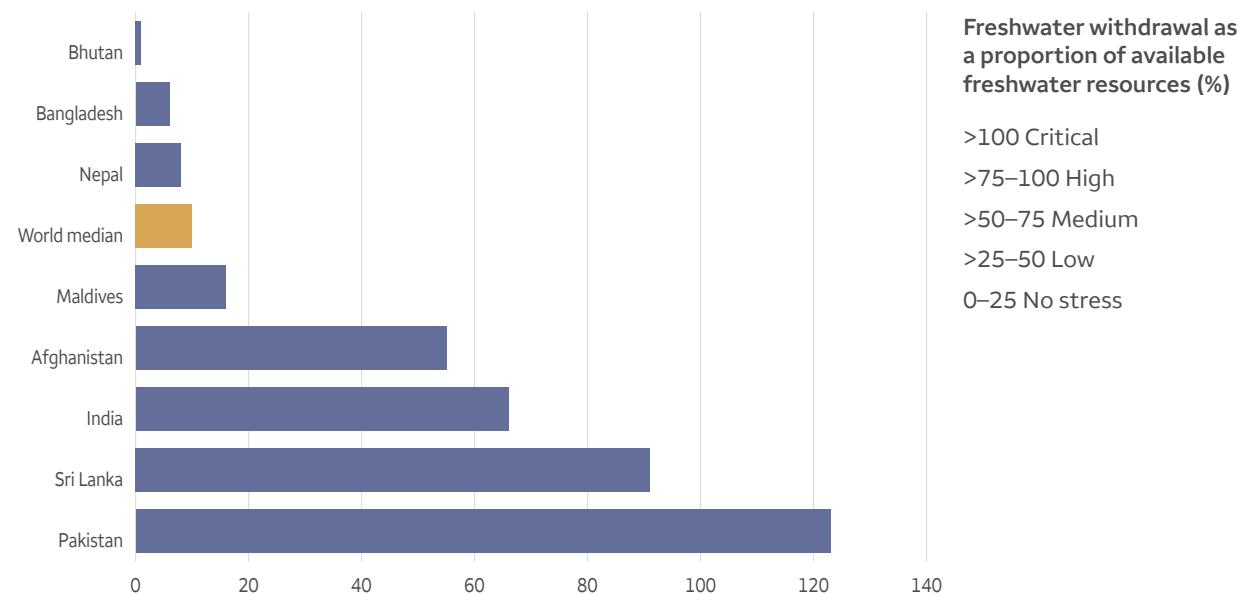
Within the region, India, Pakistan, Sri Lanka, Afghanistan, and the Maldives are all severely affected by the shortage of fresh water supply.

4. "Global Water Security," U.S. Intelligence Community Assessment, February 2012

The United Nations (UN) Sustainable Development Goals (SDG) provide a framework for governments to develop policies and programs to target today's most urgent issues and for civil society to hold governments accountable. SDG 6, a set of indicators dedicated to water and sanitation, seeks to ensure the availability and sustainable management of water and sanitation for all. In particular, the SDG 6.4.2 Indicator tracks the level of water stress, which is defined as fresh water withdrawal by all economic activities as a proportion of available fresh water resources.

Pakistan, Sri Lanka, India, and Afghanistan are all facing severe water scarcity, and their respective water stress scores are significantly above the world median (Figure 4). More specifically, 70% of the population in this area (roughly 1 billion people) were exposed to water scarcity as of 2000, and by 2050, exposure to this risk is projected to grow to nearly 1.7 billion people, or 81% of the area's projected population (Gosling & Arnell 2016).

**Figure 4. SDG 6.4.2. water stress**



Sources: FAO 2017 and AQUASTAT database. AQUASTAT website accessed on Nov. 5, 2020.

Figure 5 quantifies how different sectors of the economy in each South Asia country are influenced by water stress.

**Figure 5. Water stress scores in South Asia countries**

Country	Water stress (sector scores)			Water stress (total score)	Overall ranking
	Agricultural	Municipal	Industrial		
India	4.16	3.37	3.79	4.12	13
Pakistan	4.06	3.6	3.64	4.05	14
Afghanistan	3.82	3.06	2.44	3.8	27
Nepal	3.18	2.92	3.32	3.17	40
Sri Lanka	1.66	1.67	1.66	1.66	77
Bangladesh	0.44	0.33	0.31	0.43	128
Bhutan	No data	No data	No data	No data	-
Maldives	No data	No data	No data	No data	-

Sources: Aqueduct, World Resources Institute (WRI)

Water stress scores are explained in Figure 6. In short, higher values indicate more competition among users.

**Figure 6. Mapping of water stress scores**

Water stress score	Value (water withdrawals/available flow)
[0-1)	< 10% (low)
[1-2)	10 to 20% (low to medium)
[2-3)	20 to 40% (medium to high)
[3-4)	40 to 80% (high)
[4-5)	> 80% (extremely high)

Sources: Aqueduct, WRI

The WEF's report, "Regional Risks for Doing Business 2019,"<sup>5</sup> ranked water crises as the #1 risk for doing business in South Asia (Figure 7). Water crises was the #5-ranked issue for the region in 2018 but rose to being the #1 risk in 2019. At a country level, water crises ranked as the highest risk factor across all countries in the subcontinent: India, Pakistan, and Sri Lanka.

**Figure 7. Top 10 risks in South Asia (2019)**

<b>1. Water crises</b>
2. Terrorist attacks
3. Manmade environmental catastrophes
4. Failure of urban planning
5. Energy price shock
6. Deflation
7. Unemployment or underemployment
8. State collapse or crisis
9. Fiscal crises
10. Asset bubble

Source: WEF

During recent years, demand for water has been increasing due to growing populations, economies, industries, urbanization, and hydropower development in South Asia. However, water supplies in this region have become more unreliable, mainly driven by three risks:

- Viability of monsoons and climate change
- Low water-storage capacity and low efficiency in irrigation systems
- Over-exploitation of ground water

5. The [report](#) offers a business perspective on the impact of global risks and illustrates how they are experienced differently across regions.

## Viability of monsoons and climate change

In South Asia, rainfalls are accompanied by high temporal and spatial variations. About three-quarters of the region's annual precipitation occurs during monsoon seasons (Hasanain et al. 2013). This results in excess surface water during monsoon seasons and water shortfall in other seasons of the year.

This situation has worsened in recent years because of climate change. During 2018 and 2019, India and Pakistan experienced severe heat waves, with measured temperatures climbing to 50 degrees Celsius (122 degrees Fahrenheit). The prolonged heat waves caused extreme droughts, widespread crop failures, and water shortages across both countries.

In contrast, during monsoon seasons, severe rains have brought in cyclones, flooding, and landslides, which have destroyed houses, dams, and infrastructure. In August 2017 alone, intense monsoon rains affected 40 million people in Bangladesh, India, and Nepal, claiming nearly 1,300 lives and putting 1.1 million people in relief camps. It's been estimated that by 2030, floods could cost South Asia as much as \$215 billion each year (UNESCAP/ADB/UNDP, 2018).<sup>6</sup> Also of concern is the possibility that floods might contaminate water sources, destroy sanitation facilities, and limit access to sustainable water and sanitation services.

According to the global climate-risk report from Germanwatch (Eckstein et al. 2020), India and Sri Lanka ranked #5 and #6 on the "Top 10 most-affected countries in 2018" list, and Pakistan and Nepal ranked #5 and #9 on the "Long-Term Climate Risk Index." Figure 8, from the World Bank and the International Water Management Institute, lists the ranking of climate-related risks for each country (Hirji et al. 2017).

**Figure 8. Climate-related risks for countries in South Asia**

Risk level	Afghanistan	Bangladesh	Bhutan	India	Nepal	Pakistan	Sri Lanka
<b>High</b>	Flash flood Landslide Riverine flood	Riverine flood Storm/cyclone Coastal flood Siltation	Landslide Flash flood GLOF*	Drought Riverine flood Flash flood Groundwater depletion	GLOF Flash flood Landslide	Drought Groundwater depletion Landslide	Storm/cyclone Riverine flood Coastal flood
<b>Medium</b>	Drought Erosion/ siltation Groundwater depletion	Erosion Drought Groundwater depletion Coastal aquifer salinization	Erosion/ siltation Riverine flood Drought	Landslide Storm/cyclone Coastal aquifer salinization	Drought Erosion/ siltation Groundwater depletion	Riverine flood GLOF Flash flood Erosion/ siltation Groundwater salinization	Flash flood Landslide Erosion/ siltation Drought Coastal aquifer salinization
<b>Low</b>	GLOF Storm/cyclone	Flash flood Landslide	Storm/cyclone Groundwater depletion	GLOF Erosion/ siltation	Riverine flood Storm/cyclone	Coastal flood Storm/cyclone	Groundwater depletion

\*GLOF = Glacial lake outburst flood

Sources: The World Bank and the International Water Management Institute

6. Unless otherwise noted, all currency amounts mentioned throughout are in U.S. dollars.

## Low water-storage capacity and low efficiency in irrigation systems

Due to the risks driven by declining viability of monsoons and recent climate change, surface-water storage and irrigation systems are of critical importance for South Asia countries. However, the irrigation efficiency in South Asia is low (less than 40%, Rohwer et al 2007).

Since 1960, a lot of effort has been put into building surface-water irrigation systems. However, due to poor maintenance, many large-scale irrigation sites have deteriorated rapidly. In 2002, India's government decided to launch the National River Linking Project to transfer water from water-abundant regions to water-scarce regions of the country. This project has been criticized widely due to its negative environmental impacts, such as widespread waterlogging, salinization, and the resulting desertification in areas where large irrigation projects have been underway. In Pakistan, very little progress has been made on efforts to achieve agreements among provinces regarding the construction of additional dams and reservoirs (Hasanain et al. 2013).

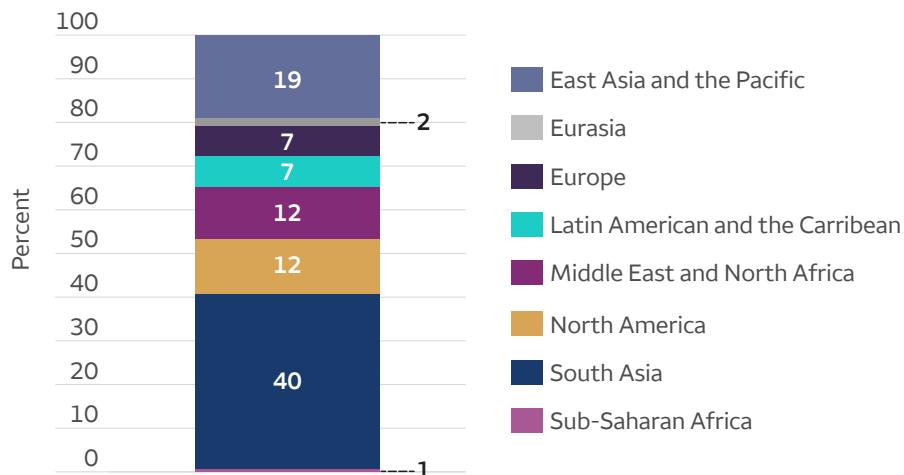
Development of groundwater irrigation systems, which is less restricted by topography and hydraulics, has attracted significant private investment and has recently been playing a key role in the region. The amount of area irrigated by groundwater has been rising in South Asia.

## Over-exploitation of groundwater

Given the acceleration of this trend, South Asia is facing the risk of groundwater over-exploitation. Groundwater is precious—and critical for agriculture. Compared with surface water, it's more resilient to climate change and less prone to pollution. In South Asia, it's also a key resource of piped drinking water for cities and rural areas. When the rate of groundwater extraction exceeds recharge possibilities, groundwater depletion will gradually occur. Should this happen, agricultural output, direct human consumption, and the balance of the ecosystem's structure will be negatively affected. However, it's not easy to detect over-exploitation of groundwater until some damage can be observed.

In South Asia, roughly 344 cubic kilometers of groundwater are withdrawn annually, accounting for 40% of global usage (Figure 9). Groundwater in this region has been depleted more quickly than is socially optimal—as highlighted by World Bank economist Hanan Jacoby in a Policy Research Talk<sup>7</sup>—and has resulted in a rapid decline in water tables.

**Figure 9. Fresh groundwater withdrawal**



Source: FAO 2017 and AQUASTAT database. AQUASTAT website accessed on Nov. 5, 2020.

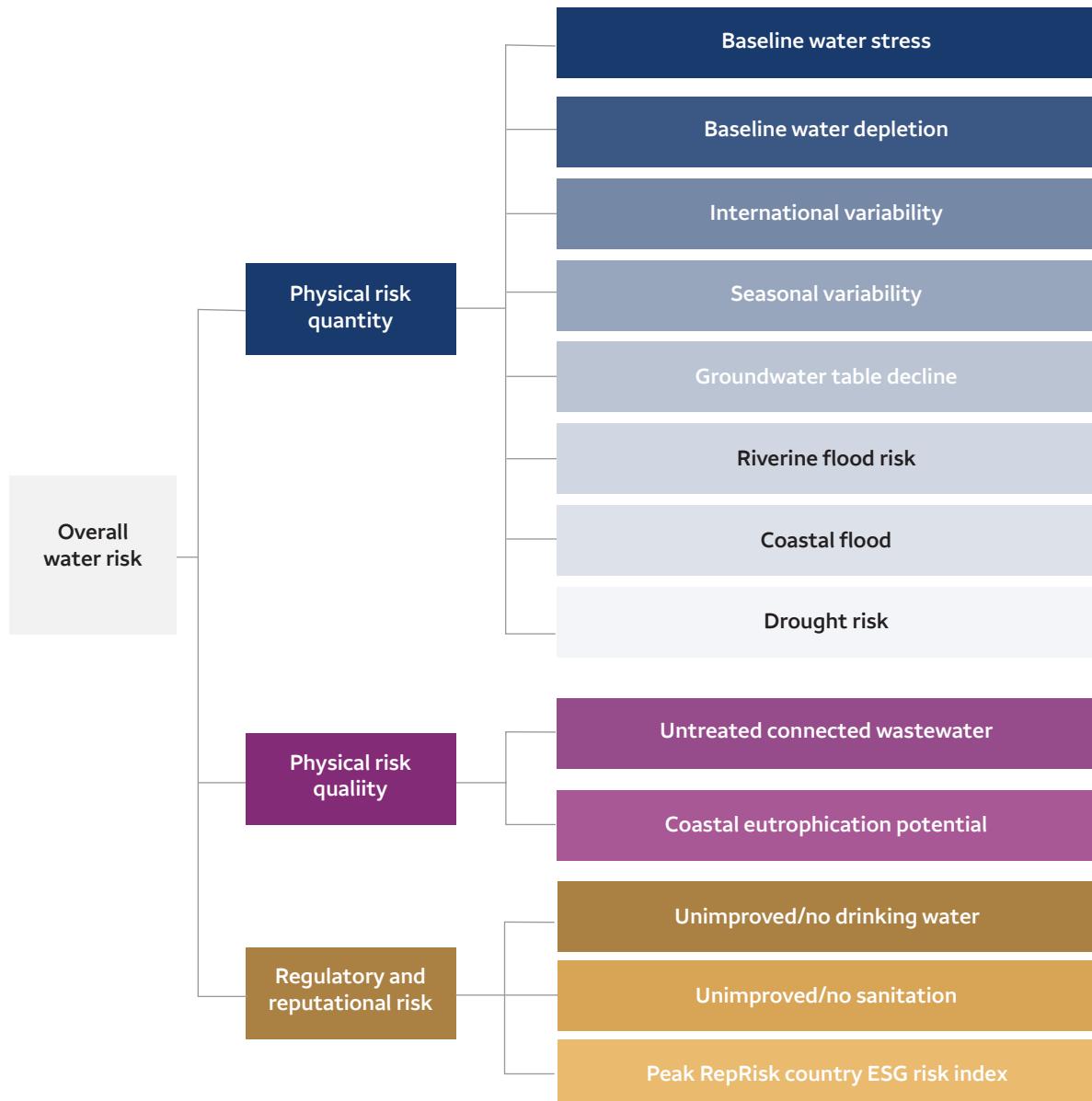
7. "Drilling Down into South Asia's Groundwater Dilemma," worldbank.org, May 27, 2015

# Water risk framework

WRI has built a comprehensive water risk framework called Aqueduct which organizes multiple water-related risk indicators into categories of risk. This allows the creation of a composite index that brings together these multiple dimensions of water-related risks into comprehensive aggregated scores (Luo et al. 2015)<sup>8</sup>

The framework has three hierarchical levels, as shown in Figure 10, and covers 13 indicators of various types of water risk. The indicators are then grouped to calculate the grouped water-risk scores for “physical risk quantity,” “physical risk quality,” and “regulatory and reputational risk” using a weighting scheme. Finally, the three groups are combined into a single, overall water risk score.

Figure 10. Aqueduct's water risk framework

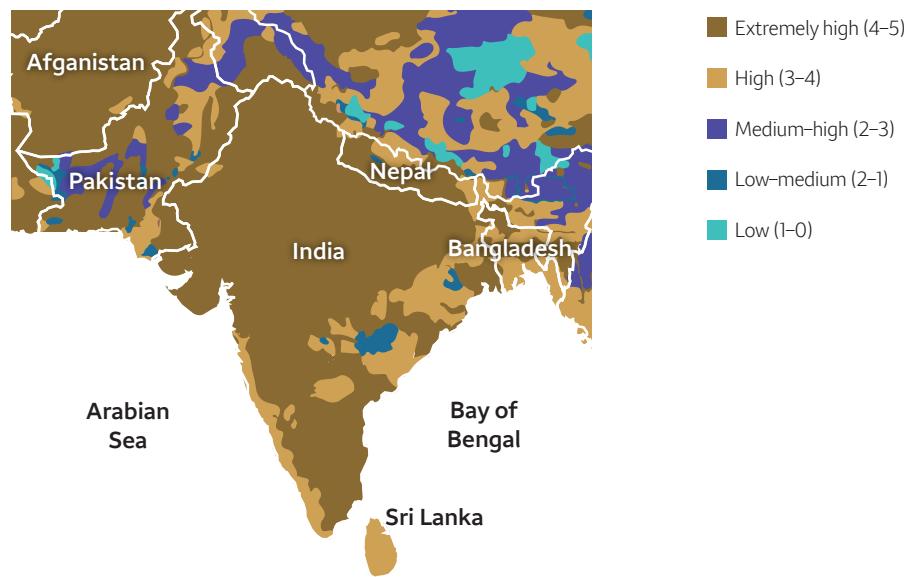


Source: WRI's Aqueduct tool

8. WRI's Aqueduct water risk framework enables rapid comparisons across diverse aspects of water risk by quantifying a variety of multidimensional water-related measures.

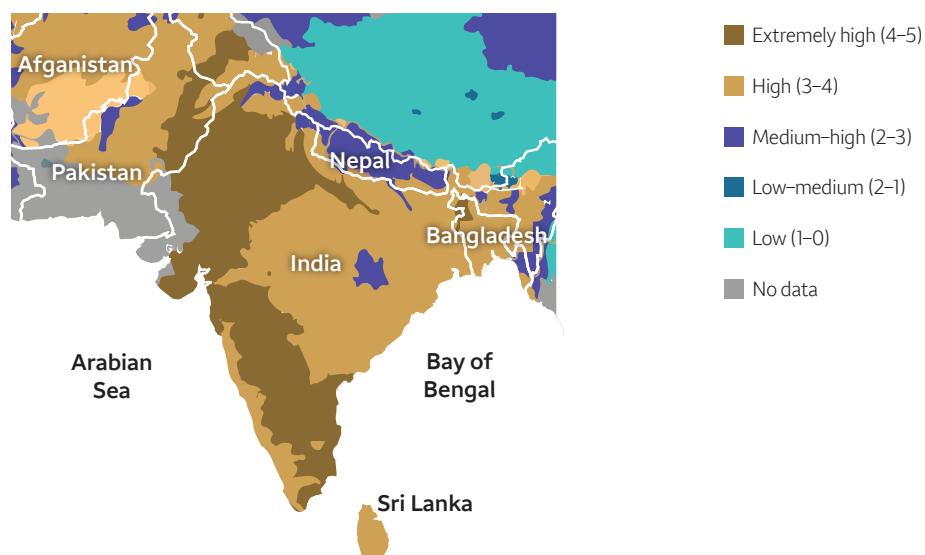
Figures 11–13 provide geographical views of how different aspects of water risk are affecting South Asia. “Overall water risk” measures all water-related risks by aggregating all indicators within the “physical risk quantity,” “physical risk quality,” and “regulatory and reputational risk” categories. Drought risk is one of the indicators in the “physical risk quantity” category, which measures where droughts are likely to occur, where the population and assets are exposed, and the population’s/assets’ degree of vulnerability to adverse effects. “Physical risk quality” measures the risks related to water that’s unfit for use by aggregating all of the indicators within that category. For all measurements, higher values indicate higher corresponding risks.

**Figure 11. Overall water risk in South Asia (baseline)**



Source: WRI’s Aqueduct tool tool, as of March 31, 2021

**Figure 12. Drought risk in South Asia (baseline)**



Source: WRI’s Aqueduct tool tool, as of March 31, 2021

**Figure 13. Physical risks quality in South Asia (baseline)**



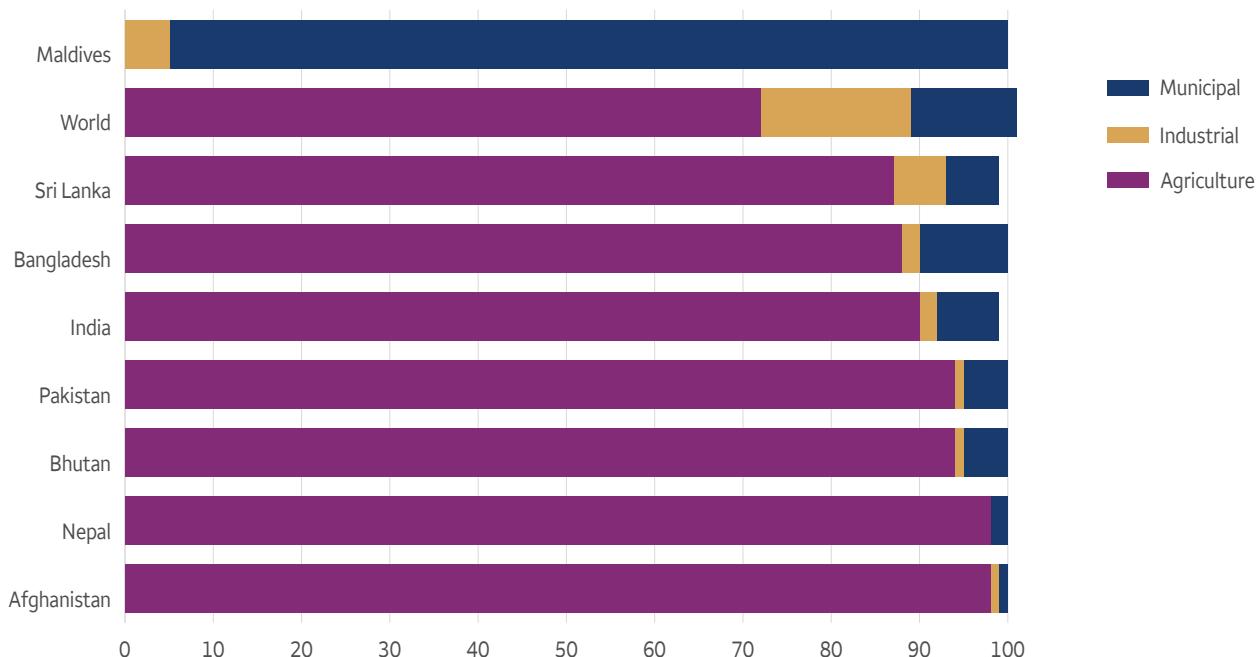
Source: WRI's Aqueduct tool tool, as of March 31, 2021

## South Asia: Impact of water risks

Water scarcity is likely to adversely affect South Asia's economic growth across multiple sectors, including agriculture, industry, and human consumption.

Agriculture is the primary source of livelihood in South Asia and is also the largest consumer of fresh water. Out of the 1,012 cubic meter of fresh water withdrawn in South Asia every year, 91% is used in agriculture—much higher than the 70% global percentage for agricultural use (Figure 14).

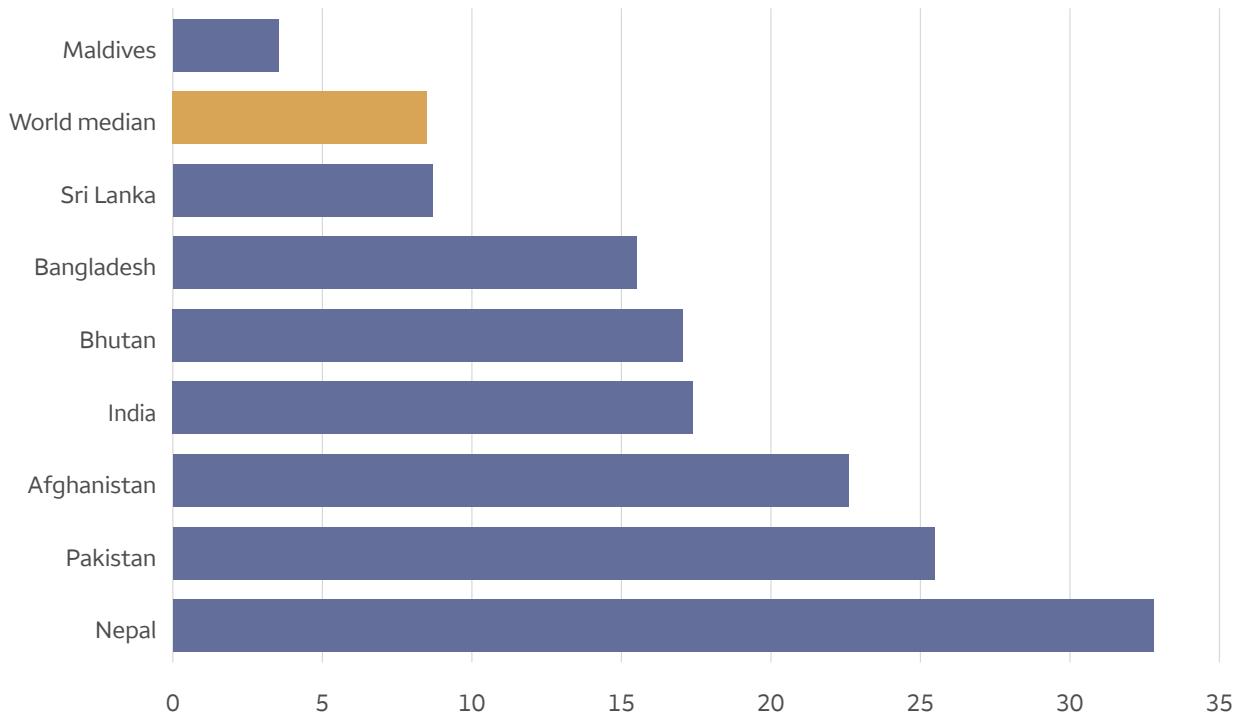
**Figure 14. Percentages of total water withdrawn by sector**



Source: FAO 2017 and AQUASTAT database. AQUASTAT website accessed on Nov. 5, 2020.

Further, because agriculture delivers a significant percentage of gross domestic product (GDP) in South Asia (Figure 15) and is responsible for significant levels of employment, water is of paramount importance.

**Figure 15. Agriculture, value added (% GDP)**



Source: FAO 2017 and AQUASTAT database. AQUASTAT website accessed on Nov. 5, 2020.

Water scarcity and stress in South Asia will likely have a large negative impact on agricultural productivity and efficiency if no actions are taken, potentially leading to higher poverty levels and declining GDP. Chaturvedi (2015) estimated that India's major food crop losses could reach \$208 billion and \$366 billion in 2050 and 2100, respectively.

The negative impact is widely observed in other sectors as well. For example, almost 90% of India's thermal power generation depends on fresh water for cooling (CEA, 2017). Fresh water consumption from India's thermal utilities increased by 43% from 2011 to 2016 while withdrawals stayed fairly stable (Luo, 2017). WRI research shows that 40% of India's thermal power plants are in high water-stress areas, thus facing shutdown threat, and the percentage could grow to 70% by 2030 (Luo et al. 2018).

Water also presents geopolitical challenges in the region. While there are bilateral arrangements between India and Pakistan regarding the Indus River and between India and Bangladesh regarding the Ganges River, water is a potential weapon in cross-border disputes. Countries at times have threatened to cut off flows to other countries due to violent outbreaks in disputed territories. In addition, China—where the headwaters of several major rivers are located—has been building hydroelectric dams that have caused political friction, particularly with India.

Ahmed and Suphachalasai (2014) assessed the economic costs associated with impacts of climate change through a three-step quantitative model:

1. Regional climate modeling
2. Physical impact assessment
3. Economic assessment

Sectors evaluated by Ahmed and Suphachalasai included agriculture, energy, forests and other ecosystems, health, and water. According to their estimates, Bangladesh, Bhutan, India, Nepal, and Sri Lanka face potentially meaningful losses (Figure 16).

**Figure 16. Projected losses by 2050**

	Annual GDP losses (%)	Average total annual economic losses (%)
<b>Bangladesh</b>	2.0	9.4
<b>Bhutan</b>	1.4	6.6
<b>India</b>	1.8	8.7
<b>Nepal</b>	2.2	9.9
<b>Sri Lanka</b>	1.2	6.5

Source: Ahmed and Suphachalasai (2014)

In Nepal, a government-led Economic Impact Assessment estimated that climate change has a direct cost to annual GDP of 1.5% to 2.0% (\$270 million to \$360 million per year in 2013 prices) and increases to a 5% annual GDP cost in extreme years (IDS-Nepal, 2014).

# Case study: Republic of India

Water issues render an underappreciated set of risks and opportunities for India. India is the largest; the only investment grade-rated; and, arguably, the most successful economy in South Asia. Many investors have been highly optimistic on India's prospects for sustaining and even accelerating its growth rate into the future. But delving deeper and comparing India with both its South Asia peer group and emerging market peers, weaknesses emerge. For example:

- India's per-capita GDP of roughly \$7,000 (purchasing power parity basis) lags Sri Lanka's and is substantially below China's as well as several Latin America countries', like Mexico and Colombia. Much of India's lower per-capita GDP relative to other countries can be explained by the high variation in living standards across the country: Urbanized India has grown materially faster than rural India, and incomes in the larger cities can be more than 10 times higher than incomes in the hinterlands.
- While India has enjoyed food security to support its growing population, industrialization and migration to big cities, subsistence agriculture, and the low productivity of smaller farms have substantially constrained rural development and contributed to high poverty rates.
- Despite material improvements in recent decades, India still lacks a continuous water supply in many urban and rural areas. Access to sanitation and safe drinking water has remained limited for significant segments of the population, hindering overall development and the ability to lift more citizens out of poverty.
- Historically, India's inflation has been high and volatile compared with investment-grade peers. This has been driven partly by infrastructure gaps, reliance on fossil fuel imports, and volatile food prices due to the country's exposure to frequent droughts, floods, and other physical risks.
- From a financial standpoint, India has enjoyed self-sufficiency with strong foreign currency reserves and a limited external debt, especially in the public sector. Attractive growth opportunities have supported a moderate current account deficit via continued foreign direct investment inflows.
- Internal resources, on the other hand, have been constrained by high general government deficits and debt relative to GDP, disparities among states, and significant bad loans that have restricted banks and have required ongoing capital injections from the government.

Prior to the pandemic, Prime Minister Narendra Modi's government had been working to accelerate India's reform path in order to promote growth. Reforms of bankruptcy and labor laws, agriculture practices, and health care; liberalization of foreign direct investment; privatization of state businesses; a rebalancing of taxes toward consumption and away from corporate taxes; digitalization of government services; and financial reforms like demonetization and implementation of inflation-rate targeting were all designed to bring greater efficiency and productivity to the economy. Yet, some of the reforms as well as more challenging external conditions posed a near-term cost: Real GDP growth slowed to 4.2% during 2019, the slowest pace in 11 years. The combination of weakened GDP and disinflation have increased strains on the government's budget and debt sustainability.

While it's too soon to judge India's performance exiting the pandemic, initial signs look promising. Buoyed by abundant global liquidity and an increase in the domestic savings rate, foreign exchange reserves have risen sharply, and interest rates and inflation are at historically low levels. A return to growth in late 2020 sets the stage for a strong recovery over the next few years, especially as some of the pain from the initial implementation of reforms has already been absorbed. Focus will likely turn to the government's infrastructure development goals. There are ambitious plans for roads, bridges, electrification, decarbonization, and greening of the economy, along with improving housing, and, importantly, water and sanitation issues. These provide key opportunities to solidify the medium-term growth trajectory while improving productivity and reducing income inequality.

# Closing summary

Water crises have been a severe risk for the economic growth of South Asia and for the 1.9 billion people living in this region. However, the declining viability of monsoons and recent climate change have expanded drought and flood risks for multiple countries in the region. The effects of these risks are amplified due to minimal water-use efficiencies in the region. Over-exploitation of groundwater is also posing a long-term risk for agriculture, human consumption, and the ecosystem. The negative impact of water stress is likely to be experienced across multiple sectors. If no action is taken, this could eventually be reflected by severe loss of human life, productivity, and GDP, starting in South Asia and reverberating around the globe.

While different aspects of water risk might influence countries and economies through different channels and over different time horizons, a systematic approach to combine various dimensions of water risk and evaluate the overall impact on various sectors, industries, and financial securities is warranted. This not only helps us better control the exposure of our clients' portfolios to these risks, it also gives us a better perspective and systematic view of potential future impacts and investment opportunities.

At Allspring, we believe water risk should be considered a key investment risk. To this end, we incorporate water stress and other climate-related risks as key factors in Allspring's Sovereign ESG risk analysis framework. We understand water risk is a dynamic issue, and we continually update our views by taking into account the latest information available. We evaluate both credit and non-credit risks for water and climate positioning alongside their materiality in each case. This information is then integrated into our investment process for emerging markets' sovereign debt during the portfolio construction process, providing us the ability to consider these very real issues for sovereign nations and for the world.

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