



CHINA WATER
RISK

Water: The New Business Risk

Part II – The Nature of Water Risk

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1. The Nature of Water Risk

1.1 Introduction

Companies operating across China face a range of water-related risks

As China struggles with existing water shortages and prepares itself for worse, companies operating across the country face a range of water-related risks. While there are various approaches to identifying risks and impacts, four categories are referenced widely in existing literature: physical, regulatory, economic and reputational.

In addition to the categories mentioned above, other categories widely referenced include water-related social risks, investment risks and supply chain risks as particularly relevant to companies with China operations.

Please refer to The Big Picture and the booklet 'Introduction to China's Water Crisis' which can be downloaded from the China Water Risk website.

1.2 Physical / Operational Risk

According to the CEO Water Mandate¹, physical risks relate to: "...the inability to access adequate water supplies or services to manage a company's operations. This can be caused by drought or long-term water scarcity, flooding causing damage to infrastructure and/or disruptions in supply, or pollution to the extent that such water is rendered unfit for operational use."

High quality water in sufficient quantity is crucial for many industrial production systems. Lack of water and increased pollution levels can mean:

- higher expenditure on water treatment as legislation and legal enforcement tighten;
- the need to relocate operations to sites where water is readily available; and
- increased operating costs where tariffs are raised as a regulatory response to the crises.

As an example of actual risk, JP Morgan estimates that if a water shortage increased water costs by a factor of two, Texas Instruments' investors' earnings per share would be reduced by \$0.02 and Intel's earnings per share reduced by \$0.01 in 2008².

Pressure to reduce water intensity as scarcity increases

As water scarcity increases, the Chinese government's attention has turned to water efficiency. In 2005, NDRC revealed that the nation's water consumption for every 10,000 yuan of industrial value-added is five to ten times that of developed countries³. Recent research⁴ estimates that China's per capita water productivity

¹ CEO Water Mandate, Corporate Water Accounting, 2009

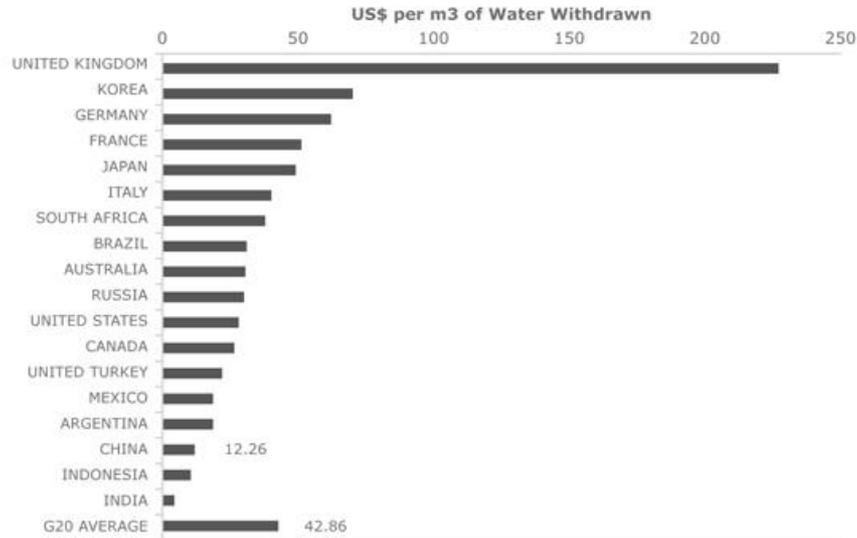
² Watching Water, JP Morgan, 2008

³ China Water Conservation Technology Policy Outline, NDRC, 2005

⁴ Water in China – Issues for Responsible Investors, Responsible Research, 2010

is estimated to be higher than only India and Argentina amongst its G20 peers. As seen in the graph below, China's water productivity is US\$12.30 per m³ of water withdrawn, around a quarter of the G20 average of US\$42.90 per m³ of water withdrawn.

Figure 1: Water Productivity of G20 Countries



Source: Hoekstra, A.Y. and Chapagain, A.K., IMF, Responsible Research, 2010.

At the end of 2008, according to statistics provided by the Ministry of Water Resources (MWR)⁵, water consumption in China averaged 229 m³ per RMB 10,000 worth of products. That figure was down 10% compared with the previous year. In February 2009, MWR announced a goal of slashing water intensity per unit of GDP by 60% by 2020. This means that companies across China will be required to use no more than 6,500 m³ to generate each RMB 1 million of output⁶.

Geographical water supply and pollution disparities

Northern China suffers from severe water scarcity, compared to the south. Beijing has a mere 3 to 4% of the world average on a per capita basis⁷. As the north China plain experiences growing desertification, depleted water supplies and rural-to-urban migration, industries in the region will be tasked with becoming more efficient, re-using greater quantities of water and balancing withdrawals with the physical constraints of the regional river basins.

As China's water scarcity becomes more apparent, industrial needs will likely be pitted against those of the agricultural sector, which is located primarily in the north, as China strives to maintain its self-sufficiency policy as both industrial and agricultural demands for water grow. Under a business as usual scenario, agriculture is set to remain the largest water demand sector for the foreseeable future, but is anticipated to lose some share to industry⁸.

⁵ China to strengthen water control in light of shortage People's Daily, February 2009
⁶ In perilous waters-Pollution and Scarcity China Economic Quarterly, Volume 13 Issue 2 June 2009
⁷ Addressing China's Water Scarcity World Bank, 2009
⁸ Charting Our Water Future 2030 Water Resources Group, 2009

Perhaps reflecting water scarcity concerns, in recent years, investors have unanimously chosen to invest in large new chemical plants in the Yangtze and Pear River basins, rather than the chronically water-short north⁹.

1.3 Regulatory Risk

According to the CEO Water Mandate¹⁰, physical risks “...manifest themselves when policymakers and/or water managers changing/introducing laws or regulations or management practices...Stricter water regulation can be driven by conflict among various needs, public perception of a company’s water practices as wasteful, or poor water management among a region’s different water managers.

China’s environmental policy and regulatory landscape is shifting rapidly, towards more stringent environmental requirements, higher penalties for non-compliance, better enforcement, new financial regulations meant to discourage polluting enterprises, and laws encouraging both greater public participation and environmental litigation. These risks are most consequential for sectors that not only use or discharge relatively large amounts of water, but do so in connection with relatively low-value production processes¹¹.

Relevant legal measures provided in the REGULATIONS section of the China Water Risk website include:

- Measures on Open Environmental Information (for Trial Implementation) (2008)
- Amended Water Pollution Prevention and Control Law (2008)
- Interim Measures on Public Participation in EIA (2006)
- Green Credit Policy (2007)
- Green Securities Policy (2008)
- Provisional Measures on Public Participation in the Environmental Impact Assessment (2006)
- Environmental Impact Assessment Law (2003)
- Environmental Protection Law (1989)

As result of regulatory changes, avenues for civil action are developing and civil cases appear to be on the rise. It is anticipated that as the green courts develop further, such action is likely to increase (please refer to ‘REGULATIONS’ on the China Water Risk website for more details on the green courts).

Increasing regulatory pressure represents a challenge to companies, as they struggle to reconcile a more forceful approach to environmental regulation and enforcement with the historical and more familiar lack lustre performance of many government agencies. Companies in breach of these measures are increasingly being prosecuted and fines are increasing. As some experts observe however, there is still a long way to go.

The following offers a snapshot of how regulations are impacting companies in China:

⁹ In Perilous Waters China Economic Quarterly, June 2009

¹⁰ Corporate Water Accounting CEO Water Mandate , 2009

¹¹ Watching Water JP Morgan, 2008

- In January 2010, five people were jailed for spilling industrial waste into a drinking water source, causing the water supply for a city of five million to be cut off for a week. Jail terms ranged from nine to 29 months. The court also fined the responsible firm RMB 1 million (US\$146,000)¹²
- Also in January 2010, a pharmaceutical company, Zhejiang Apelo Tospo Pharmaceuticals in Zhejiang province, was forced to pay US\$322,200 in compensation for pollution violations¹³
- In August 2009, a small smelter in Hunan province situated along the Xiang River failed to stop production despite being requested to do so by virtue of being listed on the government's closure plan. In response, the county chief, flanked by local National PC delegates, the local government agencies and armed paramilitary police stormed into the plant and destroyed its furnaces with three tons of dynamite¹⁴
- In 2008, the environmental impact assessment system resulted in 156 projects being denied or suspended¹⁵
- More than 8,000 papermaking companies were inspected in 2007 and 621 were shut down for violating national industrial policy and total discharge standards¹⁶
- Fountain Set Holdings Ltd., one of the world's largest cotton-fabric manufacturers, was temporarily shut in 2006 and forced to pay more than US\$1 million in back fees after SEPA (now MEP) found the company dumping roughly 22,000 tonnes of contaminated water each day directly into a local river¹⁷

Box 1. MEP Suspends Approvals for New Hydropower Projects Due to Lack of EIAs

In June 2009, MEP announced it was suspending its approval of hydropower construction applications submitted by China Huaneng Group and China Huadian Corp., as punishment for illegal construction of two dams on Jinshajiang River, located in the upper reaches of the Yangtze. Neither dam received prior approval through the environmental impact assessment (EIA) process, as regulated by Law.

Since 2004, environmental regulators and NGOs have been fighting against power companies' plans to build hydropower plants near World Heritage Sites. With the government's RMB 4 trillion (US\$588 billion) economic stimulus plan including many construction projects, MEP has planned a new round of inspections, nick-named "green storms", starting in July 2008. Between November 2008 and May 2009, MEP suspended or rejected almost 30 new projects, representing lost or delayed investment of more than RMB 145 billion (US\$ 21.3 billion).

For more on how public participation affects business download the booklet "Snapshot of Impact on Communities" on the China Water Risk website (www.chinawaterrisk.org).

¹² Five jailed for polluting Chinese city's water AFP, January 23, 2010

¹³ Drug Firm made to pay for pollution China Daily, January 13, 2010

¹⁴ Heavy Metal Warfare, Caijing Magazine, August, 2009

¹⁵ State of the Environment Summary Report, MEP, 2008

¹⁶ Ibid.

¹⁷ China Shifts Pollution Fight, Wall Street Journal, November 2007

1.4 Economic Risk

The following section was developed in collaboration with Responsible Research. Content was based on their published research of ‘China Water Issues for Responsible Investors’.

A critical issue for any utility sector in transition is economic (pricing) risk. The Chinese power sector can be referenced as a case in point: the government has spent much of the past 10 years formulating a more transparent and realistic pricing regime and while much progress has been made, sector returns have often been unpredictable, in large part due to a reluctance to pass on higher capital and fuel costs to consumers.

China first began pricing water in 1985, and in the initial years Beijing directed water-pricing policy. More recently, this has come under the authority of provincial price bureaus, which approve and implement all tariff changes. Either way, in the 20 or so years since water was first assigned a price; tariffs have increased only modestly and do not reflect the costs of service.

Urban households in China currently spend on average just over 1% of their disposable income on water¹⁸. According to Wang Hao, director of the China Institute of Water Resources and Hydropower Research, water prices in Beijing should be increased to a minimum of RMB 11.4/ton. Beijing authorities have kept water prices pegged at RMB 3.7/ton since 2004¹⁹.

Figure 2: Average domestic water prices of select cities worldwide



Source: China Water Risk, Global Water Intelligence 2010 Water Tariff Survey

In 2006, NDRC issued a supervisory regulation on water pricing, which suggested that the price of water should be based on the cost of water supply, including the costs of accessing groundwater or aquifers, constructing pipes and treating sewage²⁰. This new pricing scheme was designed to comply with the World Bank’s recommendation that China should move towards marginal opportunity cost (MOC) pricing. In this model, the government covers the capital

¹⁸ Public-Private Partnerships in China’s Urban Water Sector, Environmental Management, June 2008

¹⁹ Water price ‘needs to shoot up, China Daily, March 2009

²⁰ Water Shortage Top Urban Problem, China Daily, November 24, 2006

investment and water facilities, while consumers cover the operational, maintenance and disposal costs²¹. Until very recently, however, in most areas, local officials have been resistant to price increases (see boxes below). In August 2009, the NDRC published a supporting document discussing why water prices are too low to cover the costs of managing supply and sewage treatment²².

The challenge is to predict the rate of price increases as these could dramatically affect cash flows for both companies that use water as a key input (costs increasing) or for utilities and water treatment companies that provide the services (revenues increasing).

Box 2. Strong Public Reaction to Water Tariff Increases

Since the beginning of 2009, ten major Chinese cities have raised their water tariffs in at least one category¹. While price hikes will be good news for the more patient joint ventures in the water industry, consumers accustomed to viewing water as a public good are still unprepared for increases. There has been a spate of protests over tariff increases, with some local news reports suggesting the price increases are being driven more by corporate greed than a real need to conserve water.

The Economist reports² that even China's state-controlled press has been airing complaints, criticizing public hearings on water price increases as mere "window-dressing." Chinese commentators claim that the consumer representatives allowed to attend public hearings "are actually officials or else are too well-off to be able to represent those that will be most affected by water price increase."

The key issue in price hikes is the lack of transparency –the cost of providing water supply and sewage in China has never been made publicly available. "The enigma of how tariffs are calculated underscores the ease with which some of them fluctuate ... even after contracts are signed ... higher government rarely allows itself to get drawn into such disputes, let alone arbitrate and elucidate³." Consequently, the public tends to be cynical as to the rationale for price increases.

Public hearings, consumer education and transparency are necessary to overcome resistance to price reform, especially when the quality of the existing service is poor.

¹ Chinese city to back down over tariff increases, Global Water Intelligence, November 2009.

² Water Pricing in China, The Economist, January 7, 2010.

³ Too few cats, too many mice, Global Water Intelligence, September 2009.

²¹ Addressing China's Water Scarcity, World Bank, January 2009

²² Water cost matters, China Daily, August 8, 2009

Box 3. Changing Tariffs in Heilongjiang and Shanghai

The upward trend in Chinese urban water tariffs is facing its first major reversal. The city of Qiqihar in Heilongjiang province is planning to lower its tariff from RMB 4.20/m³ (\$0.61/m³) to RMB 3.00/m³ (\$0.44/m³). Water supply and billing services in this city of 900,000 people are provided by Qiqihar Water Supply Company (QWSC). The city government has committed to making up the difference in the company's income – estimated at RMB 12 million (\$1.76 million) per annum – as a result of the lower tariff. In 2003, Harbin Sinoeagle Group acquired a 68% stake in QWSC. Numerous public appeals since then against what was the most expensive urban water tariff in China have forced the city government to reverse those increases.

Shanghai Pudong Veolia Water Co. Ltd., was the French water giant's first Sino-foreign joint venture. It supplies integrated water services including production, distribution and customer service. During the seven years since it was established, it has been gradually raising the water price, causing some risk to its reputation in China. The latest increase was in July 2009, when the water price in Shanghai was raised from RMB 1.84 (US\$0.27)/m³ to RMB 2.30 (US\$0.34 USD)/m³, a 26% price hike. Local reaction to the price hikes in Shanghai has been strong.

Source: Water Prices in Chinese Large and Middle Cities Are Being Raised and the Investment Outlooks of the Water Industry Are Optimistic, Chen, K, China Research & Intelligence, August 4, 2009

1.5 Reputational Risk

According to the CEO Water Mandate, reputational risks stem "...from diminished stakeholder perceptions due to inefficient or harmful operational activities that have negative water-related impacts on watersheds, ecosystems and/or communities. Reputational concerns can lead to decreased brand value or consumer loyalty or changes in regulatory posture and can ultimately threaten a company's legal and social license to operate."²³

Reputational risk relates to damage to brand/image and can potentially impact market share as consumers exercise their right to choose. As China's water supplies dwindle, companies perceived as wasteful or irresponsible may face consumer backlash. For example, Chinese industries' relatively inefficient use of water and polluting practices may come under increased public scrutiny as water scarcity issues worsen.

In August 2009, the Beijing Development and Reform Commission included Coca-Cola and Pepsi (two of the largest multinationals operating in China) on its list of the top twelve factories causing water pollution in Beijing, because of the large amounts of energy and water they consume, not because they were polluting. The commission saw such intensive water use as a conflict to the city's 11th Five-year plan environmental goals. "If these companies do a little more in cleaner production, they will contribute a lot to the capital's energy and water saving," it reported.

²³ Corporate Water Accounting, CEO Water Mandate, 2009

This action sent a strong message to large-scale water users in China, that in such water-stressed times, compliance is not always enough. Blacklisting companies has also proved to be an effective tool in getting polluting companies back on track. The Institute of Public and Environmental Affairs (IPE) manages a database which lists public records of specific pollution violations and as of January 2010, 50,000 companies had been cited. Companies such as GE, Wal-Mart, Nike and Esquel are using it to monitor the environmental compliance records of their suppliers. In extreme cases, a company's reputation can threaten a company's license to operate as in the case of Coca-Cola and Pepsi.

Box 4. Reputational Risk: Coca-Cola and Pepsi and Reputational Risk in Kerala, India

Large water withdrawals can result in reputational damage in regions where water is scarce and/or local populations lack access to safe and affordable drinking water. In Kerala, India, for example, both Pepsi and Coca-Cola have lost their license to use local groundwater at bottling plants after successive droughts. Coca-Cola was criticised repeatedly throughout 2003 for extracting 1.5 million litres of water a day from the deep wells it had drilled into the aquifer to produce Coke, Fanta, Sprite and the local cola, Thumbs-Up, whilst farmers walked up to six miles, twice a day to fetch water. Their irrigation wells became brackish and unusable as water was diverted to the bottling plant. There were also recriminations from local government of pesticides found in both Pepsi-Co and Coca-Cola products, which led to a subsequent ban in 2006. It is unclear how the Kerala issue will play out, as the court appeals process in this state is a lengthy process.

There is every chance of similar social conflict in China if businesses set up water-intensive operations in areas with poor water sustainability.

Source: Water in China, Issues for Responsible Investors, Responsible Research 2010.

Box 5. China's Growing Middle Class Making Greener Choices

China's growing middle class is becoming more environmentally aware. As early as 2006, CLSA reported the rise of a segment of society termed "green collar," individuals whose increasing wealth is affecting product choice and allowing them to take a more active role in the environmental debate. The sharp rise in bottled water alongside increased wealth exemplifies this trend. China is already the third-largest consumer of bottled water in the world. Since the year 2000 it has been the leading product in China's soft drink market. The recent China Drinking Water Market Report (2008-2009) states that, with the improvement of living standards in China, output and sales of drinking water have increased sharply. The market has developed rapidly due to understandable consumer demand for purity, hygiene and convenience.

Source: China Greening, CLSA, WWF and IPE, 2008.

1.6 Social Risk

The social risk of poor environmental performance relates to civil unrest, which often manifests itself in public protests and demonstrations. Inevitably such action can increase reputational risk and threaten a company's license to operate. Worsening water pollution and more frequent incidents, now often reported by Chinese media, are stirring up deep public resentment with real and dramatic impacts for companies caught off guard.

Civil society's increasing role in redressing environmental pollution in China has in recent years been strengthened by Government legislation, which clearly recognises that people have a right to be informed.

Pollution and water scarcity threatens communities

As a result of China's water crisis:

- An estimated 300 million rural Chinese lack access to safe drinking water
- The OECD estimates that hundreds of millions are drinking water contaminated with pollutants such as arsenic and excessive fluoride, as well as toxins from untreated wastewater, agricultural chemicals and leaching landfill waste²⁴
- In 2006, nearly half of China's major cities did not meet state drinking-water quality standards²⁵
- Pollution incidents result in the periodic suspension of water supplies to millions
- The World Bank forecasts that if present water quality and quantity trends are not reversed, by 2020 there will be 30 million environmental refugees in China fleeing water stress
- Additional data and statistics are provided in the "Introduction to China's Water Crisis" booklet which can be downloaded from the China Water Risk website (<http://www.chinawaterrisk.org>).

There is no shortage of evidence that China's polluted waters are poisoning local communities. Along the country's large lakes and major rivers, reports of health impacts, such as diarrheal diseases, tumours, leukemia, stunted growth, spontaneous abortions, diminished IQs and what have been dubbed "cancer villages," are emerging with increasing frequency. Today 190 million Chinese are reported sick from drinking contaminated water²⁶.

The effects of the water crisis clearly extend beyond these direct physical ailments, affecting the livelihoods of farmers and rural communities. According to renowned water expert Peter Gleick²⁷, water quality is so bad in some regions that local farmers sell their contaminated grains, grown with polluted water, and then purchase grain for themselves grown in areas with supposed trusted water supplies. Farmers' livelihoods are further compromised by water scarcity. In northern Hebei province, for example, it is reported²⁸ that villages are digging 120 to 200 meters to find clean drinking water, versus the 20 to 30 meters required

²⁴ Environmental Performance Review of China, Organization for Economic Cooperation and Development (OECD), Paris, France, July 2007

²⁵ Ibid.

²⁶ The Great Leap Backwards? The Costs of China's Environmental Crisis Economy, Elizabeth C. ,Foreign Affairs 86.5 , Sept-Oct 2007: 37-59

²⁷ China and Water, The World's Water 2008-2009: The Biennial Report on Fresh Water Resources Gleick, Peter H., Island Press, Dec. 2008: 79-100

²⁸ Ibid.

just a decade prior. Deep wells are costly, in some instances accounting for nearly half the annual income of farmers.

Despite alarming water pollution statistics, many factory owners and local officials remain in favour of business as usual. Environmental requirements are typically circumvented if they are perceived as an impediment to investment.

Public unrest

The fallout of government and corporate inaction when it comes to addressing water pollution and scarcity is, not surprisingly, deep public resentment. While communities have little sympathy for polluting companies, they also have limited understanding of their legal rights as well as lack sufficient access to essential pollution data to support their case. Historically, barriers to the public seeking redress have included:

- limited government and corporate transparency
- a weak and constrained NGO sector
- inadequate mechanisms to facilitate participation
- lack of public awareness concerning laws and rights
- problems surrounding enforcement and implementation of environmental laws

In the absence of a transparent and well-functioning system for the public to “watchdog” polluting industries, citizens act by lodging complaints to local officials primarily through letter-writing, environmental hotlines and calls to government agencies. Complaints are mounting in tandem with the rise in environmental problems. From 2001 to 2006, Chinese environmental authorities received more than three million letters and five hundred thousand visits by petitioners seeking environmental redress²⁹.

Beyond these channels, the public is increasingly participating in protests. Prolific cell phone and Internet use is adding fuel to the fire and providing the means to mass organisation. During the widely publicised Xiamen protest in June 2007 it was reported that concerned citizens, soliciting the support of others, sent out one million text messages³⁰. In light of widespread public opposition, the Xiamen Government initially delayed the project, ultimately relocating it to a neighbouring city.

In 2005, China’s State Environmental Protection Administration (SEPA) reported 50,000 protests around pollution incidents. Recent research shows that mass riots and anti-pollution protests have been increasing by one third every year³¹, some drawing as many as 30,000 people. It is not unusual for factories to be shut down in the wake of protests but some argue this post facto model of punishment accomplishes little in the long term. Were citizens given better access to environmental information and effective avenues for voicing complaints, damage would likely be minimised to communities and companies alike.

Please refer to The Big Picture to see some of the pollution incidents, major disruptions and instances of civil unrest that have happened in recent years.

²⁹ Building Effective Governance for Water Environment Conservation in China – A Social Experiment in Community Roundtable Meetings in the Tai Lake Basin, Ge, Junjie, Bi, Jun and Wang, Shi, Chapter 2, Public participation in Environmental Protection,” 2009

³⁰ Trial By Fire: A Chinese NGO’s Work on Environmental Health Litigation in China, Go, Kimberly Go and Suzuki, Maya, July 2008. This research brief was produced as part of the China Environment Forum’s partnership with Western Kentucky University on the USAID-supported China Environmental Health Project

³¹ China Water: Issues for Responsible Investors, Responsible Research, February 2010

Social issues are explored more fully in the booklet ‘Snapshot of Impact on Community’ which can be downloaded from the China Water Risk website.

1.7 Supply Chain Risk

“A clean and transparent supply chain has the potential to become a strategic asset for top tier suppliers. Conversely, poor supply chain performance can result in investment risks and reduce shareholder value.”

Source: ASrIA, Taking Stock, Adding Sustainability Variables to Sectoral Analysis: Supply Chain, 2006

Supply Chain Risks reflect the considerable uncertainty facing companies with extensive supply chains that are themselves operating in water-stressed environments. China’s meteoric rise as the world’s factory is well documented as companies across the globe have outsourced beyond national boundaries, taking advantage of cheap logistics, low domestic production costs and a strong domestic consumer demand for cheap goods. These companies can invest billions of dollars in extensive supplier networks and as a result are exposed to physical (operational), regulatory, reputational and social risks that are often overlooked. These risks can be highly material, particularly for those industries relying on water to manufacture their products and have significant wastewater discharges.

1.8 Investment Risk

Investment risks refer to the potential impact of water-related risks on access to capital. The investor community is beginning to recognise the reality of China’s water crisis, its potential impact on companies operating in the region and the implications to corporate financial performance. This is reflected in equity research appearing in the mainstream, pension fund policies on water and with the advent of the [Carbon Disclosure - Water Disclosure Project](#). There is also additional pressure for companies to provide metrics and data for analysis. In China, the Government’s Green Credit Policy provides another marker that poor environmental performance can be a barrier to finance (please refer to ‘REGULATIONS’ on the China Water Risk website for more details on the Green Credit Policy).

Box 6. Pollution Risk Becomes Financial Reality Affecting Share Price in China

In 2005, two major chemical spills threatened water supplies of residents of the northern city of Harbin close to the Russian border and China's southern manufacturing hub, Guangzhou, one of China's most densely populated areas.

The first spill, the now infamous Songhua river pollution incident, occurred as a result of an explosion in a PetroChina chemical plant, which released 100 tonnes of benzene and other toxic substances into the Songhua River. PetroChina is listed in New York and following the spill, Western shareholders reconsidered their positions in the company's stock. California's Treasurer called on the California State Teachers' Retirement System (CALSTERS) to sell its US\$24 million equity stake in the company. The spill was also a catalyst for the 2008 amendments to the Water Pollution and Prevention Control Law.

The second spill in Guangzhou was caused by the Shaoguan Smelting Plant in Yingde City, which released large quantities of cadmium into a major river. As a result, cadmium levels were raised to 10 times the required safety standard. This and 14 other smelting plants were forced to shut down by the authorities to assess the risk of further spills. Investors in the parent company, Zhongjin Lingnan Nonferrous Metals, which is listed on China's Shenzhen Stock Exchange, lost out when share-trading was frozen and reopened down.

Source: Half Full or Half Empty? UNEPFI, October 2007.

Water risks are already influencing investment decisions in China and affecting shareholdings. Increasing water risks are therefore increasingly likely to influence access to capital and corporate finance.

Box 7. Water risks in value chain are often overlooked

For most industry sectors, the largest portion of a company's water footprint is embedded in the production of raw materials such as food crops, fibres and metals. Many companies' raw material production lies far upstream from direct operations; as a result they typically fail to assess water-related risks in this segment of their value chains. Severe drought, flooding or changes in precipitation patterns due to climate change can decrease agricultural yields and quality, which may increase input costs. In addition, water scarcity and increased competition for freshwater resources can change pricing structures or subsidies for irrigation water for crop or livestock production, which can also drive up costs.

In some sectors (e.g., high-tech/electronics and apparel), the bulk of the water footprint is associated with the manufacturing activities of suppliers. This can lead to a false sense of security about water risk exposure, with companies dismissing water issues as not being material to their business.

Source: Water Scarcity and Climate Change, Growing Risks for Business and Investors, CERES, Pacific Institute, 2009.

1.9 Risks in Combination

The risk identified above are inherently inter-related, frequently occurring in combination, such that Impacts related to risks in one area can easily lead to risks in another. For example, social risk can influence regulatory and reputational risk: as i) government increases legal enforcement in response to protests; and ii) brands become associated with negative community impacts. Regulatory risks can also result in reputational risks where non-compliant polluting companies are named and shamed in the media.

Figure 3: Guide to Evaluating Corporate Risks

Risks	Supply Chain	Production Process	Product Use	
Physical	Temporary non-availability of water disrupts supply chain	Temporary non-availability of water disrupts operations	Temporary non-availability of water disrupts supply chain	
	Water scarcity drives up input prices	Increased capital expenditure on water treatment, water extraction, or alternative technologies to circumvent water problems raises costs	Water scarcity drives up input prices	
	Intensifying competition for scarce water constrains growth	Intensifying competition for scarce water constrains growth	Intensifying competition for scarce water constrains growth	Intensifying competition for scarce water constrains growth
Regulatory	Suspension or withdrawal of supplier's water license or discharge permits disrupts supply chain	Reallocation to more urgent needs during drought disrupts operations	Non-issuance of water license or restrictions on use of particular products or services due to water intensity raises costs or checks growth	
		Suspension or withdrawal of supplier's water license or discharge permit disrupts operations and/or constrains growth		
Reputation	Competition with household water demand constrains suppliers' growth	Increased capital expenditure on wastewater treatment to meet or exceed standards	Public outcry regarding water intensity of product damages brand, reputation, hinders growth	
	Responsibility "by association" for suppliers' water pollution damages brand or reputation, hinders growth	Competition with household demands, or pollution incidents, damages brand or reputation, hinders growth		

Source: Watching Waiter, a Guide to Evaluating Corporate Risks in Thirsty World, JP Morgan, 2008.

2. Assessing Risks in Your Portfolio

To initially assess water-related risks, investors and indeed the companies themselves can ask some key questions. The following questions are an excerpt from Responsible Research’s “Water in China: Issues for Responsible Investors.” The United Nations Environment Programme’s Financial Initiative (UNEP FI) also provides a relatively detailed checklist for financial practitioners in the report “Half Full or Half Empty”, as a basis for identification, assessment and mitigation of water-related risks.

Questions should not be part of a “Box Ticking” exercise. Rather, they should highlight initial issues that can promote a dialogue between company management and shareholders. The questions are by no means intended to be exhaustive and are provided here as guidance only.

For more information on the business risks related to water, please download the “Business Risk” booklet from the China Water Risk website (www.chinawaterrisk.org).

Water Foot Printing	Does the company measure and understand its water footprint?
	Does the company know its direct water use?
	Does the company measure how much water is required and used in its direct operations?
	Does the company measure the quantity and quality of its wastewater discharges?
	Does the company understand the connections between its energy and water use?
Water Risk Assessment	Does the company monitor its indirect water use?
	Does the company know which parts of its supply chain are most water-intensive?
	Is the company aware of how much water is used or discharged in association with its products and services?
	Has the company assessed the business risks associated with its water footprint?
	Has the company evaluated water risks associated with its direct operations? How are the company’s direct operations dependent on quantity, quality, timing and cost of water supply?
What is the nature of the company’s water rights and legal obligations with regard to quantity, quality, price, reliability and duration of water supply?	
What percentage of the company’s direct operations is located in water-stressed or ecologically sensitive regions? Is water demand growing in those regions?	
What percentage of the company’s direct operations relies on energy sources that require large amounts of water to produce?	
What percentage of the company’s direct operations is located in the areas where local population lacks access to clean and affordable drinking water and sanitation?	
What is the water infrastructure situation and water management capacity in regions with key operations?	
How does the amount and source of the company’s water withdrawals impact local communities and ecosystems?	
How does the quantity and quality of wastewater discharge impact local communities and ecosystems?	
What is the quantity/quality of the company’s wastewater discharges in relation to permitted levels and/or industry averages?	
Has the company considered water risks related to its extended supply chain?	
How might the company’s supply chain be affected by changes in water supply, quality, reliability, and price?	
What percentage of the company’s supply chain is located in water-stressed or ecologically sensitive regions?	
Has the company considered water-related regulatory risks of key suppliers?	
What percentage of the company’s key suppliers relies on energy sources that require large amounts of water to produce?	

Water Risk Assessment	Has the company considered water risks related to its products and services?
	How are the company's products and services dependent on quantity, quality, reliability and the price of water supply? How do they perform in relation to competitors?
	What percentage of the company's product users and customers is located in water-stressed or ecologically sensitive regions? Are those customers and users located in regions with growing water demand?
	Do the company's services and products have potential impacts on water resources when disposed of or recycled?
	How will water supply, quality, and reliability in the company's key markets be potentially affected by climate change?
	What percentage of the company's direct operations and supply chain are located in areas where the local population lacks access to clean and affordable drinking water and sanitation?
	Has the company considered water-related regulatory risks of its products and services?
	Does the company have contingency plans to respond to water risks, such as supply disruptions, price increases, more stringent regulations etc?
	Does the company conduct contingency planning for regions with key operations?
	Does the company have contingency plans to respond to supply chain disruptions or raw material price increases due to water issues?
Water and Business Strategy	Has the company assessed how climate change will affect water availability, reliability, price and quality?
	How might the company's direct operations be affected by changes in water supply quantity, quality, and reliability due to climate change?
	Does the company assess how its raw material supply and supply chain may be affected by change in water supply quantity, quality and reliability due to climate change?
	Does the company assess how users of its products and services may be affected by change in water supply quantity, quality and reliability due to climate change?
	How might water price, permits and water quality regulation be affected by climate change in key places the company operates?
	Has the company integrated water risk into its overall business planning and governance structure?
Does the company have a water management policy and plan?	
Has the company's top management (i.e. CEO and board) publicly expressed its commitment to sustainable water management?	
Has the company made water management the responsibility of a direct report to the CEO and ensured that a board-level committee has water management as part of its mandate?	
Has the company formed an integrated water-energy team staffed by a representative of every business function that uses significant amounts of water or energy, or has the potential to pollute water?	
Has the company developed water management programs with specific priorities, tasks, measures and quantified performance goals based on the company's water, energy, and carbon footprints and impact assessments?	
Does the company have a system that promotes continuous improvement in water management and performance?	
Water and Business Strategy	Does the company meet or exceed regulatory requirements for water use and quality?
	Does the company meet or exceed regulatory requirements in its direct operations?
	Does the company work with suppliers to make sure that they meet or exceed regulatory requirements for water use and quality?
	Does the company's water management planning integrate the impacts of climate change on water resources?
	Does the company consider impacts of climate change on water for situating plants or investment decisions?
	Does the company consider the energy implications of water management plans and activities?
	Does the company develop or invest in business opportunities that address water issues?
	Does the company develop and provide solutions to water scarcity and quality, such as water efficiency or treatment technologies, water-efficient products, etc.?
Does the company apply best available technologies to improve water efficiency or wastewater quality?	
Does the company consider energy implications of measures and solutions to water issues?	

Water Disclosure Policy and Practice	Does the company disclose and communicate its water performance and associated risks?
	Does the company report and communicate its water policies and management plans?
	Does the company report its water performance, using broadly accepted metrics or indicators, such as those provided by the Global Reporting Initiative?
	Does the company report its water use/discharges for direct operations?
	Does the company report water use/discharges at the regional or facility levels?
	Does the company report water use/discharges for key suppliers?
Stakeholder Engagement	Does the company disclose water-related risks in its stock exchange filings?
	Does the company engage with key stakeholders (e.g., local communities, non-governmental organisations, government bodies, suppliers, employees) as a part of its water risk assessment, management, and long-term planning?
	Does the company consult with local communities and non-governmental organisations regarding water impacts as it considers where and how to site or expand its operations?
	Does the company work with local governments, businesses and communities to develop and implement integrated watershed management in locations with key operations?
	Does the company collaborate with governments and communities to address issues related to access to drinking water and sanitation?