

How the Coal Industry is Aggravating the Global Water Crisis

In its *Global Risks Report 2015*, the World Economic Forum stated “water security is one of the most tangible and fastest-growing social, political and economic challenges faced today.”¹ Out of all industrial production, the coal industry represents one of the greatest demands on fresh water resources. The entire coal supply chain, including extraction, washing, coal-fired power and coal-to-chemical consumes enormous quantities of water. Moreover, in recent years, the coal industry has rapidly accelerated and further exacerbated the global water crisis.

In order to better understand the link between the coal industry and water supplies, especially coal-fired power plants’ impact on water resources, Greenpeace have released the report *The Great Water Grab: How the coal industry is deepening the Global Water Crisis*, the first global plant-by-plant study of the coal industry’s current and future water demand.

Greenpeace International commissioned the Dutch engineering consultancy Witteveen+Bos to develop a model to calculate the existing and growing fresh water withdrawal and consumption (hereafter referred to as water demand) from coal-fired power plants and coal mining, and to analyse the detailed impact of coal-fired power plant water demand on surface freshwater resources.

It combines data on existing and proposed coal-fired power plants as of the end of 2013, drawing mainly from Platts World Electric Power Plant Database and uses the World Resources Institute’s Aqueduct water risk analysis model.

The report reveals that the water demand of the coal industry, including mining, washing and coal-fired power as well as the treatment of combustion waste, around the world is enormous. It estimates that every year the world’s 8,359 coal-fired power plant units consume enough water to meet the most basic needs of more than 1 billion people. Further, the coal industry’s effects on water-deficient areas in the near future poses the most serious threat to water security around the world.

China faces a particularly severe coal-water conflict. Coal power plants China, consuming a total of 7.4 billion m³ of water every year. Already water-deficient areas such as parts of Shandong, Henan, Hebei, Shanxi, Inner Mongolia, Liaoning, Xinjiang and Shaanxi are also rich in coal and sites of coal-fired power plant clusters.

¹ World Economic Forum, Global Risk Report 2015, <http://www.weforum.org/reports/global-risks-report-2015>

Greenpeace has singled out the Kuye Basin, one of the primary tributaries of China's Yellow River, for case analysis. It showcases a typical 'coal-water conflict' situation. The Kuye River Basin flows through Ordos City in Inner Mongolia Autonomous Region and Yulin City in Shaanxi Province, both situated in the Yellow River's 'Energy Golden Triangle'. The research indicates that presently a pointed imbalance between the basin's water supply and demand exists. Severe over-withdrawal of underground water has even meant that areas along the Kuye River have experienced interrupted water flow, resulting in only seasonal water flow.

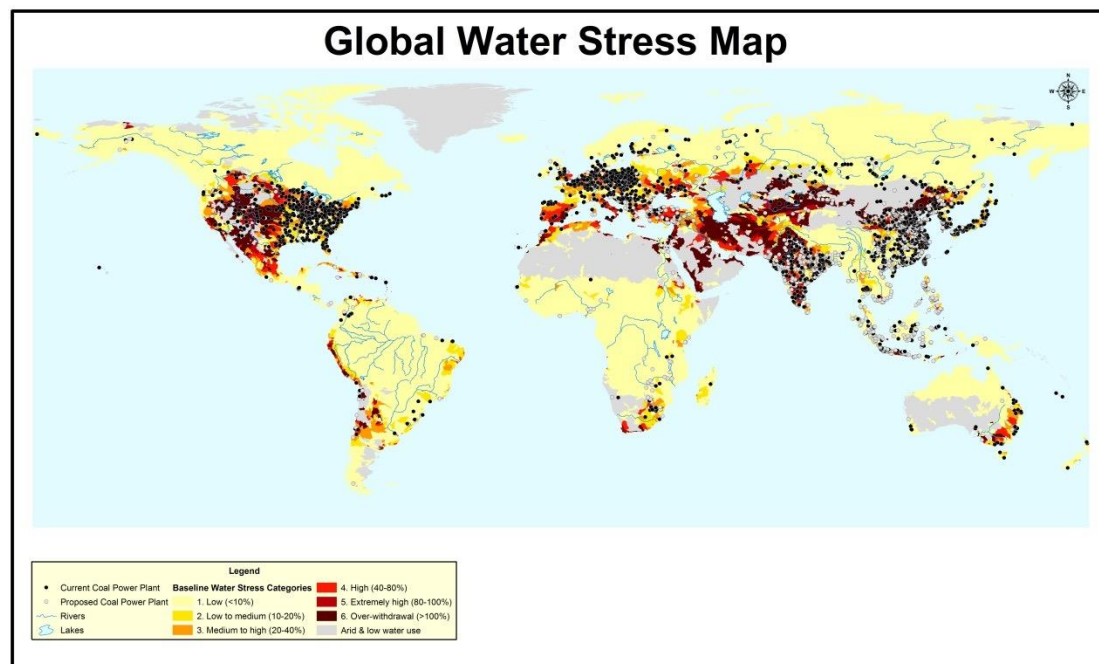
In recent years, coal production has increased drastically, already having a severe effect on aquatic ecology. But the area's coal industry is still expanding. It is anticipated that in 2020, the Kuye Basin's coal industry's water demand alone will exceed the projected total annual water volume of the entire basin.² This means that the coal industry's further expansion will cause increasingly intense water usage competition between domestic, agricultural, ecological, and other industries' needs.

Key Conclusions:

- Coal extraction, washing, coal-fired power and coal-to-chemical require large-scale consumption of water and cause considerable water pollution.
 - According to 2013 end of year data, global coal-fired power plants consume 19 billion m³ of water annually — enough to meet the basic needs of over one billion people.
 - Adding in the amount of water consumed in the process of coal extraction and washing, that number increases to 22.7 billion m³ of water — enough for the basic needs of 1.2 billion people.
- By the end of 2013, a quarter of current coal fired power plants and planned plants were estimated to be located in "over-withdrawal" areas. In these areas humans are withdrawing water from it faster than the waterbody is able to regenerate, posing a serious threat to local ecology.

² Projected total annual water volume as according to the EIA report of the Integrated Plan of the Kuye River Basin. <http://www.yellowriver.gov.cn/zwzc/gzgb/gg/201403/P020140326615862181717.pdf>

The Great Water Grab report includes the following map of baseline water stress with existing coal power plants overlaid.



The shaded areas indicate different baseline levels of water stress, with the brown parts designated as 'water over-withdrawal' areas. Black dots and white dots represent the world's current coal fire power plants and proposed coal power plants respectively as of the end of 2013. Black dots in brown areas, i.e. areas in which coal fire power plants exist in areas of 'water over-withdrawal', are known as "red list" areas.

Greenpeace's analysis of the global coal-water conflict shows that the top 5 countries with the highest water consumption by current coal power plants in red-list areas are, in order, China, India, US, Kazakhstan and Canada. The top 5 countries with the highest water consumption by proposed power plants in their red-list areas are, in order, China, India, Turkey, US and Kazakhstan.

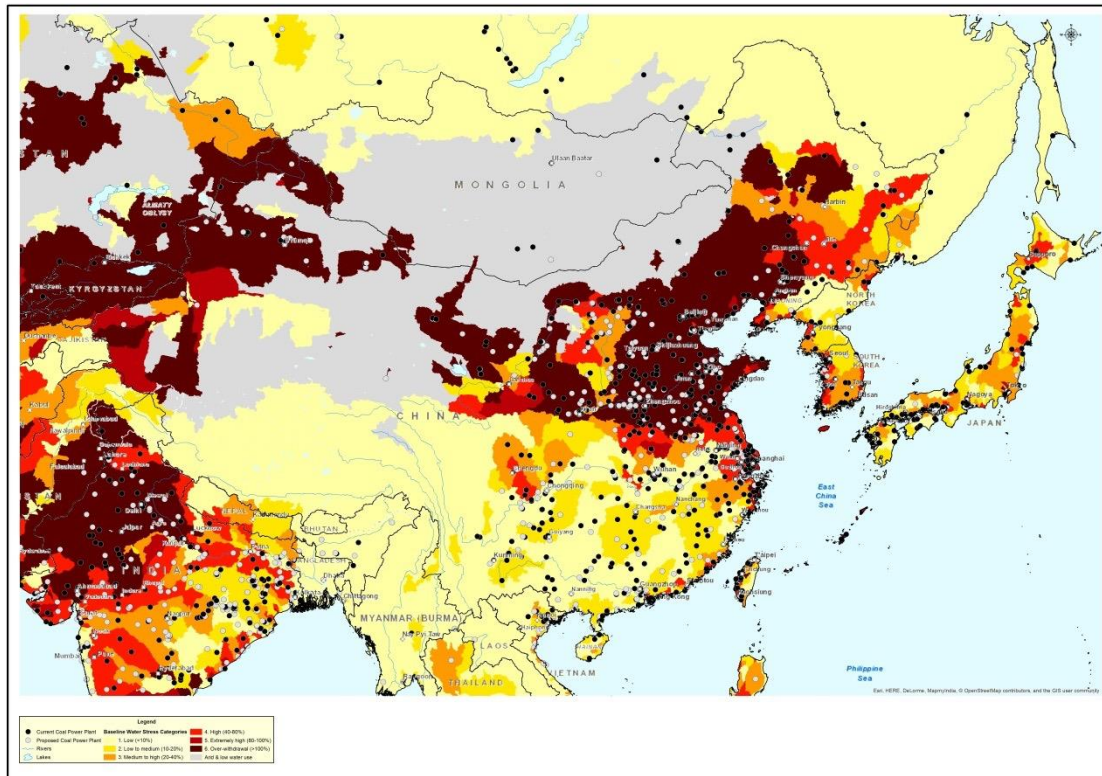
China's Coal-Water crisis

In China, the defining feature of coal resources and water resources is that rich coal resources almost always coincide with limited water resources. The report shows:

- **The scope of 'red-list areas':** China's 'red-list areas' cover large areas of northern China, including parts of Shandong, Henan, Hebei, Shanxi, Inner Mongolia, Liaoning, Xinjiang and Shaanxi.
- **China's 'red-list areas' contain the largest water consumption for coal-electricity worldwide:**
 - At the end of 2013, China had 45% of the world's coal-fired power plants (installed capacity of 358 GW), of which those located in 'red-list areas' had an annual water

consumption of 3.4 billion m³ (water withdrawal of 29 billion m³), equivalent to the basic annual needs of about 186 million people.

- 48% of proposed coal fired-power plants, with an installed capacity of 237 GW, are slated for construction in 'water over-withdrawal' areas, with an annual water consumption of 1.8 billion m³ (water withdrawal 6.5 billion m³), equivalent to the basic annual needs of about 100 million people.



Regional Snapshot of a map of Global Water Baseline Stress

Kuye River Basin Case Analysis

China's Yellow River Basin's coal supply is incredibly rich, but water resources are inversely scarce. Per capita water volume is only 23% of the national average.

The Yellow River's middle section "n" shaped bend is an ecologically fragile area that acts as the river's vital area of replenishment. It contains approximately 25% of China's total coal reserves and is the site of China's large-scale coal bases development plan.

A primary tributary of the Yellow River's middle reaches, the Kuye Basin's range holds some of the richest coal resources, and its coal industry is well-developed as a result. In recent years the area has experienced expansion in the coal industry that has already left the basin's water supplies and aquatic eco-environment seriously affected. Greenpeace East

Asia published the *Kuye River Basin Area's Coal-Water Conflict Study* to point out that:

- There is a strong imbalance between the Kuye Basin's water supply and demand.
- It is assessed that the coal industry's water demand in the Kuye River Basin area in 2020 will reach 198.06 million m³, far exceeding the region's EIA projected total water volume of 188.45 million m³ within the basin. This will seriously exacerbate water conflict. Aside from continuing the withdrawal of underground water and transferring water directly from the Yellow River, there can be no other ways to obtain this quantity of fresh water.
- A part of the basin's plains have already experienced over-withdrawal of underground water reserves, such that large areas have become cones of depression.
- The Yellow River itself has had its resources seriously overdrawn, with annual water consumption percentage 1995-2007 estimated at 70%.³

The Kuye Basin Region's Severe Ecological Problems:

- Coal extraction has caused the river's natural flow volume to sharply decrease and the river has suffered frequent flow disruption.
- The ecology is very fragile, with serious water and soil erosion.
- The aquatic environment is severely polluted. During non-flood season water quality in the basin has been graded as 'Inferior V', below the quality considered suitable for agricultural use.

Policy Proposals:

The coal industry's impact on water resources is immense. In China's water-deficient areas, the effects are especially severe. Greenpeace offers the following recommendations:

- Water resources management should be brought into account in all regional and project planning. The development of coal industry projects when their water demand exceeds the water availability in the area must be seriously restricted.
- Immediately halt licensing new coal industry projects in "over-withdrawal areas".
- Prioritise phasing out coal industry projects in "over-withdrawal areas" in implementing the policy of over-capacity reduction in the coal industry.
- Opt for low-water consumption or zero water consumption renewable energy instead of coal.

³ Yellow River Conservancy Commission of the Ministry of Water Resources, 'Integrated Plan of Yellow River (2012-2030)', The Yellow River Water Conservancy Press, 2013.