GLOBAL WATER TRENDS AND RISK HOTSPOTS

As with most energy sources, coal-related industries—including mining, coal-to-chemicals, and power generation—are extremely water-intensive. Coal mines depend on water to extract, wash, and process coal, while coal-burning power plants need water to create steam and for cooling. Use varies widely at different plants depending on their generating and cooling technologies. In the U.S., for example, dry cooling, when employed, requires small amounts of water for system maintenance and cleaning. Once-through cooling systems withdraw the most water—between 20,000 gal/MWh (75.7 m3/MWh) and 50,000 gal/MWh (189.3 m3/MWh). They consume far less—between 100 gal/MWh (0.4 m3/MWh), and 317 gal/MWh (1.2 m3/MWh). (The difference in water withdrawal and consumption is explained in the sidebar). Without effective regulatory enforcement and long-term water–resource management, water–energy choke points create uncertain financial risks to companies and investors.

Like much of the world's energy supply, the coal industry's thirst is especially concerning when you consider global water trends and risk hotspots.

According to WRI's Aqueduct Water Risk Atlas, water stress—taking into account agricultural, industrial, and domestic users (Figure 3)—is growing worldwide. Baseline water stress was more prevalent and more severe in every continent in 2010 than it was in 2000, particularly in China, South and Central Asia, and the U.S. west coast. This increased stress can be attributed to a growing demand for freshwater and supply shortages caused by shifting global precipitation patterns from climate change, among other factors.7

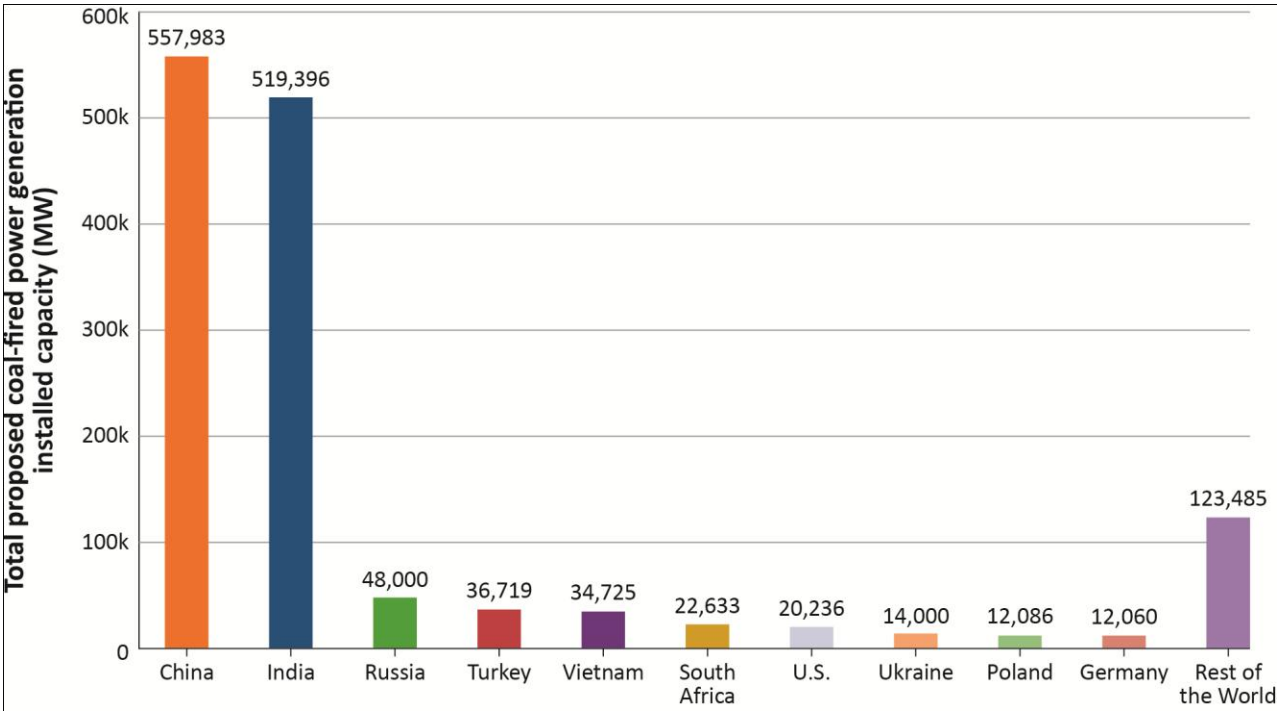

Figure 2. Global Proposed New Coal-fired Power Generation Capacity as of June 2012 (Source: WRI)

As well, more than 50 percent of the world's largest coal-producing/consuming countries face high to extremely high levels of water stress, which can be attributed to the many competing demands on water resources.

WRI developed a country-level water stress measurement that identifies where agricultural, domestic, and industrial users are withdrawing water. This is important, since water supply and demand varies significantly within a country, from dry prairies to lush rainforest and from industrial megacities to rural townships. High to extremely high stress indicates that farms, municipalities, and industries nationwide already account for at least 40 percent of the water naturally available to them, based on a weighted average. That fact can pose significant hurdles for energy producers and other water-intensive businesses.

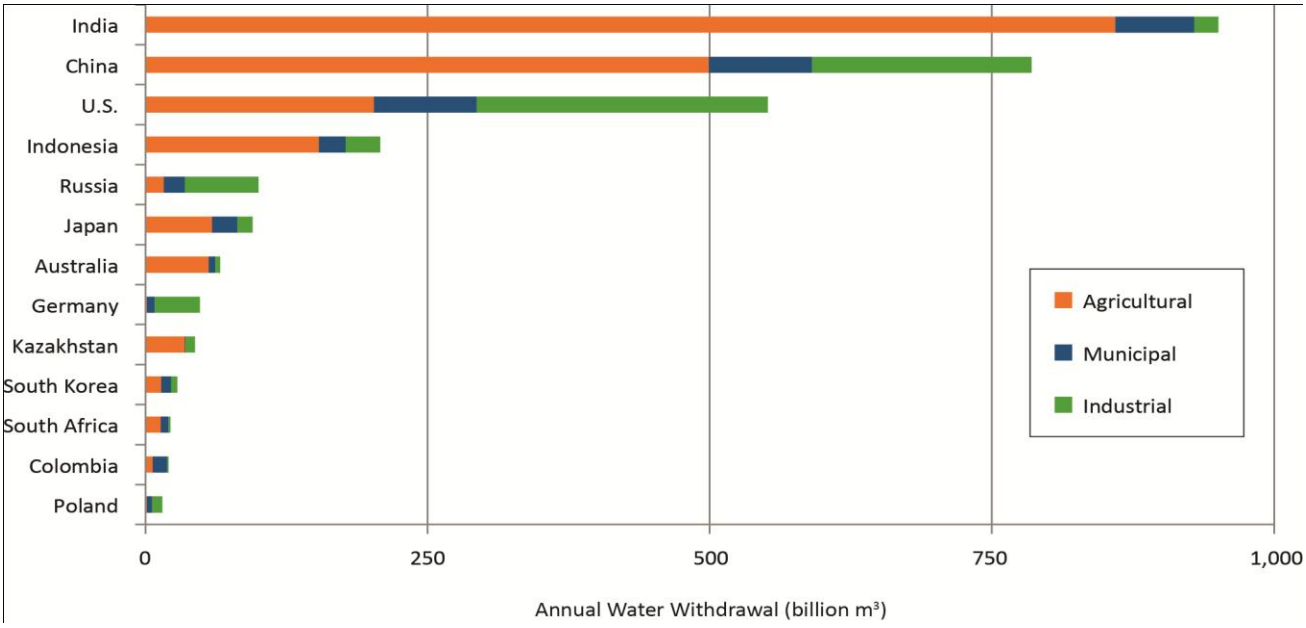

Figure 3. 2010 Water Withdrawal by Sector of Major Coal-producing/consuming Countries (Source: WRI Aqueduct)

Additionally, nearly half of the seven most water-stressed countries also face high to extremely high seasonal variability (Table 3); in each of these countries, the water supply varies dramatically between wet and dry seasons within a year.

That volatility can disrupt operations and increase production costs. For example, a drought in Texas in 2011 placed exceptional stress on the power grid, and the state only avoided blackouts by placing restrictions on farmers and ranchers with senior water rights, showing the tension on the water resources from the competing demands of primarily agriculture and energy.

Water stress is not limited to geographically dry countries. Indonesia, South Korea, and Japan—all coal producers/users—are classified as highly water-stressed because they use more than the annually available surface freshwater supply for city, agricultural, and industrial development. Because naturally occurring, renewable freshwater cannot meet these countries' needs, their cities are heavily dependent on costly alternative water sources, such as groundwater, seawater desalination, and inter-basin transfers. The more dependent an area is on alternative freshwater sources, the higher the water-related risks to its financial assets.

These risks can be wide-ranging, as Société Générale outlined in an October 2013 report.1 The report found that limited access to water-supply sources can disrupt operations. Cutting water-allocation permits due to insufficient water in an area can delay project development. Securing new water sources is often an expensive process, increasing project costs.

Possible up-front investments—which can reduce those long-term costs—include efficiency, recycling, and wastewater treatment to meet regulatory requirements meant to protect stressed resources. Companies could avoid all those issues with sufficient naturally occurring supplies. However, as demand exceeds renewable supplies, alternative sources and all their associated issues come to the forefront.

Ranking	Country	Water Stress Level	Seasonal Variability
1	Kazakhstan	Extremely High	High
2	India	High	Extremely High
3	South Korea	High	High
4	Australia	High	Low to Medium
5	Indonesia	High	Low to Medium
6	Japan	High	Low to Medium
7	South Africa	High	Medium to High
8	China	Medium to High	Medium to High
9	U.S.	Medium to High	Low to Medium
10	Germany	Low to Medium	Low
11	Poland	Low to Medium	Low
12	Russia	Low to Medium	Low to Medium
13	Colombia	Low	Low to Medium

Table 3. Water Stress and Seasonal Variability Levels of Major Coal-producing/consuming Countries

Source: http://endcoal.org/resources/identifying-the-global-coal-industrys-water-risks/?ref=water