

Corporate Water Risk Assessment Tool

A Look at China's Coal Companies

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Summary



China is facing serious water crises—shortages, pollution, and degradation of water ecosystems have created bottlenecks restricting socioeconomic development. Yet enforcement of water protection regulations has lagged. Building on its work improving pollution information transparency to help improve policy enforcement and encourage green supply chains, in 2013 the Institute of Public & Environmental Affairs (IPE) created a green finance program. This program collects information and develops analytical tools to help publicly listed companies, banks, and other financial institutions push for improvements in the environmental performance of commercial enterprises. In order to help listed coal companies, investors, and supervising departments understand water risks, IPE has developed the methodology for a **Corporate Water Risk Assessment Tool (CWRAT)**. CWRAT examines three aspects of water risk: water consumption, wastewater discharge, and compliance. Each aspect includes business water risks and regional water risks.

Business water risks



Assess the water resource requirements of coal operations and the potential damage coal mining or processing pose to the ambient environment. Assess a company's compliance status, information transparency, and water risk management measures.



Regional water risks

Assess the availability of existing water resources, water consumption rates, water pollution discharge policies, and local monitoring capacity in the region where coal business operations are proposed.

On the basis of this methodology, IPE has completed the first phase—applying the water risk assessment tool to listed coal companies. The water risk assessment tool is primarily used to assess the potential water resource risks in production operations and the financial health of listed coal companies. Coal companies, including coal mining, washing, coal-to-chemicals, and coal power plants, are subject to government scrutiny because of concerns about air pollution; however, policymakers have paid little attention thus far to this industry’s problems regarding water consumption and wastewater discharge.

The coal industry is heavily reliant on water and, not surprisingly, water risks facing coal companies are becoming more acute. Although Chinese policymakers have not targeted coal’s water footprint, the national government has ramped up policies and management of water overall—from the release of “Assessment Methods for Implementing the Strictest Water Resource

Management Systems,” the “Water Prevention Action Plan” (a.k.a. Water Ten Plan), and other policies.

IPE initially used this tool to assess 30 top earning coal companies listed in Shanghai and Shenzhen. The results showed high overall water risks among these 30 companies, with an average of 58.27 points (out of 100; the higher the score, the higher the risk). Of these companies, Kailuan Energy Chemical, China Coal Xinji Energy, and Shanxi Meijin Energy were at the top of the list, while Shenhua Energy, Haohua Energy, and Sundiro Holding displayed relatively low water risks.

This preliminary study faced limitations due to inadequate corporate information transparency. IPE sincerely hopes to discuss these issues in further depth with these 30 listed coal companies in order to provide a more accurate assessment of their water risks and join efforts to improve the sustainable development of businesses, industries, and regional economies.



Water
Consumption



Compliance



Wastewater
Discharge



Coal Industry Water Risks

1

1.1 Coal Industry Overview



Photo Credit: Coal Mine in Xishan, Shanxi, China, courtesy of Flickr user MWM Energy

Coal—the reigning king of China’s energy sector—generates 74 percent of the country’s electricity and is the main source of the staggering air pollution blanketing Chinese cities. Prompted in large part by the air pollution problem, the Chinese leadership has begun to pivot away from coal by strengthening monitoring and enforcement to limit coal-fired power plant emissions, piloting CO₂ emissions trading projects, accelerating expansion of renewables, and committing to CO₂ reductions in the Paris climate agreement.

While coal’s air pollution already places a huge burden on the economy, environment, and human health in China, the risks for water supplies in the country’s arid north are potentially even greater. Half of China’s population and two-thirds of its farmland are already vulnerable to worsening droughts and water pollution. Nearly half of the groundwater in northern China is so polluted it cannot even be used for industrial purposes. Beijing, which is one of 71 cities in northern China facing severe water shortages, is only able to provide its residents an average of 100 cubic meters per capita each year—similar to water scarcity levels in Saudi Arabia.¹ Most of coal’s water footprint, both in terms of consumption and pollution, occurs in three main production areas—coal mining and washing, coal-to-chemicals industries, and power generation.

Coal mining and washing refers to all types of extraction, washing, and grading, but does not include the manufacture of coal products or coal exploration. During coal extraction, the original runoff of groundwater can be easily contaminated, causing losses to water resources. In 2005, China emitted 4.54 billion tons of mining wastewater, and water reuse rates in mining were below 50 percent. Groundwater levels dropped in mining regions, causing a shortage of drinking water and affecting agricultural production in some locations.² At the same time, total wastewater from coal mining now reaches 3-6 billion tons per year. The primary pollutants found in coal industry wastewater include suspended solids, acid (pH), chemical oxygen demand (COD), and petroleum that contain heavy metals and other elements. These contaminants in the water can leech into the environment causing varying degrees of damage to soils, forests, and other resources.³

Coal-to-chemicals refers to using chemical processes to transform coal into gas, liquid, solid fuels, or other chemical products. This mainly includes coal gasification, liquefaction, and tar processing. Coal-to-chemicals projects consume an enormous amount of water, at least 2.5 tons of fresh water per ton of coal. The amount of wastewater produced in coal-to-chemical projects is also very high—at least one ton of wastewater per ton of coal. Coal-to-chemical projects are typically located in China’s coal-rich but arid northwest. The water resources in these regions are insufficient, with some areas completely

lacking bodies of water that can accommodate wastewater.⁴ Wastewater from coal-to-chemicals projects contains many types of pollutants and waste residue that can pollute groundwater supplies if not properly managed.⁵

Coal-fired generation is an industry by which coal is burned to produce electricity. Coal-fired plants use a large volume of water, and are often located in arid regions. According to public data from 2005, thermal generators consumed 63.5 billion cubic meters of water, accounting for 49.7 percent of China’s total industrial water consumption (127.8 billion cubic meters) and 11.4 percent of the country’s total water consumption (557.8 billion cubic meters) for that year.⁶ In 2008, thermal generators accounted for up to 40 percent of the country’s industrial water usage. The average generator used 40-50 percent more water than leading international units, equivalent to consuming 1.5 billion more tons annually.

Coal-fired generators mainly demand water for the cooling system. Currently there are two main methods for cooling: water-cooling and air-cooling. Although replacing water-cooling systems with air-cooling systems decreases the generation efficiency, it conserves water resources. According to data from the China Electricity Council, in 2013 air-cooling systems were installed in 150 GW of China’s generation fleet, accounting for 17 percent of thermal generation. Because most coal-fired generators still rely on water-based cooling systems, there is great potential for further water conservation.

Table 1. Water Used for Coal Production in China (Tons/10,000 RMB)

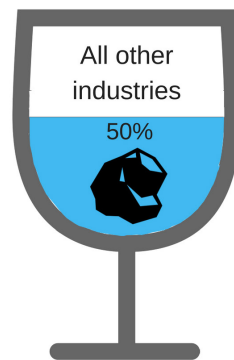
	Water Used in Coal Production
Coal Mining and Washing ^{7,8}	11.79
Coal-to-Oil ⁹	18.59
Coal-to-Gas ¹⁰	94.93
Coal-to-Olefins ¹¹	33.68
Coal-Fired Power ¹²	214

To improve understanding of water scarcity and pollution among the coal industry, the Institute of Public & Environmental Affairs (IPE) has created a Corporate Water Risk

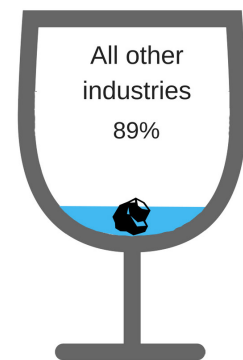
Assessment Tool. How the tool was created and used to assess 30 listed Chinese coal companies is presented in the subsequent chapters.

China's "Water Ten Plan" mandates that **industrial water reuse rate** must reach **92%** by 2020 and **recycled water usage rate** should reach **25%** in water-scarce cities.

Total Industrial Water Consumption



Total Water Consumption

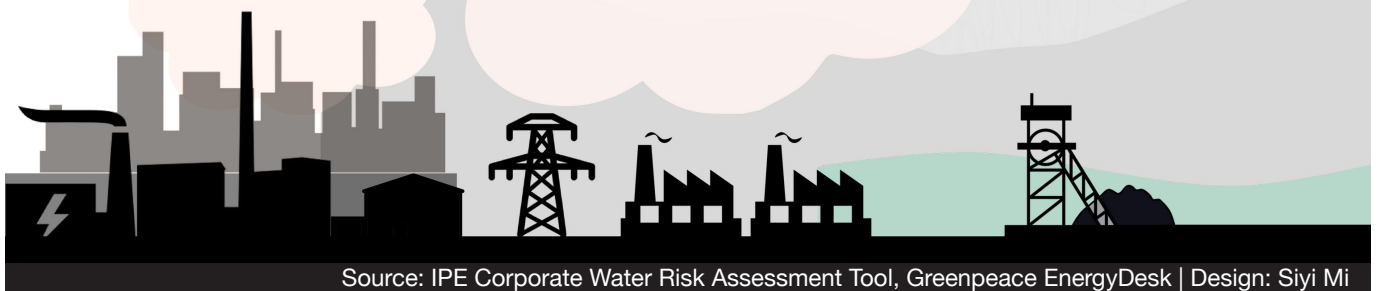


China's Thirsty Coal Under Pressure

China's coal-fired plants could use more than 3.9 billion tons of water a year in 2020 — equivalent to the annual water needs of 190 million people.

The water reuse rate in coal mining is below 50%.

China's coal-to-chemicals industry consumes 2.5 tons of water per ton of coal.



Source: IPE Corporate Water Risk Assessment Tool, Greenpeace EnergyDesk | Design: Siyi Mi

The Corporate Water Risk Assessment Tool

2

2.1 Overview



Photo Credit: A coal mine near Hailar, courtesy of Flickr user Herry Lawford

Coal and other water-intensive industries need to be sensitive to natural resource constraints so they can better site and operate their plants without threatening the sustainability of surrounding water resources.

A comprehensive water risk assessment requires assessing both internal (business) and external (regional) risks. A company's endogenous water risk factors are comprised of its products, production techniques, water management technologies and processes that have a direct effect on its consumption, discharge characteristics, and ability to comply with water protection regulations. Exogenous risk factors include the availability and quality of water resources, water-related policies, and the strength of environmental policy enforcement where the company operates. CWRAT integrates a company's business water risks and regional water risks associated with water consumption, wastewater discharge, and compliance. The assessment ranking matrix is shown below.

The rankings produced by this analytical methodology reflect the risk level of each company within its industry. This water risk assessment tool is not intended to provide direct

comparisons between risk levels of companies from different industries. The next section delves into how the indicators were defined and weighted to assess 30 listed Chinese coal companies.

Table 2. Corporate Water Risk Matrix

	Business Water Risks	Regional Water Risks
Water Consumption (Weight: 32)	Proportion of high water consumption subsidiaries (8) Water recycling and reuse measures (8)	Proportion of subsidiaries located in water-scarce regions (8) Regional water consumption policy and regulations (8)
Wastewater Discharge (Weight: 32)	Proportion of high pollution subsidiaries (8) Wastewater discharge reduction performance and measures (8)	Proportion of subsidiaries located in poor water quality region (8) Regional wastewater discharge policy and regulations (8)
Compliance (Weight: 36)	Number of environmental supervision records and instances where online monitoring data exceeds standards (12) Penalties in past three years (12)	Pollution Information Transparency Index (0.3-1.5)

2.2 Assessment Indicators

Water consumption, discharge, and compliance all have direct or indirect impacts on a company's financial indicators, thereby resulting in clear or hidden financial risks. The Corporate Water Risk Assessment Tool (CWRAT) does not simply examine water risks from a company's internal production management perspective, but also identifies how external factors relating to a company's local environment, such as water abundance and policy signals, can restrict or encourage future growth. This twofold analysis that captures both business and regional risks

enables a more comprehensive evaluation of company's water risks.

Using public information, IPE examined the business operations and geographic location of each of the 30 listed coal companies' production-based subsidiaries to assess the risks associated with water consumption, discharge, and compliance.¹³ Based on the assessment criteria shown in Table 3, IPE gathered data along the three main water risk indicators for each company to calculate their level of total water risk—a score of 100 indicates the highest possible risk.

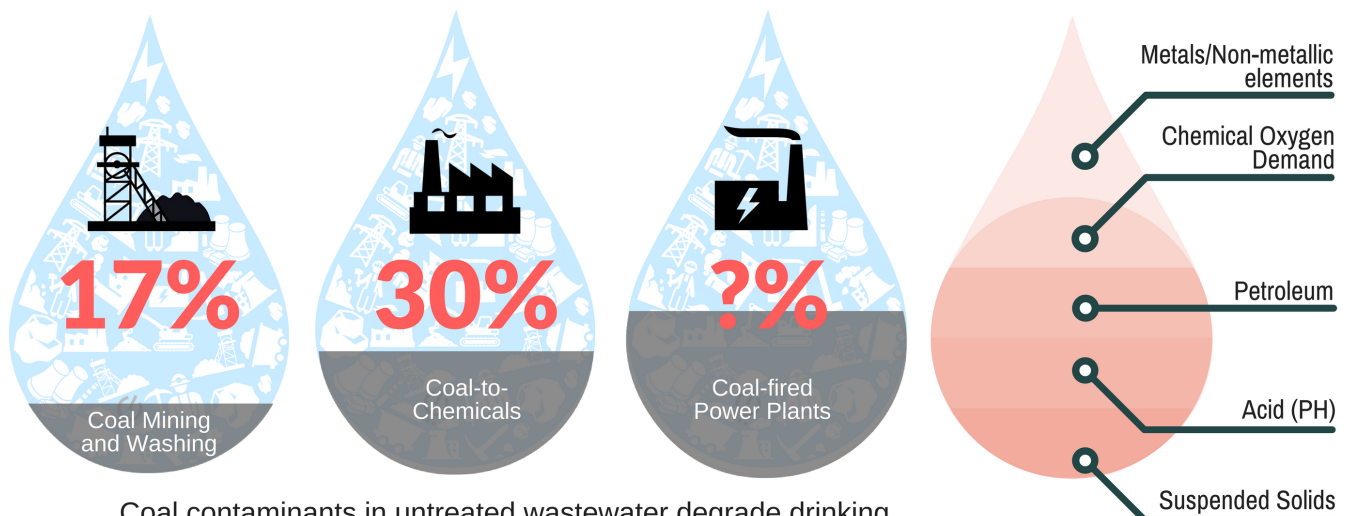
Coal Makes up Big Percentage of Industrial Wastewater in China

Source: IPE Corporate Water Risk Assessment Tool | Design: Siyi Mi

TODAY China's coal mines emit **3 – 6 billion tons** of wastewater per year.

Industrial Wastewater Emissions

Primary Pollutants in Coal Wastewater



Coal contaminants in untreated wastewater degrade drinking water and can damage soils, forests, and other resources.

Table 3. Water Risk Criteria for Listed Coal Companies

Primary indicators	Secondary indicators	Third degree indicators	Indicator explanation	Sources
Water consumption risk	Business	Proportion of income derived from high-intensity water-	How much of the company's revenue comes from high water consumption productions	Studies of industrial water consumption quota
		Water recycle and reuse measures	Company's actions and outcomes of water recycle and reuse	2015 Listed Company Social Responsibility Report and etc.
	Regional	Proportion of income from subsidiaries located in water-scarce regions	How much of the company's revenue comes from business based in water-scarce areas	WRI Aqueduct Water Risk Map
		Regional water consumption policy and regulations	Whether the regional water policies and regulations are stringent compares to national standards	"Water Ten Plan," provincial action plan and State Council <i>Notice on Implementation of the Strictest Assessment Methods of Water</i>
Water discharge risk	Business	Proportion of incomes from high pollution subsidiaries	How much of the company's revenue comes from high-pollution productions	<i>Thirsty Coal</i> (Greenpeace); <i>Analysis on the Water Resources of China's Coal Industry Chain</i> ¹⁴
		Wastewater discharge reduction performance and measures	Company's actions and outcomes of wastewater management	2015 Listed Company Social Responsibility Reports
	Regional	Proportion of incomes from subsidiaries located in poor water quality region	How much of the company's revenue comes from business based in poor water quality regions	<i>Standard Evaluation and Environmental Capacity of</i>
		Regional wastewater discharge policy and regulations	Whether the regional wastewater management policies and regulations are stringent compares to national standards	"Water Ten Plan," provincial action plan and State Council <i>Notice</i> (See Above)
Compliance risk	Business	Number of environmental supervision records and instances where online monitoring data exceeds standards	Feedback from supervisory monitoring and online monitoring results toward compliance status	Records from IPE Database of publicly disclosed information
		Penalties in past three years	Cost of penalty for non-compliance	Records from IPE Database of publicly disclosed information
	Regional	Pollution Information Transparency Index (PITI)	Key cities' environmental monitoring records for discharge standards violation	IPE Annual <i>Pollution Information Transparency Index Report</i> (2014-2015)

For each of the three primary water risks—consumption, wastewater discharge, and compliance—IPE has chosen clear criteria for creating the score for each (See Box 1). Appendix A provides further details on the specific measures.

Box 1. Weighted Criteria and Calculations

The calculation of **cumulative water consumption risks** that a company is facing is assessed across four main measures weighted at 32 points. Companies can receive a maximum of 8 and minimum of 2.

- Proportion of income derived from coal-fired power and coal-to-chemical activities
- Water conservation and recycling measures
- Proportion of income derived from high-intensity water-consuming activities
- Proportion of subsidiaries located in regions with stringent water use policies

Cumulative wastewater discharge risks are also measured across four categories for a total of 32 possible points.

- Proportion of income from coal mining, washing, and coal-to-chemical activities
- Measures for regional wastewater discharge policy and regulations
- Proportion of subsidiaries located in regions with poor water quality
- Regional wastewater discharge policies

Cumulative compliance risks (36 points) are divided into three categories: Amount of violation records, penalties, and PITI index. The maximum score for the first two is 12 each. The final score is adjusted by PITI index to factor in the different levels of provincial information transparency (Maximum: 1.5, Minimum: 0.3).

Photo Credit: Smokestackr, courtesy of Flickr user Dean Hochman

2.3 Assessment Method

Below we outline details on how each of the three main water risks—water consumption, wastewater discharge, and compliance—is assessed in terms of business and regional water risks.

Water Consumption Risks

A company's water consumption risk refers to the potential for water scarcity arising from natural forces, human activities, or local policies to affect business operations. These can increase water consumption costs or impact a company's production activities.

- Business water risks:** Examine the production characteristics associated with the main business operations within the industry and compare with industrial water withdrawal quotas to determine the categories of water-consuming activities based on intensity. Using corporate data, determine risks by calculating the proportion of income derived from high water consumption activities and examining the transparency of the company's water recycling measures and other methods to

reduce freshwater consumption.

- Regional water risks:** Summarize national and provincial policies to control total water consumption, increase water-use efficiency, and promote water recycling (see Table 4). Assess the strictness of water consumption policies in the provinces where the company's business that generates main sources of revenue is based and determine risk levels. Additionally, based on WRI China's updated Baseline Water Stress Map,¹⁵ categorize locations listed as high, extremely high, and arid and low water use as water-scarce regions.¹⁶ Examine the proportion of income earned from productions operated in water-scarce regions and determine risk levels accordingly.

Table 4. Water Consumption Policies and Regulations

Control Total Water Consumption	Water Consumption Planning
	Identify Water Resources
	Water Rights Trading
	Excessive Groundwater Withdrawals
	Non-residential Water Price
	Non-residential Water Usage Quota and Pricing Scheme
Improve Efficiency	Water Consumption by GDP per 10,000 RMB
	Marginal Revenue of Industrial Water Consumption by GDP per 10,000 RMB
	Industrial Water Conservation (Industrial Water Consumption Quota)
Promote Recycling	Ratio of Recycled Water
	Enhance Industrial Water Recycling
	2015 Mine Water Using Efficiency

Wastewater Discharge Risks

A company's water discharge risk refers to the environmental impact of processing wastewater, local environmental capacity, and other factors. A company's wastewater discharge may create conflict in terms of the impact it has on local water quality. Stricter local pollution management policies may increase the costs of pollution control and treatment for the companies as well as the associated risks.

- Business water risks:** Examine the wastewater discharge characteristics and management challenges associated with the main business operations within the industry and calculate the proportion of income earned from high water pollution activities. Examine the transparency of operations to reduce water pollution and determine risk levels.
- Regional water risks:** Identify regions with relatively poor water quality using water resources reports and other sources. Calculate the amount of income from subsidiaries located in regions with poor water quality and determine risk levels accordingly. Summarize policies at the national and provincial level related to pollution control in water function zones (rivers and lakes that are classified according to the purposes for which water will be used),¹⁷ overall pollutant discharge control, and other related issues (See Table 5). Assess the strictness of water pollution policies in provinces where the company's business that generates main sources of revenue is based and determine risk levels accordingly.



China's coal reserves are usually located in water-scarce regions while major coal firms operate in places with poor water quality.



Table 5. Wastewater Discharge Regulations

Pollution Management (2020 Goal)	Ratio of Regional Water Quality Meeting National Standards in Water Function Zones
	“Black & Smelly” Waters
	Dysfunctional (Worse than Grade V)
	Groundwater Pollution Prevention
Fully Control Pollutant Discharge	Prevent Industrial Pollution
	Focus on Industrial Wastewater Pollution
	Discharge Fee
	Promote National Wastewater Discharge Permit
Others	Strict Standard for Discharging into Ambient Environment
	Strengthen Ecological Conservation
	Yangtze River Basin Economic Zone Conservation

Compliance Risks

A company's water-related compliance risk refers to its potential to violate water-related policies or laws. IPE assesses this risk by considering a company's overall track record with regard to water withdrawal permits, penalties, results of online monitoring adjusted for the level of information transparency of local environmental protection bureaus.¹⁸

- **Business water risks:** Examine a company's water-related environmental supervision records, amounts of fines, and online monitoring data on environmental violations within the past three years to determine its compliance risk.
- **Regional water risks:** IPE analysts believe that it is easier to identify risks in places where there is a higher degree of information transparency. In other words, current high levels of information transparency can reduce hidden risks in the future. Due to deviations in environmental information transparency levels between different locations, a set number of publicly known environmental violations from a company within a region with low information transparency is unlikely to fully reflect the company's actual compliance record, making the company's true risk higher.

Since 2006, IPE has collected corporate environmental supervision information from official environmental bureaus at all levels nationwide. Since 2008, we have developed the Pollution Information Transparency Index (PITI). Over seven years, IPE has assessed the level of information transparency from environmental protection bureaus in over 100 key cities. Regions with higher PITI sub-scores for "disclosure of routine excessive emissions violation records" tend to have environmental protection departments with lower transparency of corporate compliance information.

Therefore, in these assessments, the environmental information transparency levels in a company's major income-producing regions are converted to adjustment coefficients, where regions with low levels of information transparency are given higher risk coefficients and regions with high levels of information transparency are given low risk coefficients. These adjustments to the aforementioned compliance risk make up for variation in information transparency levels among regions.



Photo Credit: Tianjin Integrated Gasification Combined Cycle Power Plant Project, courtesy of Flickr user Asian Development Bank

Preliminary Results of Listed Coal Company Risk Assessments 3

3.1 Listed Company Selection

The IPE analysts selected companies listed as coal extraction or washing companies, based on information from the China Securities Regulatory Commission, with reference to EastMoney.com’s industry sector classification. The study included a total of 30 listed companies with incomes derived mainly from coal.

The companies that have the highest risks in terms of water consumption can be divided into three categories: regional risk, business risk, and regional and business-related risks.

- High **regional risk** is the main reason a company will have a high overall water consumption risk, which was the case in IPE’s assessment of the listed coal companies. Most of these companies have assessment coal operations in Shanxi, Shaanxi, Henan, and other arid regions. Notably, the local governments in these dry regions have started to enact relatively strict water consumption policies to strengthen water resource conservation, which can lower a company’s overall risk if they are in compliance.

Table 6. Listed Coal Companies Assessed by IPE Water Risk Tool

Baotailong New Materials Co., Ltd.	Datong Coal Industry Co., Ltd.	Henan Dayou Energy Co., Ltd.	China Coal Xinji Energy Co., Ltd.	Beijing Haohua Energy Resources Co., Ltd.	Anhui Hengyuan Coal Industry Co., Ltd.
Gansu Jingyuan Coal Industry and Electricity Power Co., Ltd.	Kailuan Energy Chemical Co., Ltd.	Shanxi Lanhua Sci-tech Venture Co., Ltd.	Shanxi Lu’an Environmental Energy Development Co., Ltd.	Huolinhe Opencut Coal Industry Co., Ltd. of Inner Mongolia	Shanxi Meijin Energy Co., Ltd.
Taiyuan Coal Gasification Co., Ltd.	Shanxi Coking Co., Ltd.	Shaanxi Heimaocoking Co., Ltd.	Shaanxi Coal Industry Co., Ltd.	Shanghai Datun Energy Resources Co., Ltd.	Shanxi Xishan Coal and Electricity Power Co., Ltd.
Inner Mongolia Yitai Coal Co., Ltd.	Wintime Energy Co., Ltd.	Yunnan Coal and Energy Co., Ltd.	China Shenhua Energy Co., Ltd.	China Coal Energy Co., Ltd.	Sundiro Holding Co., Ltd.
Jizhong Energy Resources Co., Ltd.	Shanxi Antai Group Co., Ltd.	Guizhou Panjiang Refined Coal Co., Ltd.	Pingdingshan Tianan Coal Mining Co., Ltd.	Yanzhou Coal Mining Co., Ltd.	Yangquan Coal Industry (Group) Co., Ltd.

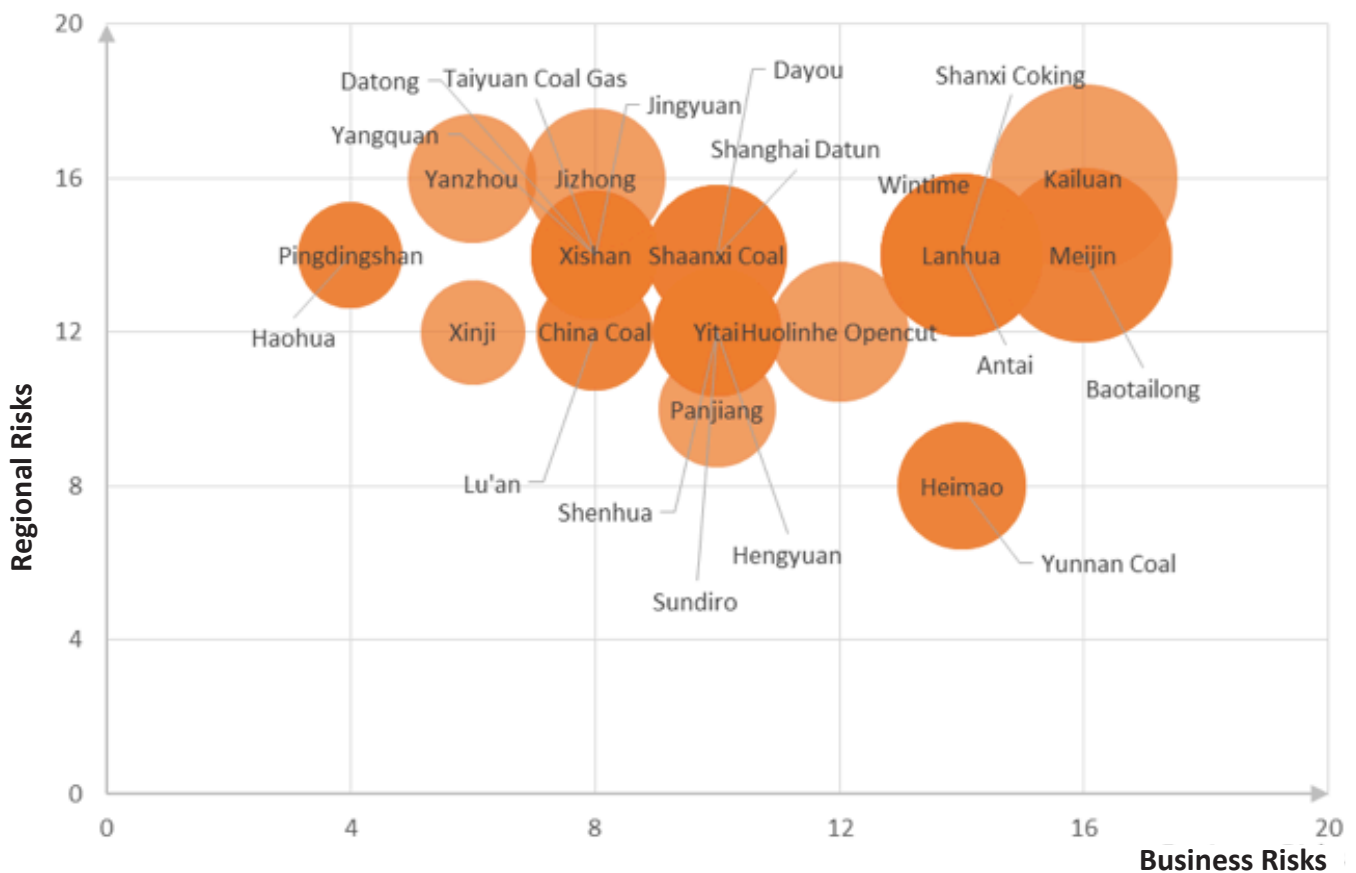
- **Business risks** mainly arise from a company's lack of water conservation measures or due to a lack of transparency regarding information such as water recycling.

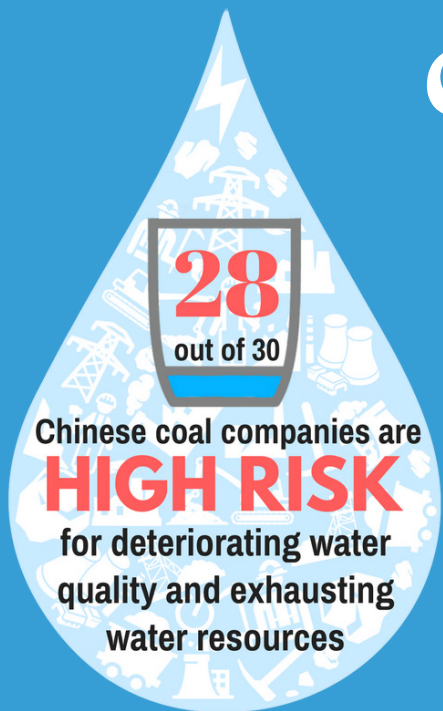
Regional risks can be lowered in areas where water consumption and pollution control policies are stricter and better enforced. The national government's "Water Pollution Prevention Action Plan" (Water Ten Plan) that passed in April 2015 sets out ten general measures that are broken down into 38 sub-measures with deadlines for specific government departments for each action. The plan emphasizes water pollution control, water conservation and recycling, as well as better enforcement and management of laws.¹⁹

The "Water Ten Plan" targets stricter mandates in some particularly water-vulnerable regions. For example, the plan required three more provisions

in the Beijing-Tianjin-Hebei sub-region than in the Yangtze River or Pearl River deltas. Among these are requirements for water recycling rates in the drought-prone cities of Beijing, Tianjin, and Hebei to reach 30 percent or higher by 2020. Additionally, among the 38 measures under the Water Ten Plan with deadlines, six must be met a year earlier in Beijing-Tianjin-Hebei, the Yangtze River Delta, and the Pearl River Delta. According to Wu Shunze, Deputy Chair of Environmental Planning at the Ministry of Environmental Protection, "The key problems that Beijing-Tianjin-Hebei face are water pollution and water shortage. The integration of Beijing-Tianjin-Hebei has already been raised to a national strategic level. Environmental integration is also a trend now, and this will set an example for other regions." Thus, companies located in regions with more stringent regulations would have lower water consumption risk scores.

Water Consumption Risks of Listed Coal Companies





“

The key problems that Beijing-Tianjin-Hebei face are water pollution and water shortage.

”

*Wu Shunze
Deputy Chair of Environmental Planning at
the Ministry of Environmental Protection*

Source: IPE Corporate Water Risk Assessment Tool | Design: Siyi Mi

Some of the companies IPE assessed as having lower water risk are located in provinces that have pushed for stricter water policies. For example:

Yanzhou Coal's subsidiary companies are mainly located in **Shandong Province**, where they face water shortages and comparatively strict water consumption policies as in the Beijing-Tianjin-Hebei region. Since 2014, under the leadership of the municipal government and Shandong provincial water bureau, the city of Jining has developed a series of programs, including water withdrawal license management, water resources demonstrations, planned water conservation management, water resources fees, and water rights reform pilots.²⁰ Shandong Province's "Water Ten Plan" specifies that by 2020, "the industrial water reuse rate in the province must reach 92 percent." Additionally, "in water-scarce cities, recycled water usage rates should reach 25 percent or higher." The plan also calls for increasing water-use efficiency and promoting circular development.

The comparatively water-abundant **Guizhou Province** has relatively strict water consumption policies too, which affects the operations of **Guizhou Panjiang Refined Coal Co.** Guizhou's "Water Ten Plan" states that "in regions where total water extraction and consumption are

nearing the control index, project approvals should be restricted for high-consumption, high-polluting, and low-efficiency projects." Additionally, by 2020, the one million RMB of industrial added value to water consumption must be reduced by 35 percent compared to 2013 levels—a higher standard than was set by the national "Water Ten Plan." The province also mandates "complete implementation of closed-cycle wastewater management in industries such as electrolytic manganese, phosphates, electroplating, and coal washing."

The "Notice on Issues Concerning the Standards for Adjusting Water Resources Fees," jointly published by Guizhou Development and Reform Commission, Guizhou Department of Finance, and Guizhou Ministry of Water Resources, specifies that when a company's water usage exceeded their plan or quota by 50 percent or more, the exceeded quantity would cost five times the standard price. This would increase the water consumption costs for high water-consuming industries, and would have a powerful effect on the companies' water consumption habits.

Hebei Province has set fairly strict water consumption policies. The main coal business operations for **Kailuan Energy** (the company with the highest water risk in IPE's assessment) and **Jizhong Energy** are located here.

**Table 7. Water Risks Scores of Listed Companies
(Ranked by highest to lowest risk)**

01 Kailuan Energy Chemical Co., Ltd. (600997) 83.1	02 China Coal Xinji Energy Co., Ltd. (601918) 73.4	03 Shanxi Meijin Energy Co., Ltd. (000723) 70.8	04 Shanxi Lanhua Sci-tech Venture Co., Ltd. (600123) 68	05 Shanxi Lu'an Environmental Energy Development Co., Ltd. (601699) 67.5
06 Shaanxi Coal Industry Co., Ltd. (601225) 66	07 Shanxi Coking Co., Ltd. (600740) 65	08 Shaanxi Heimao Coking Co., Ltd. (601015) 63.2	09 Baotailong New Materials Co., Ltd. (601011) 62	10 Yunnan Coal and Energy Co., Ltd. (600792) 59.5
11 Shanxi Antai Group Co., Ltd. (600408) 59.2	12 Shanxi Xishan Coal and Electricity Power Co., Ltd. (000983) 58.5	13 Wintime Energy Co., Ltd. (600157) 57.4	14 Henan Dayou Energy Co., Ltd. (600403) 56.8	15 Yanzhou Coal Mining Co., Ltd. (600188) 56.2
16 Shanghai Datun Energy Resources Co., Ltd. (600508) 56.1	17 Inner Mongolia Yitai Coal Co., Ltd. (900948) 55.4	18 Gansu Jingyuan Coal Industry and Electricity Power Co., Ltd. (000552) 55.2	18 Huolinhe Opencut Coal Industry Co., Ltd. of Inner Mongolia (002128) 55.2	20 Jizhong Energy Resources Co., Ltd. (000937) 54
20 Anhui Hengyuan Coal Industry Co., Ltd. (600971) 54	22 Datong Coal Industry Co., Ltd. (601001) 53.8	23 Yangquan Coal Industry (Group) Co., Ltd. (600348) 53.4	24 Taiyuan Coal Gasification Co., Ltd. (00968) 52	25 Guizhou Panjiang Refined Coal Co., Ltd. (600395) 51
26 China Coal Energy Co., Ltd. (601898) 50.8	27 Pingdingshan Tianan Coal Mining Co., Ltd. (601666) 49.9	28 Sundiro Holding Co., Ltd. (000571) 49.4	29 Beijing Haohua Energy Resources Co., Ltd. (601101) 46.2	30 China Shenhua Energy Co., Ltd. (601088) 45.2

Table 8. Water Risks Score Breakdown

			Water Consumption Risks					Wastewater Discharge Risks					Compliance Risks			
			Business		Regional			Business		Regional			Business		Regional	
			Incomes derive from high-intensity water-consuming activities	Water recycle and reuse measures	Incomes derive subsidiaries located in water-scarce region	Regional water consumption policy and regulations		Incomes from high pollution activities	Wastewater emission reduction performance and measures	Incomes from subsidiaries located in poor water quality region	Regional wastewater discharge policy and regulations		Environmental supervision records and online monitoring	Cost of violations	PITI	
Weight		100	8	8	8	8	32	8	8	8	8	32	12	12	1.5	36
1	Kailuan Energy Chemical Co., Ltd.	83.1	8	8	8	8	32	8	6	8	6	28	12	9	1.1	23.1
2	China Coal Xinji Energy Co., Ltd.	73.4	2	4	8	4	18	8	6	8	4	26	9	12	1.4	29.4
3	Shanxi Meijin Energy Co., Ltd.	70.8	8	8	8	6	30	8	8	8	6	30	9	3	0.9	10.8
4	Shanxi Lanhua Sci-tech Venture Co., Ltd.	68	6	8	8	6	28	8	6	8	6	28	6	6	1.0	12
5	Shanxi Lu'an Environmental Energy Development Co., Ltd.	67.5	2	6	6	6	20	8	6	8	6	28	3	12	1.3	19.5
6	Shaanxi Coal Industry Co., Ltd.	66	2	8	8	6	24	8	8	8	6	30	6	6	1.0	12

7	Shanxi Coking Co., Ltd.	65	8	6	8	6	28	8	6	8	6	28	3	3	1.5	9
8	Shaanxi Heimao Coking Co., Ltd.	63.2	8	6	2	6	22	8	6	8	6	28	9	3	1.1	13.2
9	Baotailong New Materials Co., Ltd.	62	8	8	8	6	30	6	8	8	4	26	3	3	1.0	6
10	Yunnan Coal and Energy Co., Ltd.	59.5	8	6	2	6	22	8	6	2	8	24	6	3	1.5	13.5
11	Shanxi Antai Group Co., Ltd.	59.2	6	8	8	6	28	2	8	8	6	24	9	3	0.6	7.2
12	Shanxi Xishan Coal and Electricity Power Co., Ltd.	58.5	6	2	8	6	22	4	2	8	6	20	12	3	1.1	16.5
13	Wintime Energy Co., Ltd.	57.4	6	8	8	6	28	2	8	8	6	24	3	3	0.9	5.4
14	Henan Dayou Energy Co., Ltd.	56.8	2	8	8	6	24	2	6	8	6	22	3	6	1.2	10.8
15	Yanzhou Coal Mining Co., Ltd.	56.2	2	4	8	8	22	2	2	8	6	18	12	6	0.9	16.2
16	Shanghai Datun Energy Resources Co., Ltd.	56.1	4	6	8	6	24	2	6	8	8	24	6	3	0.9	8.1

17	Inner Mongolia Yitai Coal Co., Ltd.	55.4	2	8	8	4	22	8	8	8	4	28	3	3	0.9	5.4
18	Gansu Jingyuan Coal Industry and Electricity Power Co., Ltd.	55.2	2	6	8	6	22	8	6	8	4	26	3	3	1.2	7.2
18	Huolinhe Opencut Coal Industry Co., Ltd. of Inner Mongolia	55.2	4	8	8	4	24	4	8	8	4	24	3	3	1.2	7.2
20	Jizhong Energy Resources Co., Ltd.	54	4	4	8	8	24	6	4	8	6	24	3	3	1.0	6
20	Anhui Hengyuan Coal Industry Co., Ltd.	54	2	8	8	4	22	6	8	8	4	26	3	3	1.0	6
22	Datong Coal Industry Co., Ltd.	53.8	2	6	8	6	22	8	2	8	6	24	3	3	1.3	7.8
23	Yangquan Coal Industry (Group) Co., Ltd.	53.4	2	6	8	6	22	6	6	8	6	26	6	3	0.6	5.4
24	Taiyuan Coal Gasification Co., Ltd.	52	2	6	8	6	22	8	2	8	6	24	3	3	1.0	6

25	Guizhou Panjiang Refined Coal Co., Ltd.	51	2	8	2	8	20	6	8	2	6	22	6	3	1.0	9
26	China Coal Energy Co., Ltd.	50.8	4	4	6	6	20	2	4	8	6	20	6	6	0.9	10.8
27	Pingdingshan Tianan Coal Mining Co., Ltd.	49.9	2	2	8	6	18	6	2	8	6	22	3	6	1.1	9.9
28	Sundiro Holding Co., Ltd.	49.4	2	8	8	4	22	2	8	8	4	22	3	3	0.9	5.4
29	Beijing Haohua Energy Resources Co., Ltd.	46.2	2	2	8	6	18	6	2	8	8	24	3	3	0.7	4.2
30	China Shenhua Energy Co., Ltd.	45.2	6	4	8	4	22	2	2	8	4	16	6	3	0.8	7.2

World's Largest Oil Company Prioritizing

3.2 Water Conservation: The Case of Shenhua²¹

Shenhua was assessed to have the lowest water risk among the 30 companies assessed in this study although it is China's largest coal company with most of its plants in very water-scarce regions. Notably, Shenhua has been prioritizing water conservation and taking encouraging steps to lower its regional water risks.



Water conservation: Shenhua has actively promoted groundwater protection in its coal mining, air-cooled power plants, water conservation techniques, and other measures to protect water resources and reduce water consumption. As of the end of 2015, the company had installed direct air-cooling systems in power plants, totaling 12,400 megawatts, accounting for 24 percent of the company's fleet. 18 of the 20 gangue units operated by Shendong Electric use air-cooling systems, resulting in 0.55 kilograms of water consumed per kilowatt-hour.



Seawater desalination: Due to local conditions, Shenhua's coastal power plants use desalinated water for power production, expanding both water and electricity production. All the company's ships are equipped with desalination facilities, enabling them to produce their own fresh water in the right conditions and lowering consumption of freshwater resources. Huanghua Electric Power owns three desalination units, capable of processing 57,500 tons of water daily. In 2015, Huanghua Electric not only met its own consumption needs, but also provided 9.71 million tons of water to nearby businesses, making it a major water supplier.



Wastewater recycling: Shenhua has combined different characteristics from four major operations to strengthen integrated wastewater management and recycling, while increasing the efficiency of its wastewater usage. Processed water is mainly used in mining, coal washing and processing, power plant cooling, dust management on roads and mine sites, green land reclamation, flushing toilets, washing vehicles, etc. In 2015 the company produced 167.38 million tons of wastewater and reused 117 million tons: a reuse rate of 69.9 percent.



“Coal mine reservoir” technologies to support sustainable water use: Coal mining produces a large volume of mine water. To guarantee mine safety, this water must be pumped to the surface, where a large amount will evaporate. After 20 years of research, Shenhua has developed underground coal mine reservoir technologies that move groundwater to already-mined areas for storage. The company has built the associated water processing and pumping facilities to efficiently use mine water and conserve freshwater. Shendong Coal Company has built 35 underground reservoirs to date, storing over 25 million cubic meters of water and supplying 68 million cubic meters of water per year. This accounts for 95 percent of the water used for industrial, living, and ecological functions within the mining area, achieving a beneficial three-dimensional mine water cycle. Of these, the Shendong Coal's Daliuta mine was the first distributed underground reservoir pilot, able to conserve 2.8 million tons of fresh water a year.

3.3 Discharge Risks

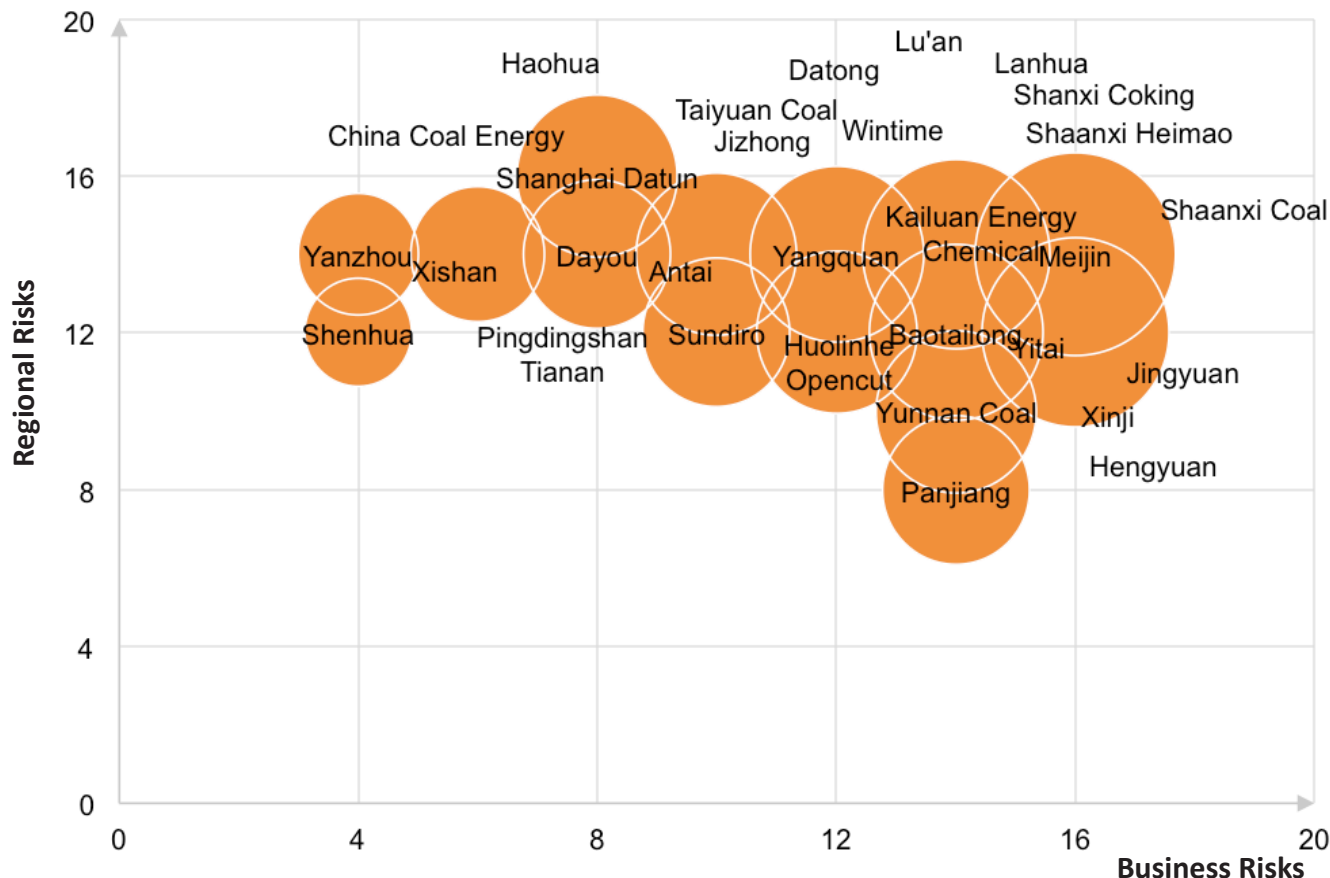
Companies with high discharge risks can be divided into three similar categories: high regional discharge risks, high business discharge risks, and high regional and business discharge risks. Of these, a high regional discharge risk tends to be the main cause of a high overall discharge risk. This is because the majority of the listed companies have coal operations located within polluted watersheds such as the Huai River or Yellow River basins. Water quality policies are relatively strict in areas with poor water quality, due to the need to control water pollution discharge.

High business discharge risk profiles mainly arise

when there are a large proportion of operations in coal mining, washing, or coal-to-chemicals, alongside a lack of appropriate water pollution control measures or inadequate transparent information on water pollution and emissions reductions.

Located in the Beijing-Tianjin-Hebei sub-region, **Beijing** has relatively strict water discharge policies. Perhaps it is not surprising that **Haohua Energy Resources Co.**, whose coal mining and washing operations are concentrated mainly in Beijing, was assessed to have very low regional and business-related water discharge risks.

Water Discharge Risks of Listed Coal Companies



The “Water Ten Plan” requires that “before the end of 2017, industrial centers must build centralized water processing infrastructure in accordance with guidelines, and install automatic online monitoring systems. Industries in Beijing-Tianjin-Hebei, the Yangtze River Delta and the Pearl River Delta must complete this requirement one year earlier” [than the rest of the country]. In addition, Beijing’s “Water Ten Plan” emphasizes the importance of the ecological protection “red lines,” and requires that “a municipal watershed and aquatic ecological health survey and assessment should be finished before the end of 2016; an aquatic ecological protection red line should be established for lakes and rivers.”

Shanghai Datun Energy’s subsidiaries are primarily located in the Yangtze River Delta of **Jiangsu Province**, where they face poor water quality and strict water discharge policies like businesses located in Beijing-Tianjin-Hebei region. The “Water Ten Plan” emphasizes that by 2020, the Yangtze River Delta and Pearl River Delta regions should “strive to eliminate the loss of functional water bodies” and that “by the end of 2017, centralized wastewater processing facilities should be built in industrial zones in accordance with regulations, and automatic, online monitoring devices should be installed. The Beijing-Tianjin-Hebei, Yangtze River Delta, and Pearl River Delta regions should complete these requirements a year in advance.” The issuance of the “Jiangsu Interim Measures on Ecological Subsidy Payment Transfers” signals that the province’s ecological subsidy payment transfer system is formally moving towards the implementation phase.

Water discharge policies are relatively strict in **Yunnan Province** too, which enjoys much better water quality. These policies impact the operations and planning of **Yunnan Coal and Energy**. Yunnan Province’s “Water Ten Plan” requires that “water quality should remain stable at the groundwater testing sites, and that variations should be kept within approximately 1.9 percent.” This is stricter than the national requirement of 15 percent. The document also requires that “by the end of 2016, the construction of a dynamic management system and information platform should be completed for key pollution sources at the provincial level.”

Photo Credit: Old coal heating furnace and modern cell tower, courtesy of Flickr user vandenn

3.4 A Case Study in Water Pollution Reduction: China Coal Energy²²

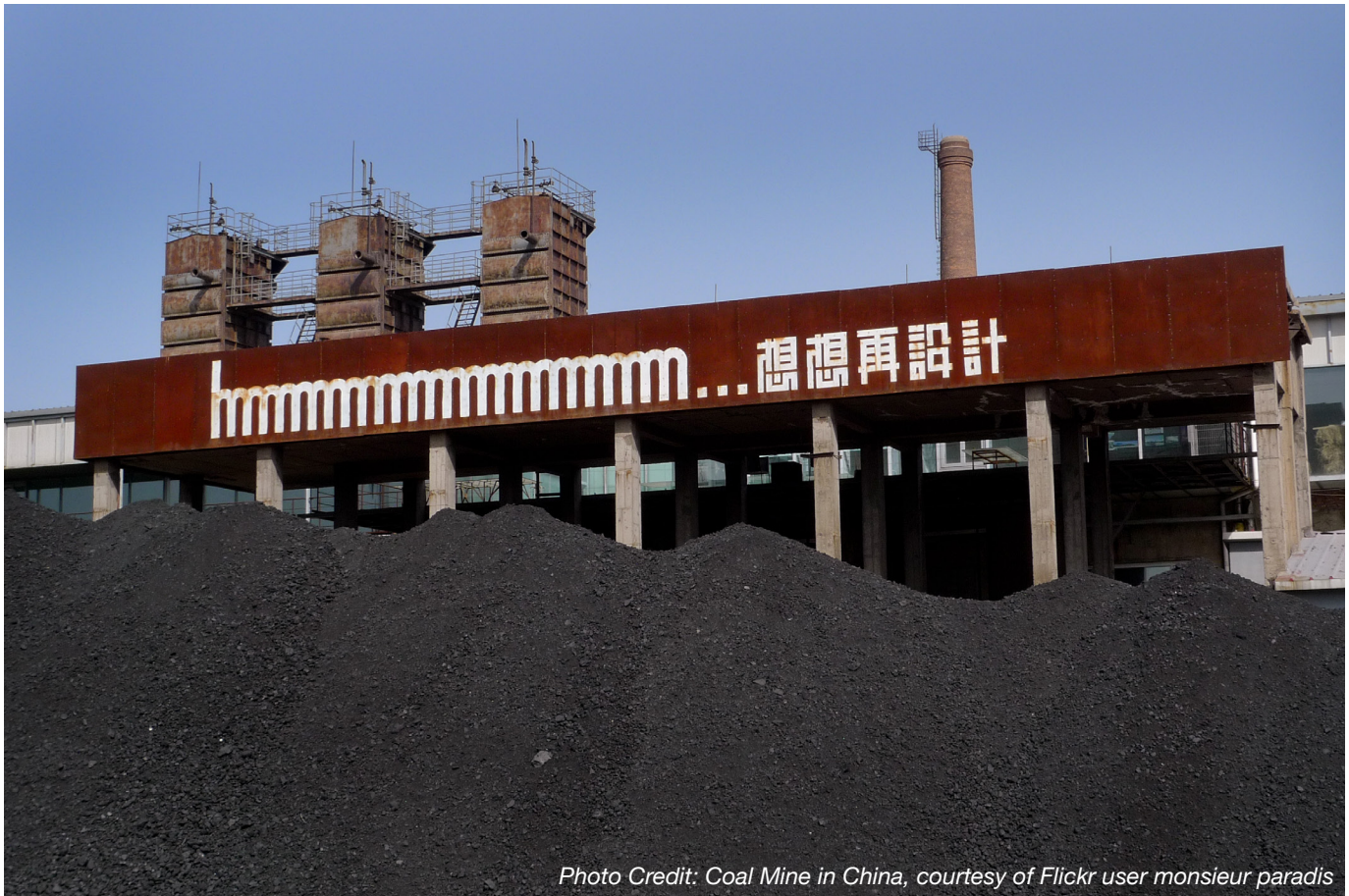


Photo Credit: Coal Mine in China, courtesy of Flickr user monsieur paradis

Tuke Fertilizer Project Achieves Zero Wastewater Discharge: Emerging coal-to-chemicals projects consume an enormous amount of water. However, one such project in Ordos, Inner Mongolia achieved “zero emissions” solving one part of the water resources problem inherent to the coal industry. By avoiding pollution and damage to the environment and ecosystem, the project has made an important step to ensuring sustainable operations.

The Tuke Fertilizer Project is a large-scale coal-to-chemicals project built by China Coal Energy at the Ordos Tuke Industrial Park. The zero wastewater discharge system is composed of five main parts: pretreatment wastewater gasification, organic wastewater biochemical processing, water reuse, brine evaporation, and brine

crystallization. In November 2014 the company installed a brine evaporator in conjunction with evaporation pools, which creates a dual-backup for high-concentration brine management. The installation has been in constant operation since then, achieving a water reuse rate of 98 percent, reducing primary water consumption by 29.7 percent, and saving 7.302 million tons of freshwater each year. This level of recycling and conservation has helped mitigate pressure on local water supplies. Additionally, the company reduced its consumption of urea to 3.8 tons, less than half the industry average. This drop resulted in actual zero-emissions and green energy savings. This method earned the company the China Nitrogen Fertilizer Industry Association’s accolade of leading promoter of environmental protection technologies.

3.5 Compliance Risks

China Coal Xinji Energy Investigation: The environmental impact assessment for the Liuzhuang Mine approved an annual production of 3 million tons, while in reality, annual production reached 11.4 million tons. There were major changes to the production scale, as well as the amount of pollutants discharged by the project without any review of the environmental impact assessment documents.

National Business Daily: In August 2015, in order to deal with serious environmental issues, the Anhui Environmental Protection Bureau conducted provincial-level investigations into 98 environmental issues, spanning 16 cities and one directly-administered county (Guangde County). Among those under investigation for environmental issues was the State Development and Investment Corporation subsidiary, Xinji Energy. The Anhui Environmental Protection Bureau put Xinji Energy's Liuzhuang Mining Co. under investigation for vastly exceeding the amount of coal production permitted under its environmental impact assessment approval documents.

Responding to these charges, Xinji Energy representatives said, "We have done nothing wrong. This is mainly due to historical factors." In 2005, the National Development and Reform Commission approved the Xinji Mining Area Development Plan, stating that "the construction and expansion of the Liuzhuang Mine will allow the production of 3 million tons per year during the first stage, expanding to 8 million tons per year in later stages." In previous years, when coal market trends were better, to strengthen the coal supply, the government of Anhui Province demanded the four large mining corporations to expand their coal production operations to make up for the scarcity in the coal supply, on the provision they guaranteed safe mining practices.

In the beginning of 2012, the Anhui Provincial Commission of Economy and Information, responding to business needs and market demand, organized contracts between generators and coal companies for the year of 2012. The contracts ask the four large coal firms to ensure the thermal coal supply for the province during the peak electricity-consumption season, specifically requiring them to provide at least 80 percent of thermal coal to be consumed by the province.

Xinji Energy's representative told *National Business Daily* journalists that this had led the company to expand the Liuzhuang mine in order to increase their coal production capacity. The expansion of operations is still ongoing. Afterwards, the Anhui Environmental Protection Bureau requested the Liuzhuang mine to reduce its production output for environmental concerns. Xinji representatives responded by claiming that the Liuzhuang mine had drafted a plan to implement a series of measures to progressively reduce production over several years, in accordance with the production layout and safety management requirements.

Kailuan Co. (highest risk company): According to 2015 in-house monitoring data that reflected the company's real-time emissions, wastewater pollutants from Kailuan's subsidiaries—Tangshan Zhongrun Coal-to-Chemicals Co. Ltd. and Qianan Coal-to-Chemicals Co. Ltd.—violated discharge standards for 77 days and six days, respectively. In 2015, IPE and the *Securities Times* published the 49th issue of "Online Pollutant Monitoring Data Rankings for Listed Companies," reporting that Kailuan subsidiaries made the list due to multiple wastewater pollutant infractions. Water risk management scores (in terms of discharge risk) were low for Xishan Coal and Electric and Yanzhou Coal, but their compliance risks were high. Their disclosures may not reflect reality.

ST Xishan Coal and Electric: The company's 2015 corporate social responsibility report disclosed that "industrial wastewater reuse rates were 100 percent," "industrial wastewater COD emissions levels were zero," and "all mines owned by the company had installed mine water treatment plants, with mine water treatment rates reaching 100 percent; treated water met national wastewater discharge and recycling standards, and was used to reduce mine dust and for groundwater reuse." However, in 2015

the wastewater treatment plants operated by the company's subsidiaries were charged with eight water-related environmental infractions.

Yanzhou Coal: The company's 2015 corporate social responsibility report disclosed the company's emissions of COD (in tons), ammonia nitrogen (in tons), and a year-on-year decrease in COD emissions. However, in 2015 its subsidiary companies were charged with eight water-related environmental infractions.



Photo Credit: Migrant workers working at the Qianjiaying Coal Mine, Tangshan, for the Kailuan Coal Mine Group, courtesy of Flickr user ILO in Asia and the Pacific

Water Risk Management Recommendations

4



Photo Credit: River of Filth, courtesy of Flickr user Adam Cohn

- 1** Strengthen Control of Total Water Consumption & Increase Consumption Efficiency

- 2** Fully Control Water Pollution Discharge & Make Continuous Improvements in Environmental Performance

- 3** Be Aware of Environmental Risks Such As Wastewater Discharge & Establish a Good Reputation

- 4** Building a Complete Water Risk Management System & Strengthen Public Transparency

Strengthen Control of Total Water

4.1 Consumption & Increase Consumption Efficiency

Using coal to provide energy consumes an enormous amount of water. Research from the Circle of Blue and the Woodrow Wilson Center's "Choke Point" showed that in 2010, China's coal industry consumed 120 billion cubic meters of water, approximately 20 percent of China's total 599 billion cubic meters of water consumption. It is estimated that by 2020, the complete lifecycle of coal will use 28 percent of the country's total 670 billion cubic meter water consumption. Coal extraction can also damage water resource systems, particularly groundwater systems.

The 2011 Central Document No. 1 called for implementation of "the strictest water resources management systems," and put forward clear requirements for water consumption. The most recent research report published by the China Coal Consumption Cap Project, "Coal-to-Chemicals Industry Coal Consumption Cap Plan and Policy Research Implementation Report," highlights the serious water conundrum in regions such as Shanxi, Shaanxi, Inner Mongolia, Ningxia, and Gansu. These regions account for at least 60 percent of China's raw coal production, yet possess only 4.8 percent of the country's water resources. Coal-directed water consumption in the Ningdong coal base has already exceeded the red line established in 2015.

Following the promotion and implementation of water resource demonstrations and water extraction permit systems, the water-intensive

coal industry is facing increasingly strict water consumption controls. Meanwhile, the rising price of industrial-use water, as well as price policies such as water rights trading and progressive fees for non-residential overconsumption, are set to increase costs for businesses that exceed their water quotas. The "Notice on Standardizing the Scientific and Orderly Development of the Coal-to-Oil and Coal-to-Gas Industries" (NEA Science & Technology [2014] No. 339) clearly forbade the reallocation of water away from daily-use, agricultural and ecological services, as well as the use of groundwater to develop coal-to-oil (gas) projects. The "Clean and Efficient Coal Use Action Plan (2015-2020)" outlines similarly strict controls on the development of projects in water-scarce regions. In June 2016, the Ministry of Environmental Protection issued the "Notice of Rejection of the Chuo'er-to-Xiliao Project Environmental Impact Assessment Report." The commentary highlighted that "in adhering to the principles of water management, priority must be given to exploring the potential for water conservation." As such, the water diversion project intended to "provide water resources to guarantee the implementation of the eastern Inner Mongolian 'water-coal integration' strategy" must be temporarily put on hold. Within this policy environment, coal companies must maintain strict control of their water consumption, ensure it is in line with water indicators, improve the use of unconventional water sources such as mine water, develop circular economies, and achieve sustainable development.

Fully Control Water Pollution Discharge & Make

4.2 Continuous Improvements in Environmental Performance

The coal industry is a classic high-pollution industry. Industrial water pollutants mainly include acidic substances, oils, and some metals and non-metallic elements. When these pollutants are released into the environment through wastewater, they cause varying degrees of damage to agriculture, soils, and forests. Coal-to-chemicals projects cause particularly severe water pollution. Illegal wastewater discharge and insufficiently strict discharge standards have led to several recent instances when China's coal-to-chemicals industry has released solid, liquid, and gaseous pollutants into the environment, polluting water sources and deserts. Meanwhile, there is still a lack of technical solutions to processing and recycling high-salinity wastewater and organic pollutants.

The “strictest water resource management system” proposed a red line for restricting pollution in water function zones. It was intended to spread social awareness about the severity of the pollution in many lakes and rivers across the country. It required strengthened management of red lines for pollution restriction, improved supervisory capacity from local governments, and implementation of discharge reduction responsibilities, a progressive reduction in pollution discharge into lakes and rivers, and a higher compliance rate in meeting water quality standards in aquatic functional areas. To achieve this goal, the “State Council Opinions on Implementing the Strictest Water Resources Management System” proposed that at least 60 percent of major lakes, rivers, and water function zones should meet water quality standards by 2015, and at least 80 percent by 2020.

The coal mining/washing, coal-to-chemicals, and coal power generation industries all follow water pollution discharge standards: the coal mining and washing industry follows the “Coal Industry Pollution Emissions Standards (GB 20426—2006)”; the traditional coal-to-chemicals synthetic ammonia and coking industries follow the “Synthetic Ammonia Industry Water Pollution Emissions Standards (GB 13458—2013)” and the “Coking Chemical Industry Pollution Emissions Standards (GB 16171—2012),” respectively, while the potential emissions of thermal pollution by thermal power plants is regulated by the “Thermal Power Plant Construction Project Environmental Impact Report Preparation Specifications (HJ/T 13—1996).” In addition, the “Modern Coal-to-Chemicals Construction Project Environmental Qualifications” has issued requirements for modern coal-to-chemicals water pollution emissions: “When modern coal-to-chemicals projects are built in locations with water bodies for pollutants to be discharged, wastewater discharge (including saline wastewater) should meet relevant pollutant emissions standards and guarantee that surface water meets downstream functional water consumption requirements; in coal-to-chemical project locations where there are no suitable bodies of water for discharge, measures should be taken to process high-salinity wastewater, while the pollution of groundwater, air, soil, etc. is prohibited. Coal companies should strictly implement relevant pollutant emissions standards, reduce their environmental impact, and meet their pollution reduction targets.

Be Aware of Environmental Risks Such As

4.3 Wastewater Discharge & Establish a Good Reputation

This assessment showed that over half of the listed coal companies (within the scope of the assessment) had subsidiary companies that had been penalized because of water pollution issues. As a result of penalty measures such as daily fines introduced by the new “Environmental Protection Law” that came into effect on January 1, 2015, businesses face dramatically higher costs for polluting water and engaging in other illegal environmentally harmful behavior. Businesses should strive to achieve environmental compliance, and actively take rectifying measures when violations occur.

However, supervised monitoring does not fully reflect a company’s environmental performance. Whether or not a company continually achieves compliance is a better indicator of the success of its water risk management program. Publishing live, online monitoring data with continuous tracking can be conducive to supervisory monitoring. In 2015, the newly released “Water Ten Plan” and other policies sent the signal that the country would strengthen its aquatic environment management and wastewater pollution controls. On 12 June 2016, the Ministry of Environmental Protection (MEP) published the “Water Pollution Prevention Law (draft version) (consultation draft)” (hereafter referred to as “the consultation draft”). On 1 June 2008, the MEP’s “Water Pollution Law” entered a formal review process. This document is similar to the 2015 draft “Air Pollution Prevention Law,” requiring companies to make their air pollution emissions data publicly

available online. Article 39 of the “Water Pollution Law” makes the following requirements regarding corporate wastewater discharge: “Heavily polluting companies must install automatic water pollutant monitoring devices and link up with the MEP authority’s monitoring devices, to ensure that the monitoring devices operate normally and produce complete and accurate data. A company’s compliance will be determined by the average daily values taken from the automatic monitoring data, in accordance with standardized monitoring requirements.” Article 116 articulates penalties for companies that do not provide data in accordance with the law: “Companies that fail to install or use automatic water pollutant monitoring devices in accordance with regulations, connect with MEP authorities’ monitoring devices in accordance with regulations, or ensure the normal operation of monitoring devices will be instructed to make corrections by the environmental protection authorities of the government at the county level or higher, and will face fines of between 20,000 and 200,000 RMB. Companies failing to make corrections will be ordered to halt production.”

The MEP’s “Notice on Publishing the 2016 Q1 National Major Corporate Pollutant Emissions Violators List” notes that,

From now on, each quarter, the Ministry of Environment will publish a national key supervision list of major companies that violate pollution emissions standards. The ministry will simultaneously publish the status of management

and rectifying measures taken by companies that violated standards during the previous quarter. Companies that remain listed for two quarters in a row due to serious emissions violations will be placed under administrative investigation by this ministry.

This announcement highlights how online monitoring data will become an increasingly important tool in the future of public supervision and be used as a basis for environmental management and policy enforcement. This greater scrutiny could push companies that discharge wastewater to take further steps to expand information transparency, realize their emissions targets, and avoid discharge risks.

On 6 July 2016, ST Coal and Gas published a company report,²³ which described the plan to reinvest the 800 million RMB worth asset in financial loss into Shanxi Coal Coalbed Methane, an asset valued at 3.3 billion RMB. According to data from the website Niuniu Finance, in the past three years, Lanyan Coalbed Methane and its subsidiaries have faced a total of 51 penalties from government bureaus, including the Ministry of Land and Resources, the Ministry of Environmental Protection, the State Forestry Administration, the Quality and Technology Supervision Bureau, the

Department of Roads and Transportation, and the Coal and Coalbed Methane Industry Bureau, for infractions including illegal land use, environmental pollution, illegal drilling, and operations without environmental impact assessment approval.

Analyses show that as supervision over mergers and reorganizations becomes stricter, it will be more difficult to ensure that supervisory bodies do not extend IPO restrictions stemming from existing environmental problems to major asset reorganizations as well. According to a report from *China Environment News*, following the implication of two listed companies, Shenzhen Noposion and Jiangshan, in the Changzhou Foreign Languages School pollution incident, they were put under close observation by the China Securities Regulatory Commission. The companies were required to conduct rapid self-investigations and immediately implement better information transparency. In response to the regulator's demands, Noposion and Jiangshan companies disclosed relevant information in several public announcements. Noposion and Jiangshan have announced that they will discontinue relevant trading with Changlong Chemicals. This shows how improved transparency can lead to companies that fail to comply with environmental regulations paying a greater price.



Building a Complete Water Risk Management System & Strengthen Public Transparency

4.4

Research has shown that improving environmental risk management helps lower a company's capital cost.²⁴ According to data from the National Statistics Bureau, in 2015 China's raw coal production and coal consumption dropped three percent year-on-year, while coal prices slid significantly. In 2015, revenue from coal mining and washing operations decreased by 14.8 percent, while total profits fell by 65 percent. The scale of this industry's losses continues to grow, with most of the 30 listed coal companies in our assessment experiencing negative growth (Wintime Energy Company's clear positive growth is due to acquisitions from the power industry, among other factors). In the context of the coal industry's capacity cuts, environmental factors will impact a company's survival. For companies operating on a deficit, tackling pollution is even trickier. They must increase their awareness, build comprehensive water risk management systems, and fully address their water risks and associated financial risks.

The International Water Stewardship Standard (AWS Standard), developed by the Alliance for Water Stewardship, is the first international water risk management system for water consumers (including commercial and industrial, agricultural, and residential users). It has undergone years of applied testing and has proven to be a reliable and practicable water risk management system. The goal of the AWS Standard is to promote responsible and sustainable water use by bringing water users into a stakeholder engagement process and taking action at the site and watershed levels to achieve fair, environmentally sustainable, and economical water use.

Lack of information prevented us from assessing these companies' water risks under the "AWS Standard" framework. We are only able to show it for key management steps for water consumption and discharge risks under "Business water risks."

Disclosing relevant information also helps reduce water risks. Environmental information disclosure

by listed companies is becoming an important part of regulatory requirements, social expectations, and corporate social responsibility. The Global Reporting Initiative (GRI) included five items related to water resources in the most recent G4 Sustainability Reporting Guidelines:

- EN8 Total Water Withdrawal by Source
- EN9 Water Sources Significantly Affected by Withdrawal of Water
- EN10 Percentage and Total Volume of Water Recycled and Reused
- EN22 Total Water Discharge by Quality and Destination
- EN26 Identity, Size, Protected Status, and Biodiversity Value of Water Bodies and Related Habitats Significantly Affected by the Organization's Discharges of Water and Runoff

There was highly uneven information disclosure from these 30 assessed coal companies in terms of their water risk management. Half of them failed to even publish a corporate social responsibility report in 2015 (of these, six companies published information related to water risk management in their 2015 annual reports). Even those companies that provided relatively complete disclosure did not strictly adhere to the G4 disclosure guidelines. The "Water Ten Plan" encourages all provinces to develop green credit, to "actively make use of policy-driven banks and other financial institutions to promote environmental protection of water ecosystems; give particular support to circular economy, wastewater treatment, water conservation, aquatic ecosystem protection, clean and renewable energy use, and other such fields." As interest in responsible and green investment continues to grow, full disclosure can more accurately reflect the state of a company's environmental management. Listed companies should provide a more complete disclosure of their operating information in order to send more accurate risk signals to the market and avoid having investors overestimating companies' risks due to asymmetric information.

Limitations of the Corporate Risk Assessment Tool: China's Coal Industry Case

5

This study was undertaken largely from a third-party perspective with limited publicly available information. Risk calculations were made based on summarized data of the listed companies, and did not include the actual operating status of specific subsidiary companies. This was resulted from a lack of information transparency from the listed companies in the following respects:

- Some listed companies disclosed the operating income from their subsidiaries in their annual reports, but the actual makeup of these subsidiaries' operations was unclear.
- Not every listed company disclosed information regarding their coal or power output, and information regarding storage or recoverable coal reserves could not accurately reflect the company's actual operating status.
- The expected income from new projects or projects under construction was impossible to determine, although in the future these could change the distribution of the company's income with respect to location and operational structure.

When conducting the water risk assessment of a listed coal company, the ideal method would be as follows: once the company's regional distribution of projects is known, set the company's business risks as the base value and then create coefficients reflecting the water resources status in each area and the level of policy strictness to adjust this base value. Or we can set the water resource availability in an area as the base value, and then adjust it using the relative risk levels of a company's business operations and the

company's water risk mitigation measures as coefficients. Meanwhile, corporate data of water reusing and recycling can be broken down to the subsidiary level and integrated with information about the local water resources and relevant policies to make adjustments. This can even be carried out at city-level.

After all, water resources problems are highly localized. The analysis of regional and business distribution can be conducted using information that better reflects a company's actual operation conditions such as profits, production, number of subsidiary companies, etc. In other words, companies can integrate their own operational context into the assessment framework provided in this report to perform water risk self-assessments.

Because policy analysis in this assessment is mainly based on the "Water Pollution Prevention Plan" and associated provincial work plans, the level of policy strictness must also take into consideration the future situation of its implementation, which can only be tested over time. For now, it is only possible to make preliminary predictions according to future implementation procedures described in the policy documents. Some cities may have more detailed policies while others lack such information. In order to objectively, comprehensively understand the risks facing these listed companies, our assessments were carried out by fuzzy data processing only at the provincial level. Each company should refer to its own situation and study the relevant policies in detail so as to better manage their own risks.



The “Measures on Self-Monitoring and Information Disclosure for Key State-Monitored Enterprises (Trial),” implemented in January 2014 by China’s Ministry of Environmental Protection, was the first policy of its kind to require real-time information disclosure from pollution sources. However, in addition to the 3000+ nationally monitored air pollution sources, there were a number of large air pollution-emitting companies at the provincial and prefectural level—including many with large emissions and poor management—whose emissions data was not publicly available and were not subject to effective public scrutiny. Of the subsidiaries of the 30 listed coal companies in this study, those listed as “key state-monitored enterprises” generally provided online disclosure of their wastewater discharge monitoring data in accordance with requirements. However, we were unable to collect much information on wastewater discharge from subsidiaries because most were not on the lists of key monitored enterprises.

For those companies that did not disclose their online monitoring data, emissions compliance

could only be determined by examining their environmental penalty and other supervision records. However, as environmental bureaus at the provincial and prefectural level expand their supervision and require disclosure from key companies on the list that monitors air emissions and wastewater discharge, a growing number of companies are expected to publish their pollution information in real time, allowing for more accurate examination of their compliance status. In the assessment there are some similar interference factors, such as the fact that companies with better disclosure may have more environmental issues than those with poor disclosure.

However, less disclosure does not necessarily mean fewer issues. Because our assessment was based only on publicly available information, we may have understated the risks of companies with poor disclosure. Also, this assessment only examined water risks for coal business operations and excluded the water risks of non-coal business operations of the listed companies with wider portfolios, thus may underestimate their overall water risks.

Appendix A

Appendix A presents details on how IPE researchers used the weighted criteria to evaluate the 30 listed companies for water risks linked to water consumption, wastewater discharge, and compliance. For criteria A and B, each criterion has points assigned along four measures—A to D, with A receiving the minimum 2 points, B 4 points, C 6 points, and D the highest score of 8 points.

Weighted Criteria 1: Water Consumption Risks

Proportion of Income Derived from Coal-Fired Power and Coal-to-Chemical Activities

A. Proportion of income derived from coal-fired power generation and coal-to-chemical activities less than 10%.

B. Proportion of income derived from coal-fired power generation and coal-to-chemical activities between 10%-30% (including 10% but not 30%).

C. Proportion of income derived from coal-fired power generation and coal-to-chemical activities between 30%-55% (including 30% but not 55%).

D. Proportion of income derived from coal-fired power generation and coal-to-chemical activities greater than 55% or between 30%-55% but with potential to increase.

Water Conservation and Recycling Measures

A. Company disclosed performance review reflecting its water conservation, such as recycling rate of mine water or residential wastewater and volume of water saved, and the performance remains steady or better than last year in addition to achieving industrial standards.

B. Company disclosed performance review reflecting its water conservation, such as recycling rate of mine water or residential wastewater and volume of water saved, but the performance is worse than last year or not achieving industrial standards.

C. Company disclosed information of equipment investment in water saving, but did not provide performance information.

D. No relevant information was disclosed.

Proportion of Income Derived from Business Located in Water-scarce Regions

- | |
|--|
| A. Proportion of Income Derived from Business Located in Water-scarce Regions less than 25%. |
| B. Proportion of Income Derived from Business Located in Water-scarce Regions between 25-50% (including 25%, not including 50%). |
| C. Proportion of Income Derived from Business Located in Water-scarce Regions between 50-75% (including 50%, not including 75%). |
| D. Proportion of Income Derived from Business Located in Water-scarce Regions greater than 75% (or between 50-75%, but with potential to grow). |

Proportion of Subsidiaries Located in Regions with Stringent Water Use Policies

- | |
|---|
| A. Proportion of subsidiaries located in regions with less or equally stringent water use policy (compared to national standard) less than 50%. |
| B. Proportion of subsidiaries located in regions with one comparatively more stringent water use policy (compare to national standard) equal or higher than 50%. |
| C. Proportion of subsidiaries located in regions with two comparatively more stringent water use policies (compare to national standard) equal or higher than 50%. |
| D. Proportion of subsidiaries located in regions with three comparatively more stringent water use policies (compare to national standard) equal or higher than 50%. |

Weighted Criteria 2: Wastewater Discharge Risks

Proportion of Income from Coal Mining, Washing, and Coal-to-Chemical Activities

- | |
|--|
| A. Proportion of income derived from coal mining, washing and coal-to-chemical activities less than 75%. |
| B. Proportion of income derived from coal mining, washing and coal-to-chemical activities between 75%-85% (including 75% but not 85%). |
| C. Proportion of income derived from coal mining, washing and coal-to-chemical activities between 85%-95% (including 85% but not 95%). |
| D. Proportion of income derived from coal mining, washing and coal-to-chemical activities higher than 95%, or between 85%-95% but with potential to grow. |

Measures for Regional Wastewater Discharge Policy and Regulations

A. Local government disclosed performance review reflecting its wastewater emission reduction goal, such as reduction in pollutants including COD or ammonia nitrogen, and the performance remains steady or better than last year in addition to achieving industrial standards.

B. Local government disclosed performance review reflecting its wastewater emission reduction goal, such as reduction in pollutants including COD or ammonia nitrogen, but the performance is worse than last year or is not achieving industrial standards.

C. Local government disclosed investment in emission reduction equipment but no performance reviews reflecting the effectiveness.

D. No relevant information was disclosed.

Proportion of Subsidiaries Located in Regions with Poor Water Quality

A. Proportion of subsidiaries located in regions with poor water quality less than 25%.

B. Proportion of subsidiaries located in regions with poor water quality between 25-50% (including 25% but not 50%).

C. Proportion of subsidiaries located in regions with poor water quality between 50-75% (including 50%, but not 75%).

D. Proportion of subsidiaries located in regions with poor water quality greater than 75% (or between 50-75% but with potential to grow).

Regional Wastewater Discharge Policies

A. Proportion of subsidiaries located in regions with less or equally stringent wastewater discharge policy (compare to national standard) less than 50%.

B. Proportion of subsidiaries located in regions with one comparatively more stringent wastewater discharge policy (compare to national standard) equal or higher than 50%.

C. Proportion of subsidiaries located in regions with two comparatively more stringent wastewater discharge policies (compare to national standard) equal or higher than 50%.

D. Proportion of subsidiaries located in regions with three comparatively more stringent wastewater discharge policies (compare to national standard) equal or higher than 50%.

Weighted Criteria 3: Compliance Water Risks

For Weighted Criteria 3: Compliance Water Risks in Pollution Violation Records of Subsidiaries and Penalties in Past Three Years, the four measures from A to D are assigned 3, 6, 9, and 12 points, respectively; in Pollution Information Transparency Index (PITI) Score for Subsidiaries, five measures are assigned with 0.3, 0.6, 0.9, 1.2, and 1.5 points, respectively.

Pollution Violation Records of Subsidiaries

A. Average violation record for each subsidiary less than 0.2.
B. Average violation record for each subsidiary between 0.2-0.5 (including 0.2, but not 0.5).
C. Average violation record for each subsidiary between 0.5-1 (including 0.5, but not 1).
D. Average violation record for each subsidiary greater than 1.

Penalties in Past Three Years

A. Ratio of all subsidiaries' environmental violation penalties and cost in past three years lower than 0.0001%.
B. Ratio of all subsidiaries' environmental violation penalties and cost in past three years between 0.0001%-0.001% (including 0.0001%, but not 0.001%).
C. Ratio of all subsidiaries' environmental violation penalties and cost in past three years between 0.001%-0.003% (including 0.001%, but not 0.003%).
D. Ratio of all subsidiaries' environmental violation penalties and cost in past three years higher than 0.003%.

Pollution Information Transparency Index (PITI) Score for Subsidiaries

A. Average PITI score for subsidiaries lower than 0.3.
B. Average PITI score for subsidiaries from 0.3 to 0.6 (including 0.6, but not 0.3).
C. Average PITI score for subsidiaries from 0.6 to 0.9 (including 0.9, but not 0.6).
D. Average PITI score for subsidiaries from 0.9 to 1.2 (including 1.2, but not 0.9).
E. Average PITI score for subsidiaries from 1.2 to 1.5 (including 1.2, but not 1.5).

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Environmental Access Conditions of Construction Projects on Modern Coal Chemical Industry (Trial)

Guidance on Standardizing the Demonstration Work of Coal-based Fuel (Second Draft for Comment)

Technical Requirements for Water Resources Demonstration of Development Planning of Large Coal and Electricity Base (Trial)

Guidance for Water Usage Efficiency in Key Industries

Management Approach of Planned Water Use System

Water Pollution Prevention and Control Action Plan (Water Ten Plan) and affiliated provincial plans

Notice on Issues concerning the Standards for the Collection of Water Resources Fees

Notice on Implementation of the Most Stringent Assessment Methods of Water Management System

Notice on Issues concerning the Adjustment of Levy Standard on Pollution Discharge

Development Plan of Water Use by Mines

Strengthening the Prevention and Control of Environmental Pollution in the Yangtze River Gold Waterway

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