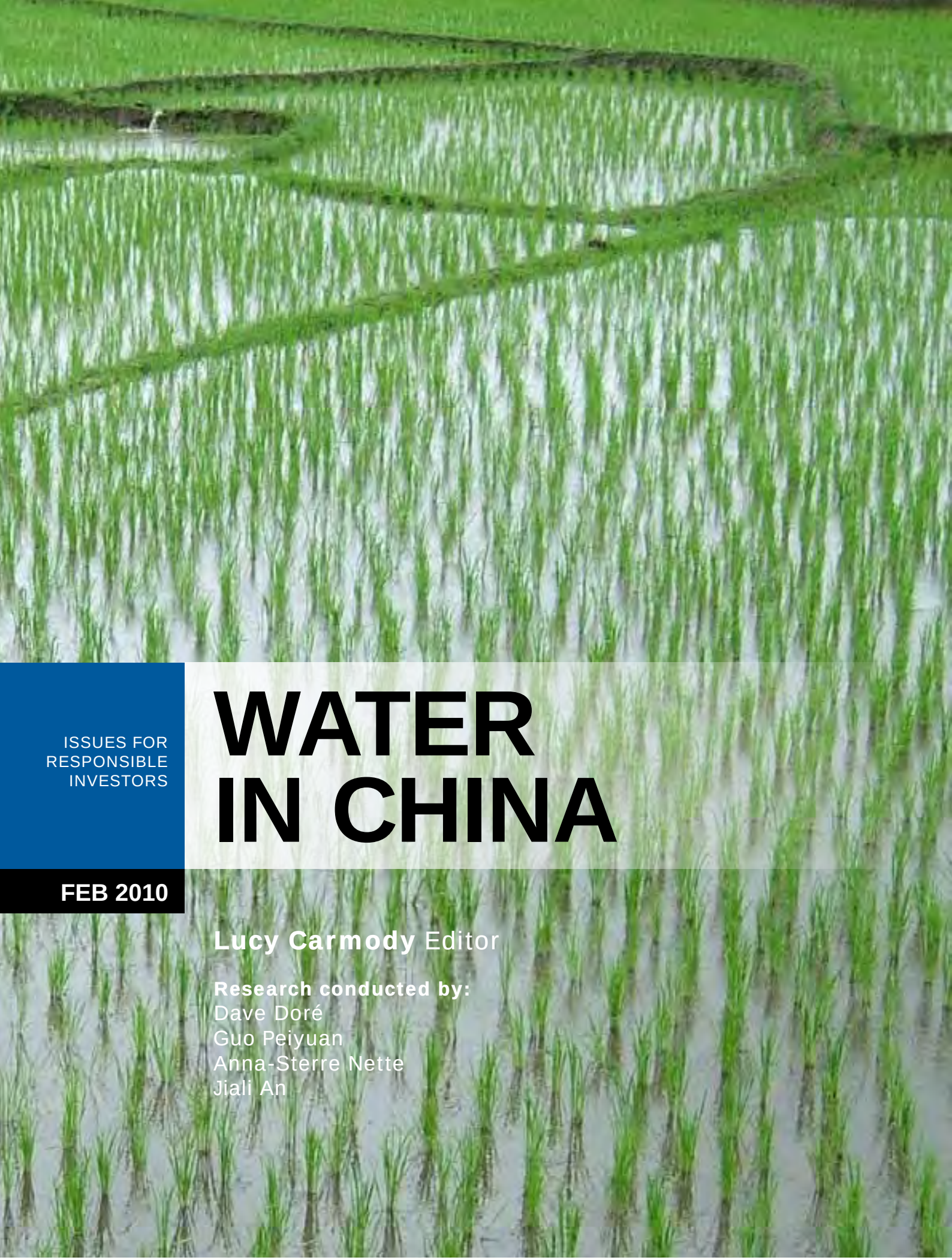


ISSUES FOR RESPONSIBLE INVESTORS

WATER IN CHINA

FEB 2010

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Exchange Rates:
The exchange rates used in the body of the report are RMB6.80 = US$1; RMB10 = €1; and S$1.42 = US$1

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Based on the market close of 13 November 2009, unless otherwise stated.

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KEY INSIGHTS

This report was commissioned by ADM Capital Foundation for the Asia Water Project as part of their special series on China. It focuses on the rapidly developing importance of water as a material factor in investment analysis and action within China. It draws on the latest findings from the Chinese government and civil society institutions, linking these to investment considerations such as market opportunities and risks to earnings. The key findings are as follows:

1. Global investors, business groups and civil society will begin to challenge the issue of water pollution in China with multi-lateral engagement of government and industry

70% of China's rivers and lakes are significantly contaminated, 50% of China's cities have polluted groundwater and over 30% of China is affected by acid rain. Despite the 2008 Water Pollution Prevention and Control Law, a concerted effort is needed to prevent the water quality from worsening. The most recent version of this law was the first environmental law in China to levy fines on individuals within polluting companies. Corporate fines under this law can be up to 50% of income. This legal development creates a more immediate incentive for plant managers to reduce pollution; previous fines were small and it was easier to pay the fine than address the issue of pollution. A strategic and collaborative focus by global investors, business associations and civil society is the most impactful way to ensure progress on these issues and prevent a return to bad habits during periods of rapid ecnomic growth.

2. Water shortages will begin to clearly reduce economic growth forecasts, resulting in trade-offs between clean water access and growth

At the national level water shortages and droughts dampen China's economic development. Water shortages are responsible for direct economic losses of US$35bn every year, about 2.5 times the average annual losses due to floods. Recently newspapers reported that the "August 2009 drought left nearly 5 million people and 4.1 million livestock short of drinking water, damaging 8.7 million hectares of cropland". The winter 2009 drought in Northern China, one of the worst in 50 years, impacted almost 10 million hectares of crops and left almost 4 million people and 2 million livestock with out adequate drinking water supply. Approximately RMB1.5bn was spent on short-term relief efforts.

3. Industry associations will collaborate to deal with China's water challenges

Our research has found few examples of industry-wide activity and collaborative projects to address China's water challenges. However, notable exceptions exist. The Chinese pulp and paper industry recently held a sustainable development forum and, in January 2009, the China Banking Association issued CSR guidelines for financial institutions. The Sustainable Water Group, a Business for Social Responsibility (BSR) working group, involves companies committed to managing water-use and wastewater discharge in global textile supply chains. Much of the group's focus is in the Pearl River Delta, a hub of textile and apparel manufacturers. The China Training Institute, another BSR initiative, has held courses on water management in the textile and apparel industry for general and plant managers and water technicians.

4. Chinese citizens are increasingly active in protests against polluting companies

Activism against water pollution is expected to increase. According to Zhou Shengxian, head of the Ministry of Environmental Protection, this could be by as much as thirty percent every year due to rising expectations of the right to clean water. Older factories that lack water treatment facilities continue to pollute surrounding water sources, but local populations will become increasingly antagonistic to this behaviour. The August 2009 clash between 10,000 locals and 2,000 riot police in Fujian province demonstrated this. Violent protests erupted due to allegations that local tannery and oil refineries have been discharging carcinogenic substances into the water used for drinking. Although incidents have focused on mostly local issues, with local government responses, the potential for these to be of a larger scale, with far wider consequences remains. The violence in Fujiuan, for example, could have spilled over to the nearby Fujian Refining & Petrochemical Co. Ltd., a US$5bn joint venture between Sinopec Corp, Exxon Mobil and Saudi Aramco.

5. Top-down reforms will combine with grass roots activism to strengthen regulation

The Ministry of Environmental Protection (MEP) is focusing on sophisticated financial regulations, such as screening companies pre-IPO and mandating banks to open 'green' lines of credit. The MEP will concentrate on macro-level policies to regulate companies that have a national presence and face national environmental regulatory scrutiny. Meanwhile, the Environmental Information Disclosure Regulations took effect in May 2008. These regulations ensure that disclosure of environmental information by enterprises becomes mandatory over time and places responsibility for the environment with various levels of the administration. It also has begun to gently promote the rights of citizens and other organizations to obtain environmental information and to encourage the public's involvement in environmental protection.

6. Companies will become more conscious of water issues, water-saving initiatives and technologies

Companies can only manage what they measure. In China, as in much of the world, measuring corporate water use and discharge is in its infancy. The measurement of the direct impact business operations have on water is only the first step in comprehensive water footprinting. Further measures involve helping to measure and manage supply chain and end-user water use and discharge. Some industries and companies in China are more advanced in terms of water disclosure than others, for example Baoshan Iron & Steel. Companies in certain sectors are becoming increasingly aware of this issue as their global competitors and customers push for the incorporation of environmental performance data. This is normally due to the ecological and community impact of their operations. For these companies, more comprehensive water reporting should be expected. Companies providing water measurement services in China will be in high demand.

7. Analysts and portfolio managers will require more and better data on corporate water issues in China

Standards of water data collection and reliability in China vary and require intense scrutiny. For example, at the national level, publicly available Chinese government statistics on water consumption distinguish only between 'Households and Services', 'Industry,' 'Agriculture' and 'Others'. These categories fail to give a measure of domestic water consumption, as the data does not distinguish information from the domestic vs service sectors. Similarly, further analysis and due diligence is usually necessary to determine company-level water performance data, when available. New global initiatives such as the Water Disclosure Project and the CEO Water Mandate will assist in improving the environment for measurement and disclosure of water metrics. The investment management industry will become more active in their engagement with companies in China on these issues in 2010 and beyond.

8. There will be increased demand-side management, increased water prices and improved pricing transparency

The National Development and Reform Commission (NDRC), which plays a supervisory role in water pricing, recognises that water prices are too low to cover the cost of managing supply and sewage treatment. According to Chinese water experts, water prices in Beijing are expected to increase fourfold to over RMB11/m3 from the current RMB2.8/m3; this new figure would represent about 2.5% of a household's disposable income. The NDRC has plans to subsidise low-income groups to minimize the impact on their living standards. Local officials, however, are showing a reluctance to impose price hikes. Throughout local water pricing debates, which take place on a regular basis, there remains poor information flow regarding the true cost of water distribution and services. Consequently, water pricing is at a significant risk of manipulation and corruption. Greater cost transparency would ensure greater acceptance of higher water pricing. Theoretically, there are now performance incentives for government officials that relate to environmental, as well as economic, targets, which should make this easier.

9. Private sector investment in emerging water technologies will increase

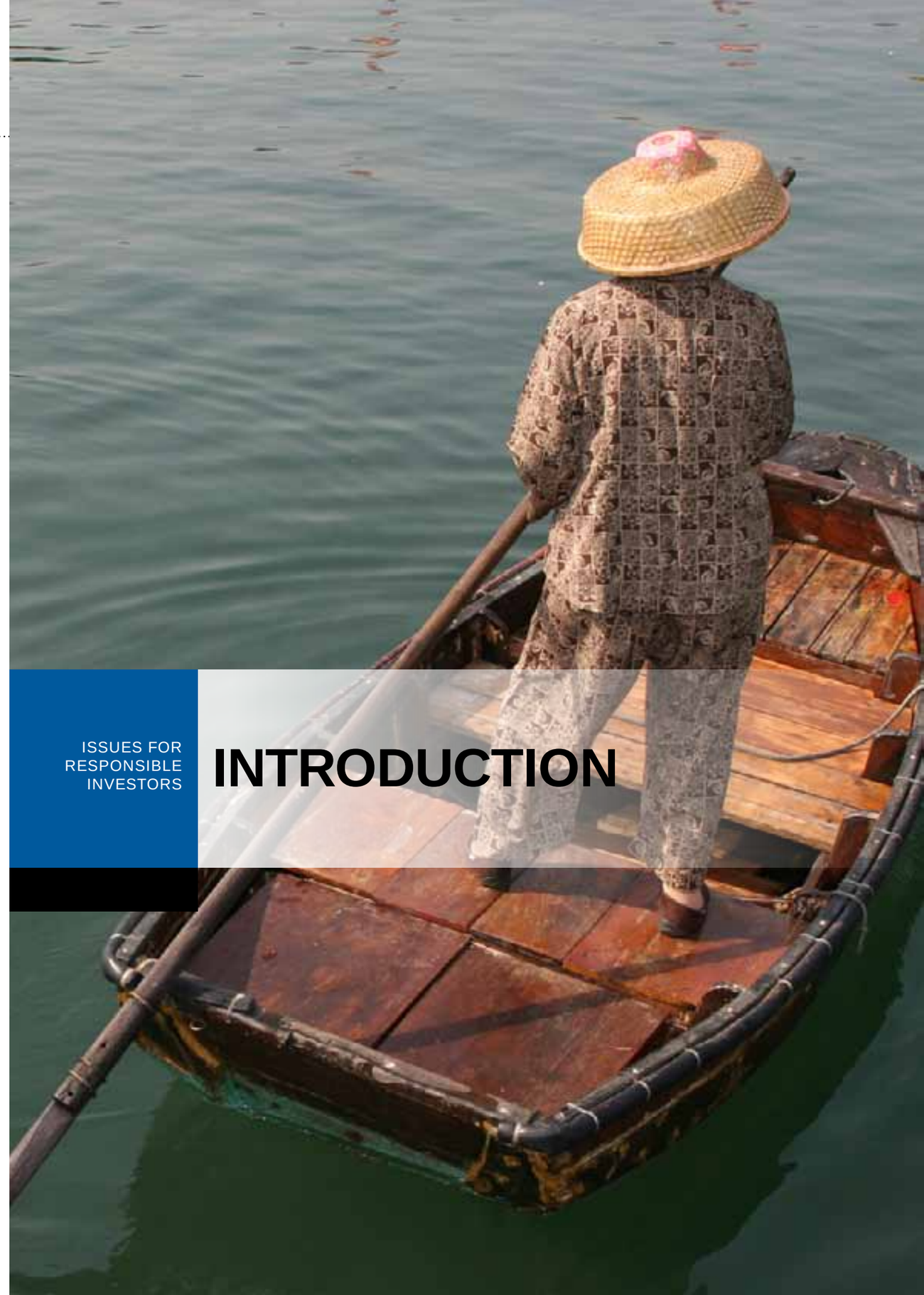
Advanced water technologies are being adopted very slowly in China. The supply and treatment of water is still dominated by the bureaucratic public sector. Private sector participation in China's water and sewerage sector is still well below the levels seen in the telecom, transport and energy sectors. Water utilities are not yet market oriented or profit-driven so there is little inclination or ability to improve efficiencies and transfer the cost of modernisation through price increases to end-users. Some early-stage and venture capital investment in Chinese water solutions is beginning, backed by multi-lateral agencies such as the Asian Development Bank and creative organizations such as Imagine H20. This is a Harvard linked organisation that offers prizes, incubation assistance and mentoring to support water entrepreneurs globally.

10. Mega Projects will test the concept of Integrated Water Resource Management

IWRM is the globally accepted approach to large-scale water management. It involves all the stakeholders of water resources within a basin, including forestry, agriculture, public works and private and public sector industry. China's 2002 Water Law reflected the national commitment to IWRM. China's massive water projects (for example, the South-North Water Transfer and Three Gorges Dam projects) are testing the concept of dialogue between public, private, and civil society sectors. Although there are newly required Environmental Impact Assessments in place, the secondary environmental impacts of the industries attracted to the cheaper hydroelectric power and water may not yet be adequately captured.

11. China will experience challenging episodes of superficial water abundance

Despite the current rhetoric surrounding water shortages, businesses and domestic users in China may be periodically under the illusion of a seeming abundance of water. This is due to widespread flooding in the West exacerbated by the rapid melting of the Himalayan glaciers and intense monsoonal activity and increased cyclonic activity in the South East. The management of these periods of temporary superficial abundance will present Chinese policymakers and business leaders with just as significant a set of challenges as the management of scarcer baseline system water resources.



ISSUES FOR RESPONSIBLE INVESTORS

INTRODUCTION

INTRODUCTION



Sixty years after the establishment of the Peoples Republic of China we look at the potentially devastating issue of water - shortages, pollution, power and abuse - and review potential solutions for investors and companies when monitoring this risk to their performance.

Even in ancient times, records suggest that flood control and central water resource management was vital in supplying plentiful water and combating the occasional deluges. The image to the left depicts 'Gong-Gong', said to have been the earliest flood-control hero and the first to use the "diversion", rather than "dredging" technique for river management. He was, according to historical accounts, an expert in embankment and dam construction and significantly increased agricultural productivity.

China has always been challenged by its unequal geographic distribution of water. Mythology has made attempts to explain this: *During a long and heated war Gong-gong's party lost many warriors and was forced to retreat to the northwest of China. Gong-gong angrily struck and broke the Buzhou Mountain that was supporting the sky. As a result, the sky, sun, stars moon all started to tilt towards the northwest and the land started to tilt towards the southeast. Everything started to fall towards the sea, there was a great flood and people on the land suffered greatly. His actions were thought to be the reason that rivers in China flow towards the southeast, while the sun, the stars and the moon moves towards the northwest.*[1]

Moving on to the present day, there is a perceptible and growing sense of urgency regarding the impending water crisis in China. Rapid industrialisation, economic and population growth have all increasingly affected the scarcity and quality of the water supply in both rural and urban China whilst climate change, pollution and increased regulation are increasingly important risks for companies and investors to consider. China must support around 20% of the global population with only around 7% of the world's finite freshwater supply. With fertility, diets, health and life expectancy improving annually, the population is expected to increase by a further 2-3 billion by 2050, with over 1 billion people living in Chinese cities by 2030.

Outsourcing of global heavy industry has contributed to China's rising water intensity

Rising water intensity per capita in China has come about primarily from the outsourcing of global heavy industry, manufacturing and processing to South Eastern China from developed countries since the 1970s leading to individual wealth creation and consumerism. The thousands of coal-fired power stations that have provided economical electricity to fuel this progress have contributed to the shortages through their inefficient use of ground water for cooling.

In recent years, rising corporate demand for both water and energy has clashed with demand stresses from increased private consumption driven by easier banking credit and the perceived freedom to spend, rather than save. The Chinese middle classes are enjoying more consumer choice (washing machines, dishwashers, car washes, gardens) lifestyle changes (increasing regularity of bathing, golf and swimming) and better diets (a move from rice, fish, chicken and vegetables to diets rich in meat, corn and sugar), all of which are putting strains on the water delivery system.

Agribusiness contributes mightily to water shortages

Modern agribusiness in China, supporting these improvements in diets, is now a significant contributor to downstream water shortages. The huge demand growth projected for rice, beef and wheat reveals that water stresses in agricultural regions will intensify further. Beef production, in particular, could have a devastating impact on supplies. The meat industry requires over 15,000 litres of water to produce 1kg of beef with intensively reared cattle. This is over 4.5 times as much water as is used per kg of rice production. Of particular concern also are the efforts towards plantation reforestation using water intensive cash crops such as eucalyptus that, if allowed to progress unchecked, could result in serious localised demand imbalances.

Industry is a contributor to both pollution and excess demand and, potentially, part of the solution. By implementing rigorous water testing and monitoring and by installing treating equipment, companies can effectively reduce their impacts, with some even claiming to be net contributors to cleaning up the water supply. This report reviews the likely new requirements for wastewater emissions disclosure and management that will become increasingly important in virtually all industry categories. New industry collaborative engagement and reporting initiatives will begin to be adopted in the next few years by multi-nationals operating responsibly in China.

Until recently Beijing has focused on providing the capital and stimulus for economic growth and addressing the social issues associated with massive wealth redistribution. Unfortunately the warning signs of over-consumption of water (falling water tables, ground and river water pollution, water-borne disease, agricultural capacity constraints and an inability to introduce real pricing) have largely been ignored until now.

Now public and private sector attention needs to turn to these critical issues. Government and industry bodies cannot afford to be complacent about the availability of clean water and, after years of chronic underinvestment, water infrastructure is rising on the political agenda. This report discusses the trends outlined above and frames the specific challenges and opportunities of pollution and water scarcity in a Chinese context.

Water markets have several unique characteristics. Water is a basic human need which the state is obliged to deliver and people have grown used to receiving it at very low cost. Both households and industry pay comparatively very little for access to water and few have any idea on what basis they are billed or what the 'true cost' of their water consumption would be once externalities such as water extraction, processing infrastructure, treatment and delivery are included. As with 'anything which seems too good to be true', this situation must come to an end.

Water is a basic human need and therefore full cost recovery is difficult to achieve

Currently, as with many global emerging water markets, the cost of delivering, treating and cleaning water for industrial, domestic and agricultural users is borne largely by the state, not the end-user. Correct pricing of water is now a major issue for the government in China. With a population so used to 'cheap water for all', the municipal governments have a huge challenge in gradually introducing taxes, tariffs and market pricing on this precious resource. One estimate suggests that prices in Beijing need to increase fourfold in order to pay for the huge infrastructural investment required to keep pace with demand over the next few decades. In Shanghai, despite many objections during public consultations, the Shanghai Development and Reform Commission has managed to increased tap water prices by almost 30% in June 2009, to RMB1.33 per m^3. By November 2010 domestic and industrial prices are due to rise again 22.6% and 20.4%, respectively.

China is trying to reform a fragmented water governance structure

In China, however, even modest price increases can cause bureaucratic gridlock. We know of one draft version of a Water Pricing Proposal that has been on the drawing board for six years. This illustrates another substantial roadblock in the journey towards Chinese water sustainability – the fragmented nature of water governance, on a national and regional level, resulting in a high level of systemic inertia with respect to innovation and investment. The situation is made more complex still by the lack of sophisticated legal machinery for regulation and enforcement. It is still early days in the development of a modern legal system that can compete with corrupt industrial activities and poor water regulation has, so far, been a lower priority than tackling other major issues such as local bureaucracy and bribery of officials.

Unlike electricity or gas, clean water is a must-have commodity. This lack of substitute potential leads to low price elasticity and a tendency for over-regulation of tariffs. It is also easily harmed (through pollution), can 'disappear' from a closed system (through evaporation or leakages), and is costly and difficult to transfer across long distances. It is worth noting that China is one of the few countries in the world, along with the USA, where water is transported from one watershed into another due to acute geographical imbalances of demand. Even the transfer of raw untreated water involves extremely high 'embedded' costs for the construction of pipelines.

Unlike global warming, access to clean water is more of a local watershed issue than a global issue

In this report we focus on the various impacts of climate change and pollution on water in China. Unlike global warming, where increases in emissions in one country can be theoretically 'offset' by reductions elsewhere, access to clean water is more of a local watershed issue. It is becoming harder for scientists to predict droughts and floods as weather systems become more volatile. Rapidly changing rainfall patterns in China are making it harder to manage water resources and predict agricultural demand for pumped water. Experts also predict that rising sea levels will affect China's vast coastal freshwater aquifers, resulting in an increase in salinity due to breaching of sea walls and encroaching tides that will result in a decline in viability of these raw water sources. To complicate matters further, air pollution seems to be having a direct

impact on total rainfall; a recent report from the U.S. Department of Energy, published in August 2009, found that Chinese increasing air pollution during the last 50 years has directly resulted in a reduction of rainfall by about 25%. One also wonders how the popular practice of cloud seeding will complicate this pitcure in the future.

Melting glaciers bring an illusion of water abundance to China

Perhaps the most complex and contentious issue to consider in this scenario is that China also suffers from short-term periods of water abundance, due to widespread flooding in the West from the rapid melting of the Himalayan glaciers. When this coincides with the very intense monsoonal activity from June to August, it can have devastating effects on crop yields and erosion. We believe that the management of a temporary abundance of resources will present Chinese policymakers with challenges just as significant as the management of a scarce resource.

This report also reviews the a variety of issues that impact water supplies in China. Ironically, the global economic crisis may have resulted in a positive medium-term impact. Not only did industrial demand drop off drastically for a period but, in November 2008, China also approved a US$588bn two-year fiscal stimulus package, including a US$31bn investment in environmental protection and energy conservation. The Ministry of Water Resources has stated that, of this, approximately US$3bn has been put aside to provide safe drinking water and to fund water projects in rural areas. Additionally US$1bn is targeted for water projects in poorer provinces and another US$100m is targeted to go to the development of water use programs in the Beijing area. Other figures state that over US$50bn has been reserved for 'improving the ecological environment and treating pollution' in rural areas. As of the time of writing there is still slight confusion over the precise amounts and their targets, some large-scale 'green' projects have already been announced. Beijing is expected to quadruple the amount of electricity sourced from renewable energy by 2010 (from 2005 levels) and build the largest recycling water source heat pump.

Many excellent initiatives are highlighted throughout the report

Both globally and domestically, politicians, corporate leaders, NGOs and scientists have begun to frame their arguments for rapid change to the existing Chinese water delivery system. We highlight many excellent public and private initiatives, for example the CEO Water Mandate and the Business or Social Responsibility 'Sustainable Water Group' that assists the textile and apparel industry in the Pearl River basin.

The time is right to implement essential regional water management policies to provide clean water to domestic and business users at the correct price and to promote good water conservation. Without significant changes to the way China manages its water resources, the improved 'standards of living' of the emergent middle classes seen over the past 20 years will be lessened by increased risks to public health, higher levels of dangerous contaminants in the groundwater and extremely high water pricing due to falling water table levels and more expensive extraction from aquifers.

Footnote on Border Conflict

Tensions with India may be heightened as transnational rivers are diverted

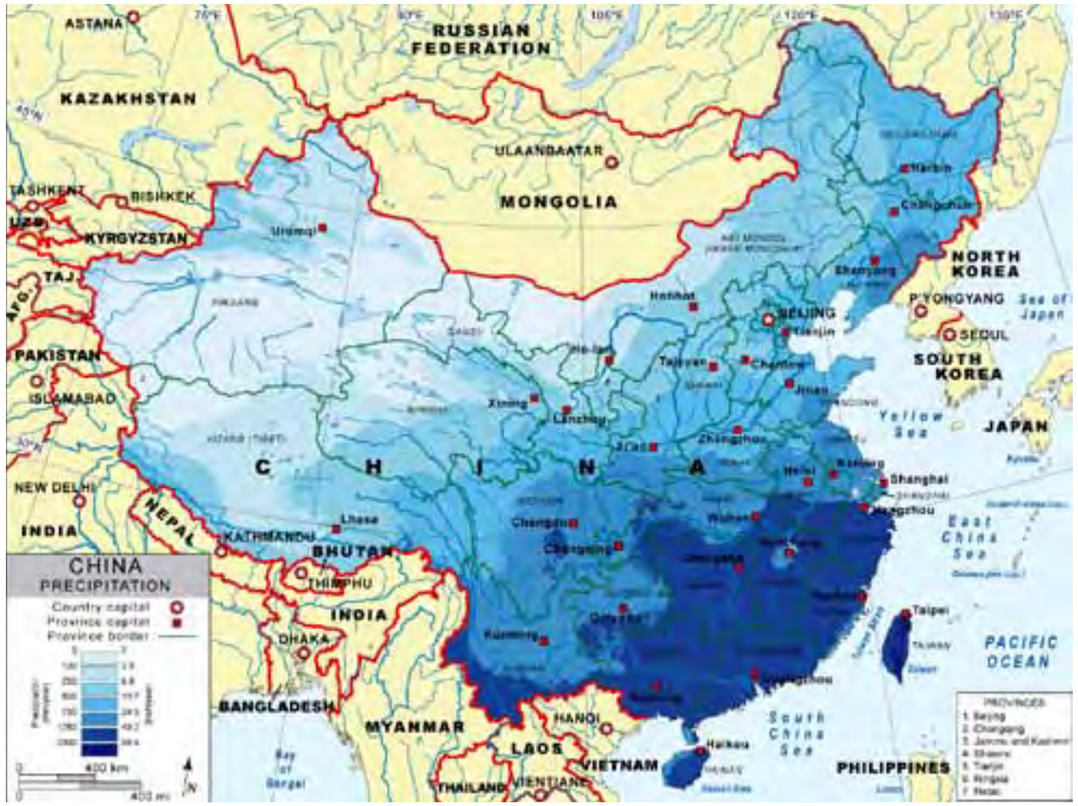
Although we do not cover the issue in this report, scarcity of water will also bring the potential for geopolitical conflict between China and its neighbours. This issue could become very real in an environment of lowering water tables, rising populations and increasing temperatures. The most likely test of China's intentions towards its neighbour's water supplies will be discussions over the potential diversion of rivers originating in Tibet to flow towards the parched Northeast of China. In particular, there has been some international concern over one sacred river source (known as Brahmaputra to the Indians and Tsangpo to the Tibetans). Bangladesh and Myanmar could also be greatly affected by any diversion of the flow of this river. Commentators have suggested that China plans to divert 40 billion m^3 of water annually to the NE and establish a 40,000 MW hydropower project at a point called the 'Great Bend' of the Tsangpo. This issue will be of future concern for responsible investors who are looking to divert capital to emerging markets in a manner that protects basic human rights in terms of access to water and riparian rights of downstream populations.

WATER IN CHINA: TEN FACTS

1. China accounts for approximately 19.5% of the world population but has only 7% of the globe's freshwater resources.[2]
2. Water efficiency in China is poor compared to its G20 peers, requiring around four times as much water per US$ of GDP created.
3. Two-thirds of China's 660 cities suffer from water shortages with the situation in 110 termed 'severe'.
4. About 700 million people drink water that is contaminated with animal and human waste.
5. Water pollution sickens 190 million Chinese and causes an estimated 60,000 premature deaths every year.[3]
6. By 2015 China is expected to have almost 110 cities with over 1 million people, growing to more than 220 cities by 2025.[4]
7. In 2005 the Chinese water supply system leaked an estimated 10 billion m3, more than 20% of the total processed.[5]
8. In Northern China 90% of the aquifers situated under Chinese cities are polluted.
9. Over 75% of rivers water flowing through urban areas are considered unsuitable for drinking or fishing.
10. 30% of river water in China is regarded as unfit for agricultural or industrial use.[6]

Precipitation and Agriculture

Figure 1: China's average annual precipitation



Source: World Trade Press

Precipitation varies greatly across China's many regions and has had a huge impact on where the majority of agricultural investment is concentrated. Increasingly, however, areas that have scarce rainfall are being intensively farmed, for example Hebei and Shanxi in the North. This limited rainfall can be underutilised or lost completely due to poor irrigation and water storage practice and investment.

THE 10 MOST IMPORTANT RIVERS IN CHINA

RIVER SYSTEMS	ENVIRONMENT, SOCIAL and GOVERNANCE ISSUES
Yangtze River (Changjiang) The longest river in China and the third longest in the world at 6,300km, it originates in the Tibetan plateau and flows through Qinghai, Tibet, Yunnan, Sichuan, Hubei, Hunan, Jiangxi, Anhui and Jiangsu before entering the East China Sea in Shanghai. It has eight major tributaries and a catchment area of 1.8 m km^2, around 20% of China's land mass. The Three Gorges dam is situated on the Yangtze.	• Social and environmental impacts of massive hydropower projects – Three Gorges and related projects. • Investments that bolster integrated water resource management. • Source important for transportation and irrigation. • Suffers from sewage and industrial waste dumping. > 14% of the water quality is poor = cannot support swimming and drinking.
Yellow River (Huanghe) The second longest river at almost 5,500km. The river is notable for its associations with ancient Chinese culture and civilization. Originating in the Bayanhar Mountains in Qinghai Province it meanders across 9 provinces and reaches the ocean in Shandong Province.	• Impact of agri-chemicals on the river in China's agricultural heartland as it suffers from intense irrigation. • Water volumes decreasing and flows less predictable. > 30% of the water quality is poor = cannot support drinking.
Heilongjiang River (Heilongjiang) This river (the Black Dragon River) marks the boundary between Russian and China. It runs east across Northern China and empties into the Sea of Okhotsk. Its entire length is over 4,300km making it the 11th largest river in the world. Its banks are still well forested in places.	• Natural habitat of Siberian Tiger, black bear and many rare bird species. • Pollution from lack of water treatment by heavy industry. • Potential for border conflict with Russia.
Songhuajiang River (Songhuajiang) - This river (also known as the Sungari) is around 2,000km long and is in the Northeast. It is the largest tributary of the Heilongjiang River and flows from the Changbai Mountains.	• Pollution from lack of water treatment by heavy industry. • In November 2005 an explosion at a petrochemical plant in Jilin contaminated drinking water supply with benzene. • Potential for transnational tension with Russia. > 65% of the water testing stations show quality is poor which means these areas cannot support drinking.
Zhujiang River (the Pearl River) The Pearl is the second largest by volume, after the Yangtze and the longest river in Southern China. It flows into the South China Sea between Hong Kong and Macau where it forms a delta. The river flows through the dense population zones of Guangdong, Guangxi, Yunnan, and Guizhou Provinces. The river basin is over 400,000km² in area.	• Water treatment from a range of industries including textile and apparel. • Initiatives under way to clean up the Pearl River Delta. • Surrounded by fertile soil and abundant natural resources.
Brahmaputra River (Yaluzangbujiang) From its source in Tibet the Brahmaputra River flows first east and then south into the Indian Ocean. About 1,800 miles (2,900 km) long, the Brahmaputra has the largest canyon in the world at over 500km long and 6,000 m deep.	• Natural habitat of rare river dolphins. • Dam building and river diversion. • Potential for border tension with India. • Source important for transportation and irrigation.
Lancang River (Lancang Jiang) Also known as the Mekong River, it is the longest river in the Southeast Asia, with a total length of over 2,300 km. Its source is in Qinghai and it runs south until it leaves China at Yunnan Province. The Mekong finally reaches the Pacific Ocean in South Vietnam. Many ethnic and tribal minorities live along the banks of the Lancang in China and North Vietnam.	• Social and environmental impacts of dams and hydropower projects. • River flow diversion from downstream countries, Vietnam in particular. • Many different ethnic and tribal minorities live along the river.
Huai River (Huai He) This 1,078km river originates in the Tongbai Mountain in Henan province. It flows through northern Anhui, finally entering the Yangtze River at Jiangdu, Yangzhou.	• Investment in flood control > 60% of the water quality is poor = cannot support drinking.
Hai River (Hai He) The longest tributary of this sediment-rich ruver runs 1,329 km through Beijing and Tianjin before emptying into the Bohai Gulf of the Yellow Sea.	• Hai's flood control has a significant economic and environmental impact on the second and third largest cities in China, Beijing and Tianjin, respectively. • Water treatment needed for a range of industrial pollution. > 70% of the water quality is poor = cannot support drinking.
Liao River (Liao He) This is also known as the 'Mother' River. It flows through Hebei, Inner Mongolia, Jilin, and Liaoning provinces, and at last empties into the Bohai Sea, with a drainage area of over 200,000km²	• Pollution from lack of water treatment by heavy industry. > 60% of the water quality is poor = cannot support drinking.

WATER REGULATION IN CHINA

Decision-making on water, pollution and preservation issues can be a complex process in China. Several agencies share responsibility for water resource management which can lead to a lack of coordination and poor delineation of public duties. This poor clarity on issues of responsibility tends to lead to hold-ups and conflicts of interest between government bodies, especially at the local level.[7]

China's water regulations have historically focused on supply management

Traditionally, Chinese water management has focused on two major rivers the Yellow River in the north and the Yangtze River in the south. Both rivers flood on a regular basis and affect millions of people. Over time, this has meant local and central governments have focused on large-scale dam building projects and agriculture water supply.[8] Most of the Water Institutes that still exist today were founded under Chairman Mao. The Yellow River Conservancy Commission (YRCC) was established during this period to manage river water related issues under the Ministry of Water Resources. During Deng Xiao Peng's leadership, however, demand for water from industry and the domestic sector rapidly increased and, in 1982, the state regained central management over all the water resources.

The state began to monitor water use by sector and to allocate resources based on market considerations with little concern for the environment. In the 1990's, industry rapidly increased its use of water and the Yellow River started to run dry on a regular basis. Increasing periods of drought in the north exacerbated China's overall water shortage. For the first time in history, drought, not flood, became the main issue for China's water management officials.

Figure 2: Summary of PRC government bodies with water-related roles

WATER RESOURCE MANAGEMENT	State Council	Implementation of administrative orders and regulations, overall coordination of ministries and agencies
	Ministry of Water Resources	Integrated water resource management, water resource protection planning, water function zoning, monitoring water quantity and quality in rivers and lakes, issues water extraction permits, proposes water pricing policies
	Ministry of Environmental Protection	Supervisory and enforcement roles on water pollution laws, regulations, standards; water environmental function zoning, monitors water quality
	National Development and Reform Commission	Pollution levy policy, wastewater treatment pricing policy, water pricing policy, industrial policies affecting wastewater discharge and treatment
	Ministry of Finance	Pollution levy management, manages wastewater treatment charges and water resource fee policy; State Office of Comprehensive Agricultural Development
	Ministry of Housing, Urban and Rural Development (formerly Construction Ministry)	Urban water supply, urban wastewater treatment
	Ministry of Agriculture	Rural and agricultural water use and agricultural pollution from agri-chemicals
	Ministry of Land and Resources	Water as a resource, land use planning
	State Forest Administration	Using forests to conserve water sources
	Ministry of Transportation	Ship transportation and water pollution control
	State Oceanic Administration	Manages sea area use; protects and conserves marine environment
	National People's Congress	Legislation, law enforcement, and supervision

Source: Adapted from the World Bank's 'Addressing China's Water Scarcity'.

We understand that currently responsibility for regulation of water is split between the following organizations:

1. The State Council of the People's Republic of China (www.english.gov.cn)
This is the highest governmental power and holder of the overall water rights in China.

2. Ministry of Water Resources (MWR) (www.mwr.gov.cn/english/)
This is a Department of the State Council and is responsible for water administration in China. It controls the massive state water budget and performs the following activities:

- Formulate water-related policies, development strategies and development plans, including water conservation and demand management policies
- Draft legislation on water drawing, pricing and tariff regulations
- Mediate in trans-boundary water disputes with neighbours
- Monitor and implement plans on water quality, supply and demand
- Assess flood risk and flood mitigation in relation to urban planning and major construction projects.
- Recommend policy on large and medium-sized capital construction projects in the water sector to the State Council.
- Draft regulations for water resource and environment protection and control of discharge of wastewater to potable water areas.
- Draft and approve technical standards, specifications and codes
- Identify key hydro-science projects
- Disseminate water saving technologies
- Manage protection of water bodies, dykes, dams, coasts and beaches
- Manage farmland irrigation and rural water supplies
- Promote and ensure national soil conservation
- Develop technical and academic water capabilities
- Oversee of the Flood and Drought Prevention agencies

The Ministry of Water Resources handles a variety of responsibilities including surface water regulation

3. Ministry of Environmental Protection (www.english.mep.gov.cn)
The Ministry of Environmental Protection (MEP), which succeeded the State Environmental Protection Agency (SEPA) in March 2008, appears to share most responsibilities for water scarcity-related issues with the Ministry of Water Resources (MWR). The agency's elevation to ministerial status suggests an increasing emphasis from Beijing and an acknowledgement that the government needs to co-ordinate its efforts to control major air and water pollutants based on more thorough research and monitoring.[9] The MEP releases an annual report on the state of China's environment that contains a large section on water quality. One official has commented that the new ministry aims 'to step up environmental improvement and ecological protection and accelerate the building of a resource-saving and environment-friendly society'.[10] Three new departments were created in 2008 – the Department for Control of Pollutant Discharge, the Environment Monitoring Department and the Department of Publicity and Education.[11] Despite the elevation of the MEP to cabinet level, World Resources Institute has commented that this does not guarantee any immediate improvements, as frameworks for environmental administration are still comparatively weak in the Chinese cabinet.[12]

The Ministry of Environmental Protection was recently elevated to full ministerial status

4. Other Ministries

- The Ministry of Housing and Urban-Rural Development (formerly Construction)
- The Ministry of Agriculture
- The Ministry of Communication - waterways
- The Ministry of Public Health - sanitation

5. Other Agencies

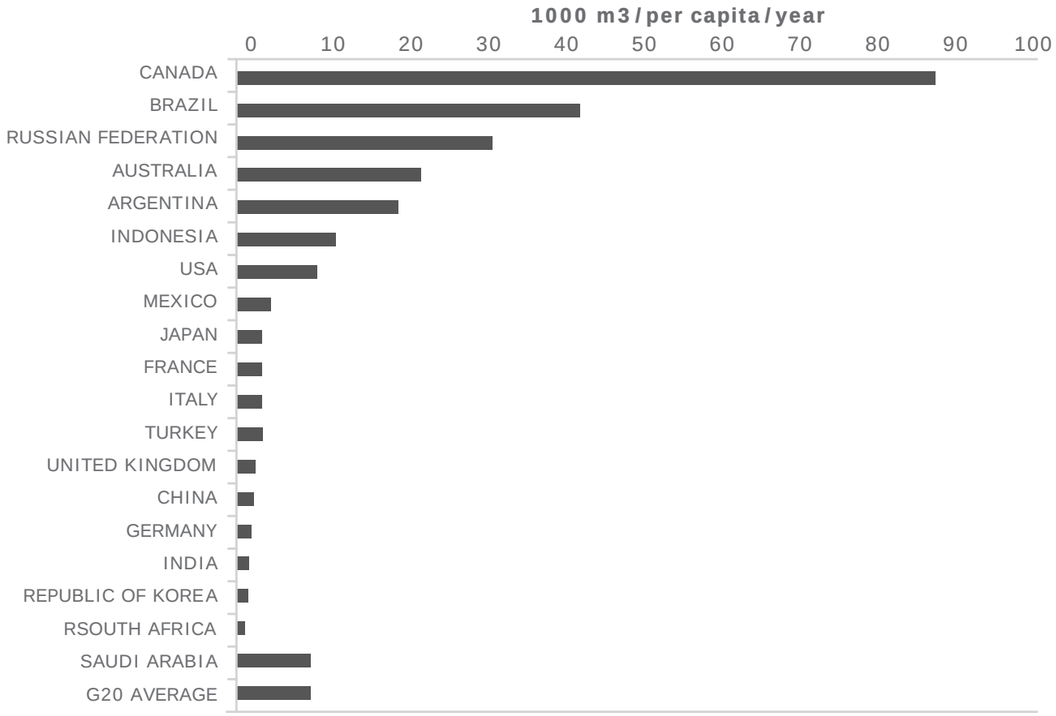
- National Development and Reform Commission (NDRC)
- The NDRC Bureau of Energy
- The State Forest Bureau (SFB)
- The China Guodian Corporation (for Hydro-electric and other Power Projects)
- The National Tourism Administration
- State Flood Control and Drought Relief Headquarters

CRITICAL WATER ISSUES IN CHINA

China accounts for almost 20% of the world population but has only 7% of the globe's freshwater resources.[13]

The country ranks fifth in the world in terms of total water resources (2.8 trillion m^3)[14] but its annual per capita renewable freshwater availability is only about 2,100 m^3, significantly below the G20 average of 9,400 m^3 per person per year.[15]

Figure 3: Per capita renewable water resources of G20 countries



Source: Globalization of water,[16] IMF, Responsible Research. NB: Per capita based on IMF population estimates for 2009.

China's water productivity is very low compared to its G20 peers

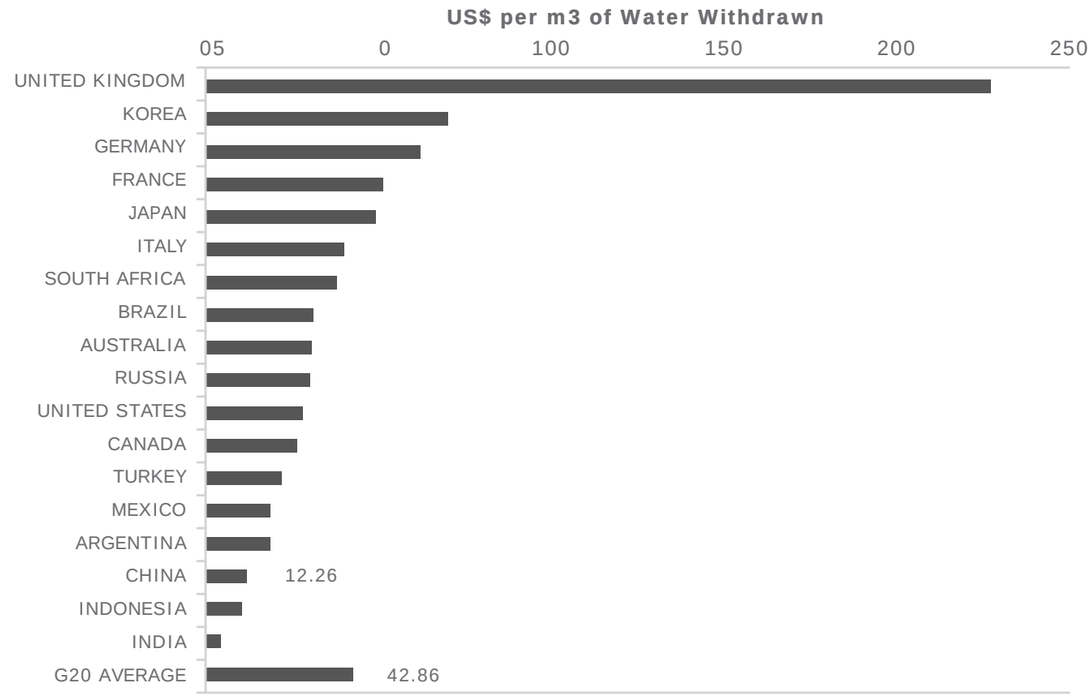
Figure 4 illustrates China's low water productivity against its G20 peers. The per capita water productivity is calculated by dividing its GDP (PPP) of just under US$6,000 by its per capita water withdrawal of 486m^3. Using these figures, its water productivity is around US$12.30 per m^3 of water withdrawn, around a quarter of the G20 average of US$42.90 per m^3 of water withdrawn.

Sustained investment in water supply and sanitation is overdue

Two-thirds of China's approximately 660 cities have less water than they need and 110 cities suffer severe shortages. About 700 million people regularly drink water contaminated with animal and human waste. Water pollution sickens 190 million Chinese annually and causes an estimated 60,000 premature deaths each year.[18]

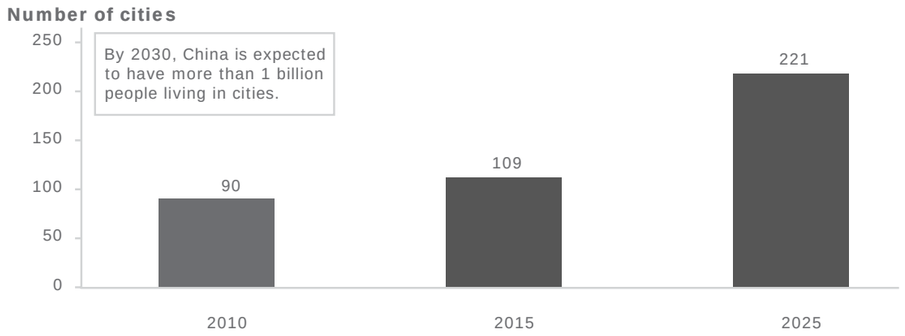
The impending increase in urban populations throughout China will further stress the limited water supply. McKinsey Global Institute projects that by 2015 China will have almost 110 cities with more than 1 million people, growing to over 220 cities by 2025 (See Figure 6).[19] These steady inflows of people put increased strains in an already antiquated water infrastructure system.

Figure 4: Water productivity of G20 countries



Source: Globalization ofwater [17], IMF, Responsible Research. NB: Saudi Arabia water withdrawal is not available.

Figure 5: Number of Chinese cities with 1 million or more people (2010-2025)



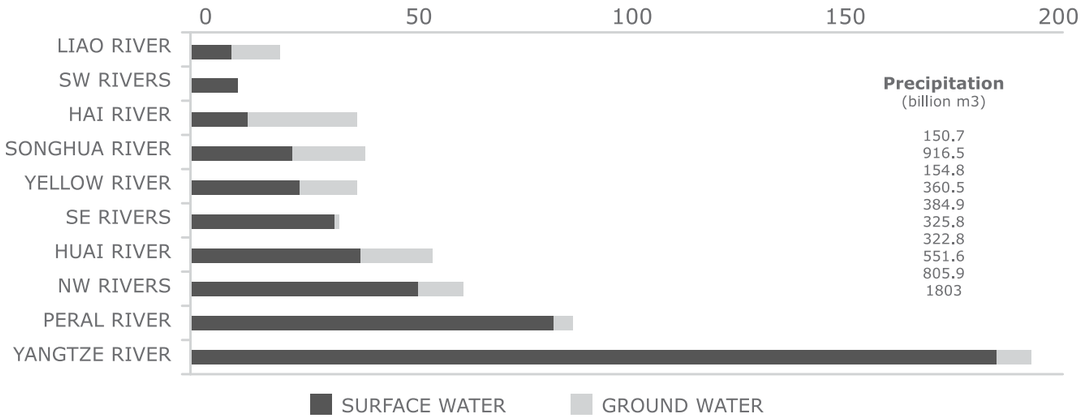
China's 'urban billion' will strain water supply and sanitation systems

Source: McKinsey Global Institute, Responsible Research.

Southern China generally has greater access to water

Figure 6 illustrates the regional imbalance of China's water supply between the North and South, with the Pearl and Yangtze River basins, the largest river basins in the South, accounting for a significant amount of precipitation and river water supply. We define Northern China as including Hai, Huai, Huang (Yellow), Liao and Songhua river basins, and southern China to consist of the Yangtze and Pearl River basins. North-western (NW) rivers are principally in Xinjiang province, while South-western (SW) rivers are mainly in Yunnan.

Figure 6: China's water supply by river basin



Source: China Water Resources Bulletin, Responsible Research.

ISSUES FOR RESPONSIBLE INVESTORS

INVESTMENT RISKS

INVESTMENT RISKS



Figure 1: Water delivery in Hujialou Beijing- Section of the Three Gorges Dam

We have identified five basic categories of risk to responsible investors in China as a result of the developing water crisis. These can be loosely defined as physical, regulatory, economic, management, and social.

Physical risks are caused by fundamental water scarcity and pollution in China as well as the regional disparities between water demand and supply. As with other natural resources (metals, agricultural products, crude oil) water can be transferred and traded but the existing distribution model means that the end user does not currently absorb the associated costs. It is likely that these regional differences in China's water availability and quality will become a crucial element in investment analysis and decision-making when high levels of economic growth mean that shortages start to become more apparent.

China's environmental **regulatory** landscape also impact water sustainability. Risks range from excessive bureaucracy and local government corruption to unenthusiastic enforcement of abuses. The many **economic** risks inherent in the sector require investors' urgent attention; particularly as local government officials and community members debate water pricing increases and the merits and legality of private participation in the water sector. **Management** quality risk is substantial in this environment – not only is the sector only recently opening up to private investment but it is rare to find adequate water management or health and safety systems in place in the corporate sector. Often, when water pollution occurs, companies have no crisis response mechanisms in place and the potential reputational risk can be significant.

Social risks are also intensifying as the Chinese public becomes more informed and engaged on environmental issues, often due to awareness campaigns of non-governmental organisations. This increased scrutiny has resulted in several noteworthy demonstrations and protests—some turning violent. A recent example is the August 2009 clash between 10,000 locals and 2,000 riot police in Fujian province, when protests erupted over allegations that local tannery and oil refineries have been discharging carcinogenic substances into the water used for drinking. Episodes of this nature can effectively revoke a company's 'license to operate' in the community, forcing companies to abandon projects or substantially scale down production.

Water risks can translate into risk to earnings

Ultimately, all these risks can translate into **risks to earnings** due to compensation payments following pollution incidents, increased cash flow volatility (such as when a plant suspends production due to lack of water) or 'soft' payments to local officials to approve plant construction or increased costs of water treatment due to upstream discharge.

China's water challenges are immense

Figure 2: Risks due to lack of water sustainability in China



Source: Responsible Research. Original Sources: China Statistical Yearbook 2005; State Environmental Protection Administration of China; Journal of Arid Environment, 2003 and 2004; Laval University, Quebec; China Daily, 2004 and 2005; Atlas of Remote Sensing Investigation on Eco-Environment in Western China; Nature, World Bank.

PHYSICAL RISKS

Here we cover the physical risks to ensuring a sustainable water supply in China, broken down as follows:

- A shortage of surface water and over-exploitation of ground water
- Regional variations in population and water scarcity
- Regional variations in usage of water
- Poor quality of ground and surface water
- Spiralling wastewater production
- Regional variations in water quality and pollution
- Poor quality lake ecosystems
- Inefficiencies in water usage

The current Five-Year Plan (2006-2010) demonstrates that national leaders are attempting to address water scarcity and management issues by attempting to:

- Strengthen river basin management
- Shift from supply-side to demand-side water management
- Protect drinking water sources
- Prevent trans-boundary water pollution
- Enhance water efficiency in agriculture
- Increase the treatment rate of urban sewage

Of course, managing and measuring water usage is more critical in certain economic sectors than others. Agriculture is by far the biggest single user, consuming around 360 billion m^3 a year, or around 63% of total water used. Industry recognises its impacts and is beginning to focus on the development and deployment of water-saving technologies. The World Bank has issued a report identifying a target of a 30% reduction in water consumption per unit of industry value added. Municipalities are also concentrating on water-saving mechanisms, such as recycling and reusing 'grey water', mandating the use of water-saving appliances, and incorporating water-saving infrastructure in houses and public buildings.[20]

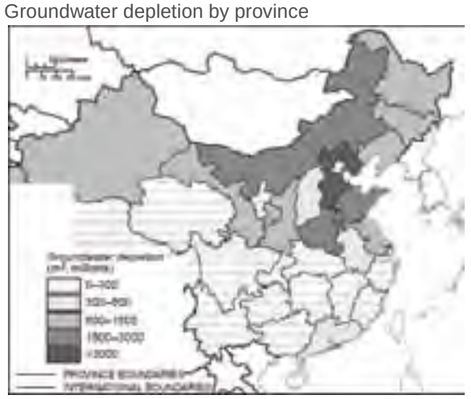
Water demand management and saving mechanisms are being tested

A shortage of surface water and over-exploitation of ground water

China sources around 81% of its total water supply from surface water and 18% from groundwater, with about 1% from other sources. 'Groundwater overexploitation,' the World Bank reports, 'is leading to a lowering of water tables and the eventual exhaustion of groundwater reservoirs, as well as extensive subsidence in many major [Chinese] cities'.[21] An over reliance on groundwater is challenging because it has a much slower replenishment rate than surface water. Figure 3 shows the clear regional difference in groundwater depletion. Other work has shown that both deep and shallow aquifers in the Hai River basin have fallen dramatically whilst the Beijing underground levels have dropped 100-300 metres in recorded history.

An overreliance on groundwater is troubling because of its slow replenishment rate

Figure 3: Groundwater depletion by province



Impact of groundwater depletion on business communities

Aquifer compacts → Land subsides above → Risk of damage (or collapse) to buildings and bridges increases.

When land subsides there is a reduction in both the capacity for flood protection and strategic reserve capacity to store water in dry years.

Destruction of aquifers is also linked to more severe droughts and desertification. Dry spells are material to the Hai and Huai basin, for example, because river flows fall to 70% of their averages once every four years and to 50% once every 20 years.

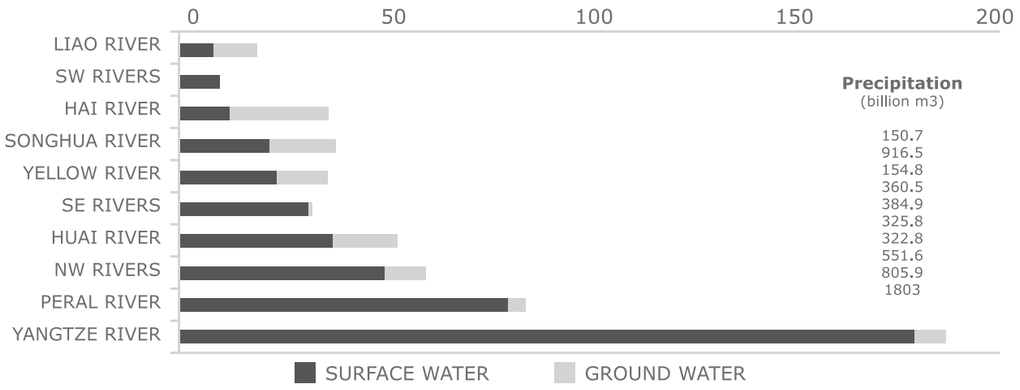
Source: World Bank, originally from The Ministry of Water Resources, Responsible Research.

Extremely low water availability per capita in many areas

Regional variations in population and water scarcity

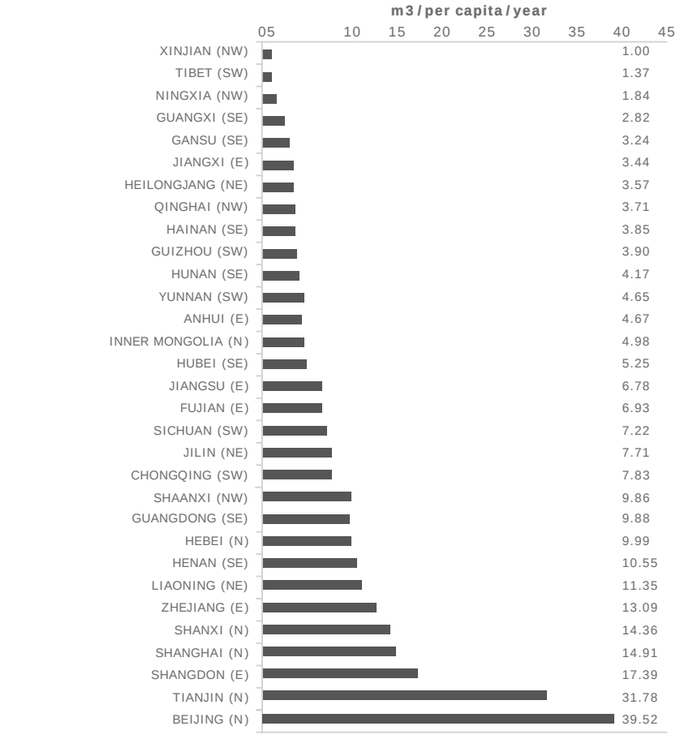
As the Figures show, there are significant differences in population and water distribution in China. The North accounts for around 45% of the country's total population but only has 20% of the country's water resources. Groundwater is extracted much more heavily in the North, making up around 37% of the total used, than in the South where it makes up only about 4% of the total used[22] due to higher precipitation levels. This uneven distribution in population and resources creates extremely low water availability on a per capita basis in many areas.

Figure 4: China's water supply by river basin



Source: China Water Resources Bulletin, Responsible Research.

Figure 5: Regional GDP per cubic metre of water consumed



Source: China Water Bulletin, Responsible Research. Abbreviations include N: Northern region; E: Eastern region; NE: North-eastern region; SE: South-eastern region; NW: North-western region; SW: South-western region. GDP and water consumption are on a per capita basis.

Beijing is clearly the most water efficient area

In terms of economic productivity from water usage, the Northern and Eastern regions continue to be the most efficient. GDP per m^3 consumed ranges from US$4 in the sparsely populated North Western provinces to almost US$40 in Beijing.

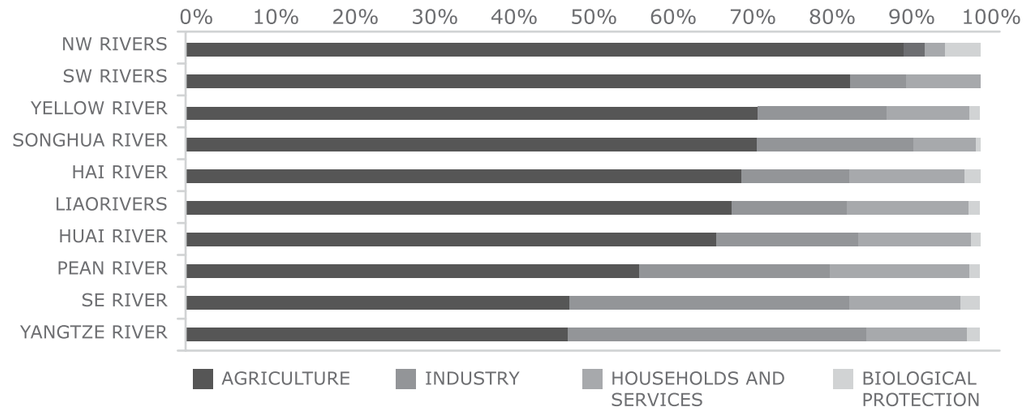
Regional variations in usage of water

In China there are significant regional differences in water supply and usage by sector, as Figure 6, below, shows. This type of information should allow investors, for the first time, to interpret water use by sector and location. In northern China, households and services account for about 10% of water use, slightly below the national average, with agriculture using a staggering 75% and industry using just 13%. In the south, industry is a much more significant user, at 33% of the total.

Government figures on 'water use' refer to gross water use distributed to users, and includes loss during transportation, which can be significant. Most 'water use' statistics are, however, not yet suitable for investment analysis as they are broken down only into agriculture, industry, 'households and services' and 'ecological protection'. These last two categories are too general to be of much use for tracking improvements in domestic efficiencies and to monitor water price elasticity. The ill-defined 'households and services' sector seems to include any water taken from municipal suppliers and includes all commercial, governmental and municipal services as well as domestic animal husbandry. Agricultural use includes irrigation of forestry and fishing and could therefore confuse analysts. There is a final sector for 'ecological protection' (our translation) that includes water used to 'green urban environments'. We also believe this last section includes water taken from aquifers to replenish lakes and rivers in times of drought, although definitions are far from clear.

Matching river basins with water use by sector is crucial for business planning and investment

Figure 6: Percentage of water use by sector



Source: China Water Resources Bulletin, Responsible Research.

Poor quality of ground and surface water

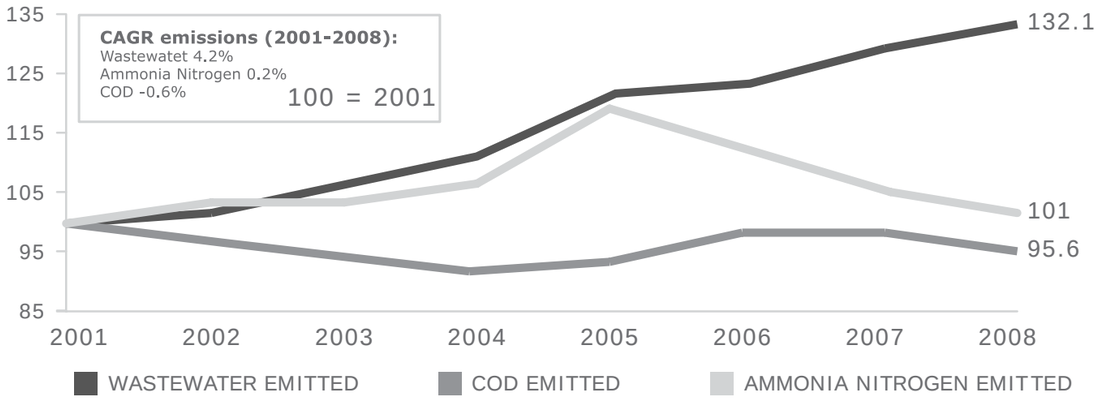
Despite the increased incidence of bacterial water-related illnesses such as diarrhoea, leptospirosis and river blindness, as well as water-borne infections such as cholera, typhoid, dengue, malaria and ringworm, official Chinese statistics show that water pollution metrics are improving. More worrying are the 'newer' industrial diseases of arsenicosis, cyanobaterial toxins, lead poisoning and fluorosis that are being identified more frequently.

Despite water quality improvements, 'newer' diseases emerging

As Figure 7 indicates, China's water pollution, measured by Chemical Oxygen Demand (COD) and Ammonia Nitrogen levels,[23] is trending down. According to the Ministry of Environmental Protection, COD emission levels have decreased 7.5% since 2006 whilst Ammonia Nitrogen, a common indictor of industrial water pollution that had previously

been trending upwards, has fallen over 10% in the same period. The reduction in the 2008 figures cannot be solely attributed to government policies and industrial efforts. China's heavy industrial water users suffered greatly during the global slowdown and this appears to have already contributed to an improvement in measurements of China's environmental water quality, especially in 4Q 2008.[24]

Figure 7: Index of wastewater and other water pollutants (2001-2008)



Source: National Development and Reform Commission, Ministry of Environmental Protection, Responsible Research.

Spiralling wastewater production

Figure 7 also shows a worrying trend: China's inability to contain its wastewater, which grew over 4% CAGR from 2001 to 2008, and has reached over 57 billion tonnes annually. The National Development and Reform Commission (NDRC) has recently recognised this as a serious issue and, in July 2009, confirmed that it will introduce reforms targeting environmental charges on pollutant discharge, sewage treatment and rubbish disposal. It also proposes further controls on natural resource prices in general.[25]

Regional variations in water quality and pollution

Water quality risks may tend to migrate to rural areas as harmful industries relocate

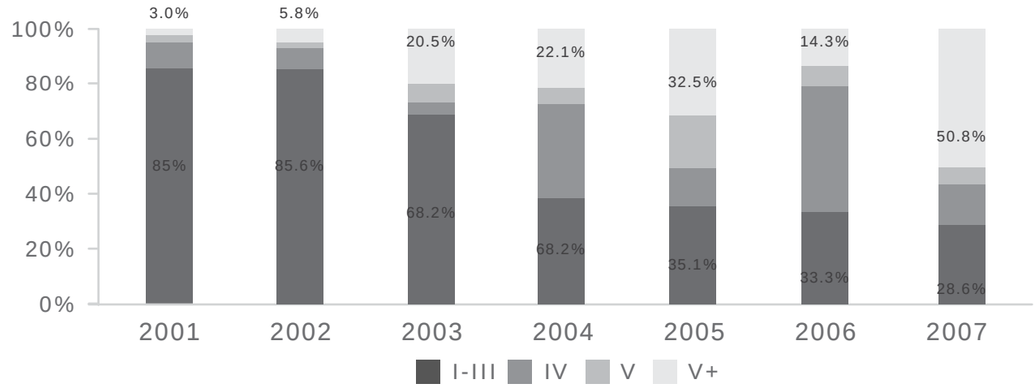
About 85% of the monitoring stations on the Pearl and Yangtze Rivers show 'good quality' water, compared to only 30% on the Hai River. There are 682 national 'water quality' monitoring stations, almost 40% of them on the major lakes and around 60% for the seven major river basins. The Ministry of Environmental Protection (MEP) released its latest water quality findings on 19 March 2009.[26] Their 2008 annual report states that environmental problems in rural areas were increasingly prominent and the report focused on the hidden risk for drinking water safety. With increased understanding of pollution issues and risks, water quality issues have tended to migrate from urban areas to rural areas as harmful industries relocate away from areas of high population density.[27] Figure 8 below provides water quality measurements of China's seven major rivers.

Poor quality lake ecosystem

Investments in nitrogen and phosphorous water treatment may spur lake improvements

Figure 9 provides data collected from on the most important freshwater lakes in China, most of which are showing heavy nitrogen phosphorus pollution. Due to their importance to agriculture, biodiversity, industry and household water supply, the national government has been monitoring their water quality for many years.

Figure 8: Worsening water quality of China's seven major rivers



Source: China's Envrionmental Status Report (2008), Responsible Research. NB: I level is best quality while V+ is worst quality.

Figure 9: Water quality of major freshwater lakes in 2008

Name of Lake		
Dalai Lake	→ Grade V+	PH, phosphorus, Permanganate index
Bai Yangdian	→ Grade V+	Nitrogen, phosphorus
Hongze Lake	→ Grade V+	Nitrogen, phosphorus
Nansi Lake	↑ Grade IV	Nitrogen, phosphorus
Bositeng Lake	→ Grade III	-
Poyang Lake	→ Grade IV	Nitrogen phosphorus
Dongting Lake	↓ Grade V	Nitrogen phosphorus
Jingbo Lake	→ Grade IV	permanganate index
Erhai Lake	↑ Grade II	-
Xingkai Lake	↑ Grade II	-
Taihu Lake	→ Grade V+	Nitrogen, phosphorus
Dian Lake	→ Grade V	Nitrogen, phosphorus, ammonia nitrogen
Cao Lake	→ Grade V	Nitrogen, phosphorus

Source: China's Envrionment Status Report (2008).
NB: →: Stable water quality from 2007 level;
↑: Improvement in water quality from 2007 level;
↓: Deterioration in water quality from 2007 level.

Inefficiencies in water usage

In 2007, China used around 0.13m^3 of water for each RMB10 worth of industrial goods produced, three times higher than the global average. In the same year, China experienced an annual 'deficit' of 40 billion m^3 of water, with almost two thirds of all cities experiencing varying degrees of water shortage and 200 million rural citizens facing drinking water shortages.[28] General water scarcity is increasing the potential for conflict between companies and the communities they operate in as they fight for their share of precious resources. Declines and disruptions in water supply for companies operating in highly water-stressed areas impact direct operations but can also stress supply chain management.

Additionally, despite claims of recently improving water quality, as much as 25 billion m^3 of available water remains unused because of pollution. This represents about

170 million tonnes of steel that cannot be produced (with a sales value of around US$100bn). (Mills need access to about 150 m^3 of water per tonne of steel produced, according to Veolia Water; Baosteel Iron and Steel's November 2009 quoted price of its major hot-rolled steel coil is almost RMB4,000 (US$580) per tonne.)[29] In addition, 47 billion m^3 of water is used despite not meeting quality standards. This 'at risk' water, from degraded rivers and aquifers, did not meet the before-treatment quality standard, and amounted to almost 10% of China's total water supply of 563.3 billion m^3 in 2005.[30]

We expect a general push for better disclosure of water indicators by individual business units within national operations so investors can derive a clearer picture of water intensity by geography.

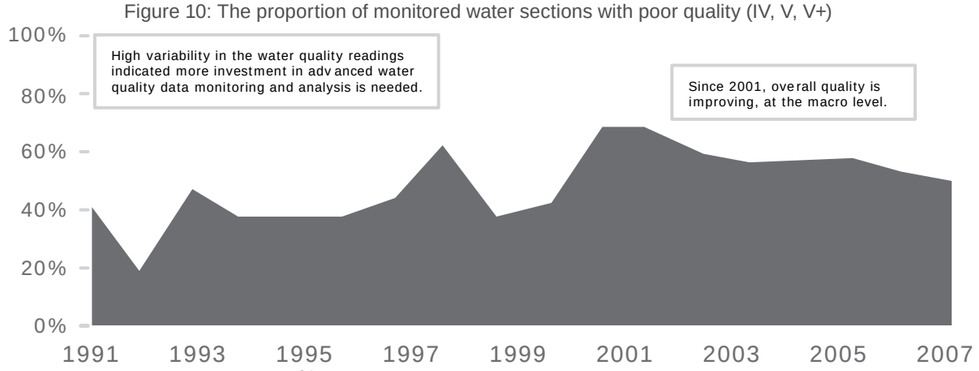
Increasing concentration of areas of highly polluted water

In China, water quality is graded I to V+. Grades I, II, and III are described as "good" and grades IV, V and V+ are "poor" and cannot support drinking or swimming. Water quality is measured at water stations that divide water resources into zones. The number of these water stations reporting poor quality readings is monitored carefully in China. Figure 10, shows that, despire a period of rapid worsening in general water quality from 1999-2002, also shown on figure 8 the trend has reversed and 2007 saw a substantial improvement in measurements

Weaker 2008 economy may have given some relief to water resources

This trend means that polluted water sources are becoming more concentrated by location and, therefore, in theory, easier to tackle. According to The Ministry of Environmental Protection (MEP) water quality at around 750 national monitoring stations improved throughout 2007 and 2008, with the proportion of poor quality water dropping to 53% in 2008.[31] Government officials have stressed that, due to the economic slowdown and factory closures, the overall performance has improved.[32] However, a respected economist at Peking University has suggested from his work that environmental protection measures have also helped bolster water quality.[33]

Figure 10: The proportion of monitored water sections with poor quality (IV, V, V+)



Source: Jiang, Y. (2009), [34] Responsible Research. NB: The 1995 figure was not available in the original study.

Poor data is a key issue for investment professionals

The infrastructure, equipment and training to provide credible water quality data and analysis is often poor or lacking and there is therefore a risk that investment in the sector cannot be effectively assessed. Figure 10 illustrates the overall low quality of back data generated by the State Environmental Protection Administration (SEPA), predecessor to the MEP. Figures show, for example, the proportion of stations with poor quality water dropped precipitously from 44% in 1991 to just 18% in 1992, but this proportion leapt from 42% in 2000 to 70% in 2001. As the figures from 2002 onwards are smoother, we infer that the water quality data collection and analysis are improving and the normalised proportion of 'poor quality zones' is closer to the 50-60% range. There is a strong case for investment in water monitoring equipment and analytics providers in China.

REGULATORY RISKS

Regulatory developments suggest that Beijing is planning a strategic switch for China from its role as the 'world's factory' to become a 'global clean-tech hub'.[35] However, as the Economist newspaper observes, whilst China's environmental elite may recognise the root causes of air and water pollution, the Party has still been slow to build a bureaucratic structure to enforce environmental laws and monitor pollution effectively.

The substantive scope of China's environmental regulatory landscape is quite impressive, ranging from controlling and preventing water pollution to mandating greater environmental information disclosure. Beijing seems to have realised that the country has passed a tipping point and that further unchecked economic development will come at the expense of the environment.

Several regulatory risks are identified which are discussed in detail below. Taken as a whole they show that, whilst laws and regulations against environmental polluters do exist in China, they are often weak, poorly monitored and rarely enforced.[36]

- Rapid changes to environmental legislation
- Central government initiatives ignored at a local level
- Poorly paid and trained local bureaucrats and technocrats
- Petty corruption at a local level
- Tougher fines and new categories of penalties
- Increasing management time spent on disclosure and public participation
- Management ignoring the public participation process
- Additional expenses for environmental impact assessments
- Competitive disadvantage from non-compliance with new environmental regulations
- Continuing emphasis on strong economic growth causing officials to ignore environmental regulations
- Increased opportunity for NGO involvement and Class Action Suits
- Corruption as a constraint to Foreign Direct Investment

Rapid changes to environmental legislation

After the 1979 Environmental Protection and the 1984 Water Pollution Prevention and Control Laws (WPPCL) were passed, China's environmental legal framework remained stagnant until fairly recently.In the past six years, however, it has expanded rapidly and many believe that China now has the most dynamic environmental legal framework in Asia. The speed of this change, however, delivers its own risks as companies, lawyers and investors struggle to keep track of promulgated and pending legislation.

The WPPCL was the first legislation in China that focused on controlling and preventing pollution, with an emphasis on industrial pollution.[37] Regarding water, the most important legal developments include recent amendments to the WPPCL and the Environmental Impact Assessment Laws. Legislation passed in 2008 on Environmental Information Disclosure is particularly relevant to all listed companies.[38]

River basin management has been introduced but mechanisms for investors to support this system are ill-defined

Another vital step towards environmental sustainability has been to change the management structure of pollution control and water treatment. The concept of 'river basin management' planning has been introduced and planning is now based more logically on geography rather than administrative regions. There is also now a system for monitoring and controlling water bodies for specific pollutants. Recent legislation has belatedly required urban sewage to be treated centrally.[39]

These legal developments as anticipated, have been implemented slowly at a local level due to a lack of 'buy in' and a perceived of loss of power by local officials. It was heartening to see, therefore, in 2008, when the WPPCP was revised again as a result of severe water pollution and accidents across China, the draft was offered for public comment. In fact, this was the first time an environmental legislative draft had been made public. The consultation process resulted in over 1,400 public comments.[40]

Shift to pollution prevention and less focus on damage control and treatment

There has been a definite shift in focus in China towards environmental policies that focus on preventing pollution and away from investments in damage control and treatment[41]. Despite the lengthy consultations that led to the changes outlined below, some excellent proposals did not make it into law, for example, the proposal to permit constructive environmental public interest litigation or to allow a 'penalty per day' for continuing violations.

Central government initiatives ignored at a local level

Governing water in China is a mammoth task. There are 33 province-level (省级 shěngjí) divisions, including 22 provinces, five autonomous regions, four municipalities (Beijing, Shanghai, Tianjin and Chongqing), and two special administrative regions (HK and Macau). Following this come the 333 prefectures (地级 dìjí) followed by the 2872 county districts (县级 xiànjí) and the 41,636 town divisions (乡级 xiāngjí).

China's national policymakers have pushed for, and passed, a wide range of stringent laws, regulations and standards to manage environmental resources, with a special emphasis on water. The new laws specify that provincial governments are now obliged to reduce and control the discharge of major water pollutants in their administrative regions. Both municipal and state government bodies are responsible for monitoring and recommending steps for the reduction and control of major water pollutants. Local governments from the prefectures downwards are then required to apply these suggestions to all entities discharging pollutants within its jurisdiction.[42]

Local officials often see water polluting projects as quick ways to expand the revenue base

However, and perhaps inevitably in a country as large and diverse as China, national initiatives towards environmental protection are limited by implementation and enforcement problems, resulting from untrained and unprepared local officials. As with most policy implementation in China, the 'devil' is not just in the 'detail', but the 'enforcement' at the local level. When water-polluting projects appear to create quick and easy returns for local governments, it is tempting for them to proceed without practising due caution, especially when the legal protection system for environmentally sound economic policies is still so underdeveloped.[43]

We believe that implementation of environmental controls is problematic at a local level because economic growth has always been the key indicator for evaluating and rewarding government officials. A so-called "veto system" was introduced in 2007 which links performance in energy saving and emission controls to government officials career promotion.[44] A senior research fellow at the think-tank 'China Society of Economic Reform', however, comments that some provinces are ignoring this system, especially during the economic slowdown.[45]

Environmental performance is now part of government's promotion criteria

One of the more interesting regulatory developments this year has been that officials are now being evaluated on environmental protection KPIs such as water conservation and treating water pollution. Local bureaucrats will become more accountable for the quality of the water in their respective region of administration and local and provincial governments will be required to sign a pledge with the State Council to fulfil the environmental protection targets set in the 11th Five-Year Plan.

Poorly paid and trained local bureaucrats and technocrats

Environmental Protection Bureaus (EPB)s monitor the environment at a local level but their structural weakness has traditionally obstructed the environmental protection of water in China.[46] While the MEP maintains a supervisory role, the EPBs rely on local government support for their budget and resources, while their monitoring teams often have limited technical equipment and training. In most circumstances the companies being monitored are able to 'guide' inspections of facilities to their advantage.[47] The over-worked bureau officials are also responsible for collecting pollution-related fines. This can lead to conflict, particularly when State-owned enterprises are the culprits. Local experts report that this is another area for conflict, suggesting that underpaid EPB officials may be using the fees to pay their own wages.[48]

Petty corruption at a local level results in significant economic losses in China

More than 50% of reported bribes go towards 'facilitation payments'

Corruption in China is thought to be endemic in economic sectors where the state is deeply entrenched. Corrupt local officials are said to appropriate public funds for their own benefit and most companies feel they have to pay bribes in order to maintain their license to operate.[49] In 2006, the director of SEPA publicly blamed corruption for frustrating environmental protection efforts and worsening the country's already severely polluted air and waterways. It was reported that fuel or water efficient replacement technologies had been budgeted for but had not been implemented due to funds being siphoned off.

In several cases, local government officials have interfered directly with environmental law enforcement by threatening to remove or demote environmental officials.[50] According to Transparency International's 2008 report, over 54% of the reported bribe demands were related to facilitation payments.[51] The U.S. Department of State reported in 2009 that the sectors most affected by corruption are banking, financial services, public procurement and the construction sector.[52] According to the Carnegie Endowment Fund in 2007, annual direct economic losses due to corruption in China are estimated to be at least 3% of annual GDP.[53]

Tougher fines and new categories of penalties for offenders

The previous low maximum limit on water pollution fines has been lifted and tougher fines for some corporate infringements are now recommended. If an incident is classified as 'serious', the executive in charge of the business or factory can be personally liable and could be fined up to 50% of the income he or she earned from that business in the previous year. This is the first time an environmental law in China has enabled the imposition of fines on owners or employees of polluting companies. Additionally, several new enforcement measures have been introduced to better equip Environmental Protection Beureaus (EPBs) in handling violations.

Increasing management time spent on disclosure and public participation

Public participation in the environmental decision-making process was first made meaningful in China when the Environmental Impact Assessment Law (2003) came into effect. This was supported by the Guidelines for Full Implementation of the Rule of Law (2004) that created a policy basis for information disclosure. As pressures to disclose water usage and management systems increase, company executives may, in the future, need to prepare to explain to a cynical public and concerned investors why water is being diverted to companies rather than households in the community.

Case Study: Government agencies form 'independent environmental groups' within the judicial system

The All-China Environmental Federation, an environmental advocacy group loosely associated with the Ministry of Environmental Protection, has filed two lawsuits against Jiangyin Port Container Co. Ltd. and Guizhou Province Land and Resources Administration.

It is reportedly the first time that an environmental organization has been the primary plaintiff in China. Special standing rules have been developed so that 'non-profit social groups' can file litigation in environmental courts. The courts, according to one of the judges, "will serve as a warning to government departments … that they should always fulfil their duty to protect the environment. … [Government officials] need to gradually realize that they are not only under the supervision of the Party and other administrative departments, but also under the watch of all citizens."

(Source: China Environmental Law Blog and Greenlaw)

Environmental Information Disclosure Measures are a breakthrough for public scrutiny

The 2004 Guidelines to the Rule of Law, for the first time, also encouraged environmental groups to become involved in the planning and decision-making processes of large-scale projects, through the corporate stakeholder engagement process. In 2006, civil society received even greater support when the Provisional Measures on Public Participation in Environmental Impact Assessment resulted in project sponsors being required to disclose some basic environmental information.[54]

While environmental transparency remains generally poor, these initiatives show substantial progress, particularly with the implementation of the Environmental Information Disclosure Measures (EIDM, 2008). These measures:

- regulate the disclosure of environmental information by administrative departments in charge of environmental protection and by enterprises
- maintain the rights and interests of citizens, legal persons and other organisations to obtain environmental information and promote the public's involvement in environmental protection.[i]

The 2008 WPPCL and 2008 EIDM reinforce the movement towards the public being an officially recognised participant in the environmental decision-making process in China. As the case study, demonstrates, it appears that environmental groups now have sufficient legal standing to bring lawsuits to court.

Public not yet involved in construction and decommissioning phases of projects

Figure 11 outlines the public participation regulations that managers will now encounter over a project lifecycle. It appears there is still a lack of regulation requiring public participation during the construction and decommissioning phases, the stages that materially impact the local community and ecosystems.[55]

Figure 11: Key public participation regulation in project lifecycle

Corporate lifecycle phase	Key public participation regulation	Description
Project design	Environmental Impact Assessment Law	The legal basis through which all Chinese environmental administrators make informed judgments on economic development and construction projects. The law prescribes the method, procedure and validity of public opinion and is the first law to require public participation in EIA.
	Interim Measures for the Public Participation in the EIA	The first regulation on public participation on environmental issues in China. It complements the EIA Law by detailing and specifying various aspects of public participation including participation rights, forms and due process and legal validity.
Construction and trial operation	**No specific regulations**	
Operation	Cleaner Production Promotion Law	The first law to promote cleaner production (i.e. energy saving and pollutant discharge reduction) in all industries. Places great emphasis on public participation and supports media participation by disclosing environmental information on enterprises.
	Measures for the Disclosure of Environmental Information	Requires environmental information from government agencies and commercial enterprises and is likely to enhance the public's influence on companies. Among the 17 elements of environmental information that are required to be disclosed, 5 are related directly to companies.tal information on enterprises.
Closure	**No specific regulations**	
OTHERS	Interim Measures on Public Hearings on Administrative Licenses with Respect to Environmental Protection	Specifies the scope, participation, chairperson responsibilities and procedures of public environmental hearings. Allows the environmental administrative authorities to hold public hearings when they consider it necessary. Also lists several types of construction projects that may seriously impact local residents' lives and allows authorities to hold a hearing to determine local residents' opinion before approving the EIA reports.

Source: WWF, IPE.[56]

Figure 12 illustrates how, during the EIA process, the most substantial public participation comes during the EIA report preparation. Investors with strategic, long-term interests in China should be prepared for more vigorous EIA implementation, resulting in longer administrative processes, more public dialogue, in-depth studies of potential impacts and alternative options, and a genuine sustainable decision-making exercise with no foregone conclusion.

Investors can take advantage of the more rigorous EIA implementation by engaging different stakeholders

Figure 12: Public participation in China's EIA process

EIA PROCESS		EIA PROCESS
SCREENING		NO ACTION
SCOPING		NO ACTION
Environmental assessment and EIA report preparation	Preparation and government review of EIA outline	No specific requirement for a public opinion survey
	Preparation of EIA report	Disclosure of the projects information within 7 days when the EIA entity has been hired
		Disclosure of the project's environmental information during the EIA preparation
		Disclosure of a simplified EIA report before submitting the full-length EIA report
		Collection and review of public comments within 10 days
Review and decision-making		Take the public's comments into consideration
		Enclose public's comments in the EIA report, accompanied by an explanation of whether developers accept or reject the proposed public opinion

Source: WWF, IPE.[57]

Management ignoring the public participation process

As can be seen above, public participation is now encouraged in the EIA process. Some companies, however, will continue to ignore the recommended process. When these regulations are ignored, there seems to be no structure for legal redress by stakeholders. According to some experts, however, the trend is moving towards more specific requirements for public participation and stricter enforcement of procedures.[58]

Additional expenses for environmental impact assessments

The Environmental Impact Assessment Law (2003) requires each new construction project to complete and submit an environmental impact assessment (EIA) report prior to breaking ground. The relevant environmental authority must then approve projects; local or central authorities may also be responsible for approval, depending on the project scope. Involvement of the Ministry of Environmental Protection or State Council is also possible.[59] CLSA, an Asian brokerage and investment group, reports that the implementation of public participation rules in the EIA process is still in its infancy; compared to the US model requirements are highly basic.[60] Also, there are still a large number of projects that have proceeded without implementing the EIA report approval process.[61] China's 2008 Environmental Status Report, however, highlights over 150 projects requiring national-level ministerial approval that were denied or suspended.[62]

Competitive disadvantage from non-compliance with new environmental regulations

Several years ago, governmental environmental initiatives focused solely on reacting to incidents of pollution.[63] Then, in 2007 a 'green credit policy' initiative was introduced which encouraged state-owned banks to suspend lending to the most egregious

Securities regulator requires companies seeking to list to report on environmental compliance

polluters.[64] Following this, in 2008, the Ministry for Environmental Protection (MEP) released a collection of environmental policies, including those on 'green' insurance, security and trade.[65] Another effort towards environmental accountability is the new 'public hotline', set up for whistleblowers to complain about environmental offenders.[66]

In an effort to encourage responsible corporate behaviour and green business strategies the China Securities Regulatory Commission (CSRC) also now requires companies in 'heavily polluting industries' that are listed, or seeking a listing, to provide a report on environmental compliance. The CSRC is supposed to consider these when deciding whether to grant a listing or additional capital-raising exercise. Some firms, of course, will ignore the capital markets, skirt around all these regulations and risk paying the fines or bribes instead of reducing their pollution levels. These companies can now be threatened with a suspension of their export licenses.[67]

There is also a whole new level of cooperation between environmental officials and economic regulators who are proactively adding incentives to the economic activity chain (through pricing, taxation, public finance, credit and insurance). Unlike the 'top-down' traditional administrative oversight, these new policies are mostly 'bottom-up', requiring changes to company management structures and reporting, and could lead to innovations in environmental protection technology and increased competitiveness as well as a reduction in the costs of environmental clean-ups and administrative monitoring.[68]

Continuing emphasis on strong economic growth causing officials to ignore environmental regulations

Whilst still striving for their comforting 8% p.a. GDP growth, Chinese leaders admit that the recent economic slowdown has helped them achieve the Five Year Plan pollution goals for the first time in 2008. In March 2009, during the annual session of the National People's Congress (NPC) it was announced that saving energy and protecting the environment is still high on the agenda, although maintaining 'steady and relatively fast' economic growth, is seen as a vital task during the global economic crisis.[69] As a result, some expect that low-level officials will take this as a signal to rush through the now mandatory environmental reviews of large projects.[70] On the whole, as long as officials deliver economic growth without too much public protest, they are still compensated and promoted, even if the growth comes at the expense of the local environment.[71]

Increased opportunity for NGO involvement and Class Action suits

Provision seeks to integrate NGO activities into environmental litigation

The MEP is now responsible for communicating standardised, reliable and accurate information on national water quality to ensure that the public is aware of the facts on water quality. There is also an interesting provision for Environmental Protection Bureaus (EPBs) and social groups to offer legal support to parties whose legitimate rights and interests are damaged in water pollution incidents. This provision is by far the most specific and clear in recent Chinese legislation to integrate NGO activities into environmental litigation. For the first time, the law allows for a large number of parties who have had their interests damaged in a water pollution incident, to file a class action suit through a representative.

Corruption as a constraint to Foreign Direct Investment

The global watchdog Transparency International (TI) states that corruption is a critical, but often overlooked, factor in the water crisis.[72] For 2008, TI's 'Corruption Perceptions' Index ranked China number 72 out of 179 countries (1st is the least corrupt), a ranking which has been fairly consistent in the past few years. The ranking commentary states that China still suffers from widespread corruption.[73] TI's publication on corruption in the Chinese water sector describes how, despite more than 1,200 anticorruption laws, bribery, kickbacks and theft account for an estimated 10% of government spending and transactions. Major infrastructure projects and procurement were seen as the areas most open to corruption.[74] Reports suggest that only half of the money earmarked for environmental protection between 2001 and 2005 was spent on legitimate projects.

The World Economic Forum Global Competitiveness Report 2009-2010,[75] substantiates this result, showing that corruption features as the sixth largest constraint for doing business in China.[76]

Despite the obstacles posed by corruption, foreign investors still appear to consider China to be the most attractive global destination for foreign direct investment. In a 2009 UNCTAD poll of attractive investment destinations, China came top, followed by the United States, India, Brazil, Russia and the United Kingdom.[77] China came top for the fifth consecutive year in the A.T. Kearney FDI Confidence Index 2007.[78]

Case Study: Yancheng Biaoxin Chemicals – weak local supervision and enforcement

Weak local supervision and enforcement

In February 2009 water treatment plants in the city of Yancheng, Jiangsu province were closed after a phenol compound from Yancheng Biaoxin Chemicals contaminated the water of the Mangshe River. Many of the 200,000 residents of the city were left without drinking water when the local authorities closed the plants following the contamination incident. The Mangshe River, surrounded by heavily polluting industries, is a major source of water to Yancheng and has long suffered from sewage and industrial contamination.

As early as 2003, local media began to expose the dangers posed by over 50 industrial firms based around this area and 11 of those firms were subsequently closed or relocated. Although the city dealt with heavy polluters situated near drinking-water sources, it continued to approve the construction of new projects.

After the 2007 algae bloom in Taihu Lake, SEPA (now the MEP) and the provincial environment authorities demanded increased environmental supervision. Yancheng closed more than 30% of its major chemical plants that were upstream from protected areas. The remaining companies were supposed to be reviewed in 2008, but the deadline for closing or relocating was since extended until the end of 2009.

Case Study: Three Gorges Dam possibly a major source of greenhouse gas emissions

The Three Gorges Dam and corruption

The Journal of Geophysical Research has claimed recently that the marshlands of the Three Gorges Dam project are now a major source of greenhouse gas emissions in China.

They allegedly emit 6.7 milligrams of methane per square meter per hour as marsh vegetation turns to gas. The study was performed in a branch of the Yangtze River that turns to marshland when the reservoir is lowered. Chongqing University in China was involved in this new study, which covers the large drawdown area of 350km^2. The research is not complete as the team was denied access to the hydro station to study the amount of methane emissions from dam's turbines, which some scientists believe could be the largest emission source of all.

The study is seen to be an important addition to the environmental assessment of dams as both the Chinese government and multilateral institutions, such as the World Bank, are praising them as renewable and sustainable sources of energy. China has received more than 3 million carbon credits—worth over €36million—for the construction of over 50 dams—in order to reduce CO2 emissions. This new research throws into dispute the argument that heavy carbon producers should use hydro to offset their emissions.

(Source: Journal of Geophysical Research, 14 Oct 2009)

Case Study: Contamination and compensation in Inner Mongolia

Local officials in Chifeng confirmed that the public water supply was contaminated after heavy rains in July 2009 caused by a power outage at a sewage pump station. The outage allowed raw sewage to flood into the well that supplies tap water to most of the city. The local authorities did not warn the public for two days and citizens continued to use the water. After more than 4,000 citizens fell sick, the case was investigated and two senior officials were dismissed. The state-owned water supply company agreed to pay RMB50 (US$7.30) in compensation to each household. As of the date of this report the water supply has yet to be fully restored.

Case Study: Three Gorges Dam project tainted by petty corruption

When the project broke ground, around a decade ago, there were abundant stories of corruption during the first phase of the US$24bn Three Gorges Dam project. The British Broadcasting Corporation (BBC) reported on the resulting government crackdown that punished almost 100 officials responsible, with a death sentence handed down to one official who embezzled over US$1m. Corrupt government officials have also reportedly skimmed a percentage from the resettlement funds that were supposed to go to families and communities. Central government estimates show that over US$50m has been siphoned away by these corrupt officials since the projects inception.
In recent years the government has been more transparent about these local level problems. For example, a 2007 PRC National Audit Office report indicated that corruption still plagues the project. Only one of the almost 350 supervisory contracts was open to public bidding and it is thought that improper contract management increased overall project costs by more than US$60m.
Chinese Central officials are aware that the country's environment and economic future is at risk because of this type of petty corruption. In January 2009, the Communist Party of China (CPC) vowed to step up investigations into corruption involving party members who are thought to have accepted bribes. Statistics from the CPC Central Commission for Discipline Inspection (CCDI) showed that almost 5,000 officials (above county head level) were penalised nationwide during the year ending November 2008, and, of those, over 800 have since been prosecuted. Additionally, in June 2009 the Impeaching Center of Supreme People's Procuratorate (sic.) in China installed a national hotline and website to enable citizens to anonymously report on corruption.

Case Study: Faulty pipes resulting in water supply disruption and imprisonment in NW China

In December 2008, China Daily reported the third main disruption to water supplies in Boaji, Shaanxi Province in two weeks, affecting tens of thousands of residents. There had been over 10 major incidents of burst distribution pipes in the previous decade, often resulting in substantial disruption of the water supply to the city's 600,000 urban residents. The Party Chief of Baoji from 1997 to 1999 was widely blamed for 'dereliction of duty' during his period of oversight on the construction of the water supply project. The local Communist Party committee criticised the ex-Chief for allowing substandard pipes to be used. The Party Chief was eventually jailed for 12 years for corruption. The frequent fractures reportedly cost the city a total of US$1.8 m.

ECONOMIC RISKS

There are several economic risks associated with water pricing, distribution and management. Here we argue for a balance between the interests of the private sector who demand a fair, market-driven water price and the interests of those who believe that the state should continue to provide cheap water as a basic human right. This debate drives towards the pursuit of an "acceptable recovery of cost" associated with providing clean and plentiful water to all.

The main risks are as follows:

- Acceptable water pricing for low-income customers
- Acceptable cost of recovery for investors in water
- Political resistance to price increases
- Rapid and unexpected price rises
- Lack of transparency and public participation in pricing
- Government spending, market reforms and Public Private Partnerships
- Localised Water Pricing
- Water reallocation to strategic industries

'Acceptable water pricing' for low-income customers
Post-war policy trends show a growing global acceptance that access to water at an acceptable price is a basic human right. The 1948 Universal Declaration of Human Rights acknowledges this human right to water as it relates to other issues such as the rights to survival, health, food and housing. The 1992 International Conference on Water and the Environment further adopted a statement acknowledging 'the basic right of all human beings to have access to clean water and sanitation at an affordable price'. Lastly, the World Health Organisation states that 'although industry and electricity are important for ensuring an adequate standard of living, these uses must not infringe on the right to household water. For both agriculture and industrial uses, contamination of drinking water must be prevented.'

The state is, generally seen to be obliged to ensure basic human rights for its citizens by respecting, protecting and fulfilling these rights. Obligations include taking legislative and administrative action, protecting water as a natural resource to be enjoyed by all and, as a last resort by providing water for them. As China moves up national wealth tables it is expected to make a move from having to provide massively subsidised water to all, to providing water at 'an affordable price with an acceptable recovery of cost'. As the World Health Organisation specifies, 'providing services such as water and ensuring its affordability, is not a charitable act, but the obligation of the state and the right of each individual.'

In August 2009 NDRC announced plans to subsidise prices hikes for low-income groups so that their living standards are not affected.[79] The Water Price Control Bureau of Hunan, for example, now prescribes that low-income families have free access to up to 2 cubic meters of water per month.[80]

Government to subsidise low-income groups should water prices increase

Anecdotal research from our discussions in Beijing show that water is very low down on the agenda of concerns for residents. Most people we questioned did not know how much they spent monthly on water or, even, in many cases, how they were billed for it. There are two primary ways to pay a water bill in China. Residents of older buildings have their water meter read monthly then receive a water bill that they then take to a specified bank or payment station of a utility company. Residents of more modern blocks have to pay via pre-payment on a top-up card. All residents in an area pay the same rate although rural prices tend to be lower and the rural utility company representative often still collects fees door-to-door. In more rural areas families are normally charged the same, regardless of usage, as there is often no metering. In some places it is the collection agent who informs the water user directly when the water price has increased. In cities, the meter-checker, banks and news media deliver this message collectively.

Water expert recommends fourfold increase in Beijing water price

Urban households in China currently spend just over 1% of their disposable income on water on average.[81] Wang Hao, director of the 'China Institute of Water Resources and Hydropower Research' believes that water prices in Beijing should increase to a minimum of RMB 11.4/m^3 (against the current RMB2.8/m^3 average).[82] Most 'real' price calculations are based on a full cost pricing system, including the total water costs in all its environmental and managerial aspects. Wang Hao reasons that water should make up around 3% of the price of industrial manufactured goods and the water for domestic use should cost around 3% of a household's total expenditure. In Beijing, if the water price was set at RMB 11.4/m^3 this would equate to 2.5% of the average monthly household income[83] and would certainly lead still only more efficient use of water.

'Acceptable cost of recovery' for investors in water

Despite moderate price increases in recent years, water is still not priced high enough for water suppliers to sustain normal operations, invest in new water supply infrastructure, and earn a reasonable profit. This situation does little to encourage investments in conservation and water-saving technologies. Most water policy recommendations, including the World Bank's multi-year analytical and advisory assistance package,[84] stress water pricing and allocation reform.

Acceptable recovery costing is made more complex by calls for access to clean water as a basic human right. We believe that it is essential for consumers to pay for the water they use in order for the resource to be used less wastefully. This does not mean, however, that all users should pay the same price. This report acknowledges that the basic right to clean water, as described above, must take into account the 'ability to pay' of consumers. This recognition is crucial because not everyone is able to pay the real cost of clean, safe water, yet all require access to it.

At the Kyoto Summit in 2003 the report 'Financing Water for All' proposed the concept of an 'acceptable' recovery of costs rather than a 'full cost' recovery and this has now been generally accepted. Where required, subsidised tariffs for water consumption and connection to the public water mains should be put in place in order for access to water and sanitation for all to be a genuine reality in China. Support initiatives for the poorest should include maintaining access to water services, educating on water saving methods and spreading the payment of bills for domestic customers who have financial or health difficulties.

World Bank recommends governments covers capital investment and water facilities, while users cover operational, maintenance and disposal costs

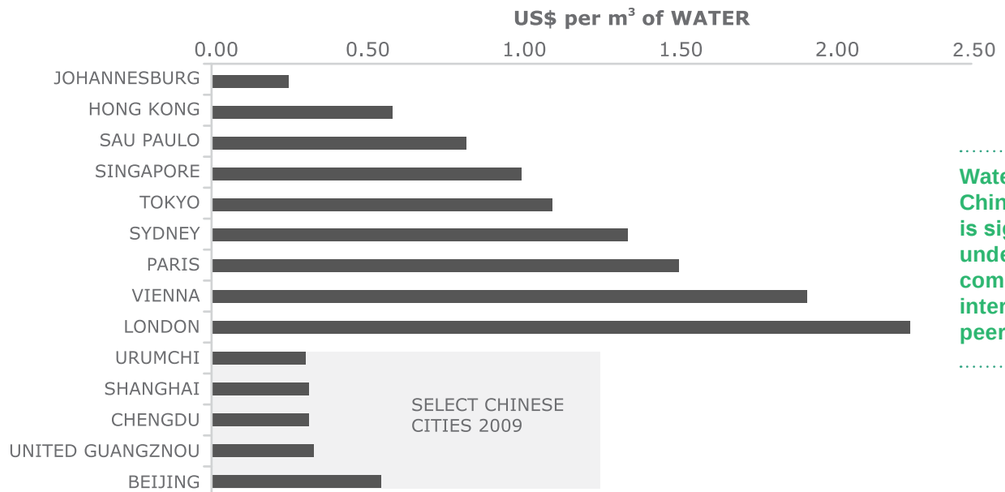
Political resistance to price increase

In 2006 the National Development and Reform Commission (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 sewage.[85] It also specifically imposed restrictions on expenditure on office buildings, salaries, benefits and hospitality within the sector.[86] This new pricing scheme was designed to comply with the World Bank recommendation that China should move towards marginal opportunity cost (MOC) pricing. In this model the government will cover the capital investment and water facilities, while users cover the operational, maintenance and disposal costs.[87] Until very recently, however, in most areas, local officials have been resistant to price increases. In August 2009 the NDRC published a supporting document discussing why water prices are too low to cover the cost of managing supply and sewage treatment.[88]

Rapid and unexpected price rises to come

The NDRC regulates all commodity prices nationally but is not involved in setting local water prices. Local governments adjust the NDRC recommendations according to local issues[89] It is fair to assume that these local water prices will increase over the next few years in China. Water prices are clearly below those of other global cities, as Figure 14 illustrates below. The challenge will be to predict the rate of 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 water services (revenues increasing). China Minzu Securities has indicated that water prices and sewage disposal rates in China are increasing at an average annual rate of 5.49% and 10.63% respectively (based on statistics from the NDRC on water prices in 123 major cities). With the increasing acceptance of price reforms and the increase in number of operating sewage disposal plants, both figures are set to increase further in the next few years. [90]

Figure 14: Average domestic water prices of select cities worldwide



Water in Chinese cities is significantly underpriced compared to international peers

Source: International Water Association, China Water.net, Responsible Research.
N.B. Water prices for cities outside China are from 2007. Figures for Chinese cities are dated 2009. The international average urban domestic water fee was calculated based on a 200 m^3 annual usage. The average water price takes into account fixed rate, variable rate and other miscellaneous fees.

Local government is are pressed to disclose more cost information

Lack of transparency and public participation in pricing

To increase water prices, the water supply departments have to submit an application for a water price adjustment. This is then analysed by local 'price supervision departments' according to the 'Measures of Supervision on the Costs of Water'. They then proceed to host a public hearing to decide on the time and range of the price adjustment. This process is rarely documented and, at present, information flow between the water supply departments and the public is slow. Consequently, the public tends to be cynical as to the rationale for price increases.[91] The cost of providing water supply and sewage in China has never been made publicly available and there is scepticism as to whether the NDRC and local governments are genuinely able to calculate the fixed and variable costs of urban water supply and sewage treatment. There is also no public information on how much of taxpayer's money is spent on providing water and sewage treatment and subsidies to operators.[92]

Government spending, market reforms and Public Private Partnerships

Because access to water has traditionally been seen as a fundamental public good, the distribution and management systems have been overwhelmingly government designed, built, operated and maintained. Since 2003, however, the State has been introducing market reforms in the public water sector resulting in a gradual increase in the number of collaborative projects from design to construction to operation. This will add value to the water supply and sanitation services whilst being advantageous to investors, business and the public.

Since 1990 new projects in the water sector have totalled just US$7.5bn (vs. US$42.4bn for the transport sector). Not only does this lag other infrastructure sectors but the average investment size is also much smaller, at around US$30m, against over US$3.6bn in the telecommunications sector.

It is informative to compare the spending on water infrastructure in China with the US$21bn currently being spent on water upgrades in the USA. The new federal stimulus package in the US allocates almost US$12bn for drinking water and waste water infrastructure upgrades over the next four years including spending on improving water quality, upgrading old pipes, filters, and irrigation systems, installing new water meters, building entire new treatment plants and planning for water shortages. The total spending on water in the US for the next few years will be bigger than the entire GDP of Cambodia.

As of 8 October 2009, according to Recovery.gov, 22% (US$173.2bn of the US$787bn total) of these U.S.-stimulus funds had been paid out. The latest data shows that around US$5.9bn has now been allocated to various state level water projects through EPA revolving funds and water loans, while the Department of the Interior has made US$945.25m available for water-related programs.[93] Additionally, there is a pending US$9.4bn bond package being negotiated in California's State Capitol which would bring the total spending figure on water to more than US$21bn.[94]

Back in China, private investors are being strongly encouraged into the sector to take up concessions for providing urban water supplies. As a result, the water service sector in China is now a hybrid public-private sector.[95] The swift development of the water services sector aims to reduce exposure to reputational and political risks, lower risk of social instability, enhance corporate earnings over time and allow the public sector to plan, execute, and assess its water governance strategy more easily.[96]

Following the publication of The World Bank recommendations in March 2009, the Ministry of Water Resources announced that a new water pricing system will be introduced as a result of the severe water shortages, inefficiencies and pollution. In the near future, therefore, some cities should expect a sharp rise in the price of water with different bands set for lower-income residents and heavy industrial uses.[97] The MWR also announced its target to reduce water consumption per unit GDP by 60% by the year 2020.[98] In July 2009, the National Development and Reform Commission (NDRC) confirmed that China would introduce reforms to resource products price structures, such as electric power, natural gas and water, while reforming environmental charges on pollutant discharge, sewage treatment and rubbish disposal and continuing to reform and improve controls on prices in general.[99]

One major area of reform has been the establishment of public private partnerships in water (see Figure 15 below). In order to reach successful conclusions foreign investors and business leaders should emphasise areas of shared interest with local government leasers, in particular the desire for a 'reliable, sustainable, and clean water supply as a prerequisite for long-term economic growth, social development, and human health.' During a recent presentation in Hong Kong, Dieter Küffer, lead portfolio manager of SAM's Water Fund, stressed the growing importance the emerging PPP'sin China.[100] These partnerships have been used in other infrastructure sectors in China, especially in telecommunications, energy and transportation, but are relatively recent in Water Services.



Figure 15: Map of Public-Private Partnerships in China's water and sewerage sector

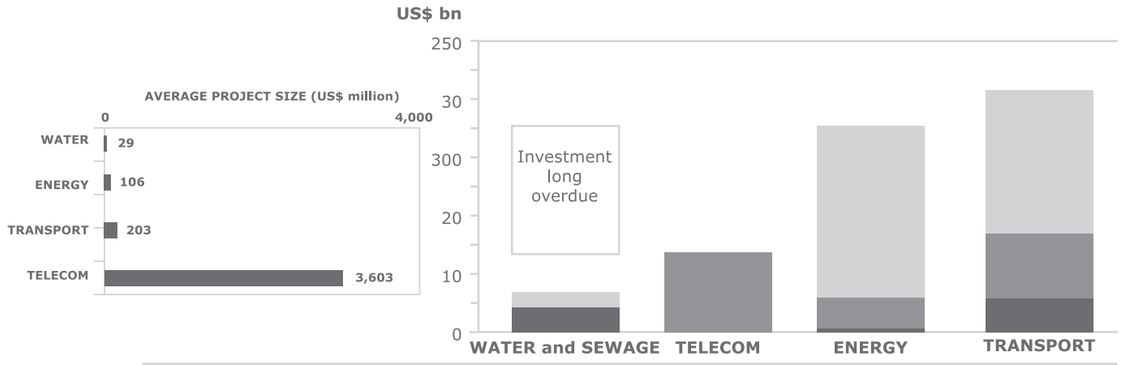


Source: World Bank's Private Participation Infrastructure (PPI) database, Responsible Research. Data as of June 2009.

Despite some early success stories, investors are still confronted with major hurdles. These include securing land use rights (for example in the Foshan project in Guangdong Province) and access to long-term commercial bank loans due to inadequate lending policies and loan restrictions in the private sector (such as has happened with the Beijing projects).[101] A clear example of a successful PPP is the Shanghai Zhuyuan No.1 Wastewater Treatment Plant. This has a treatment capacity of 1.7 million m3 per day, and serves about 23.5 million inhabitants, with a very low service price at RMB0.22 per m3 treated wastewater.

Figure 15 shows the location of the water and sewerage projects which have developed PPPs, dating back to 1994 and demonstrates how, despite China's "Go West" , development strategy, PPPs have not yet been effectively used in the western provinces.[102] One reason cited is overall lack of overall economic development in these provinces. We anticipate much more activity here in the next decade. Figure 16, below, shows that the PPP model has not been widely used in the water and sewerage sector when compared to the telecom, energy, and transport sectors. It has also been concentrated overwhelmingly in the eastern provinces.

Figure 16: Private participation in China's water, telecom, energy, and transport sectors (1990-2007)

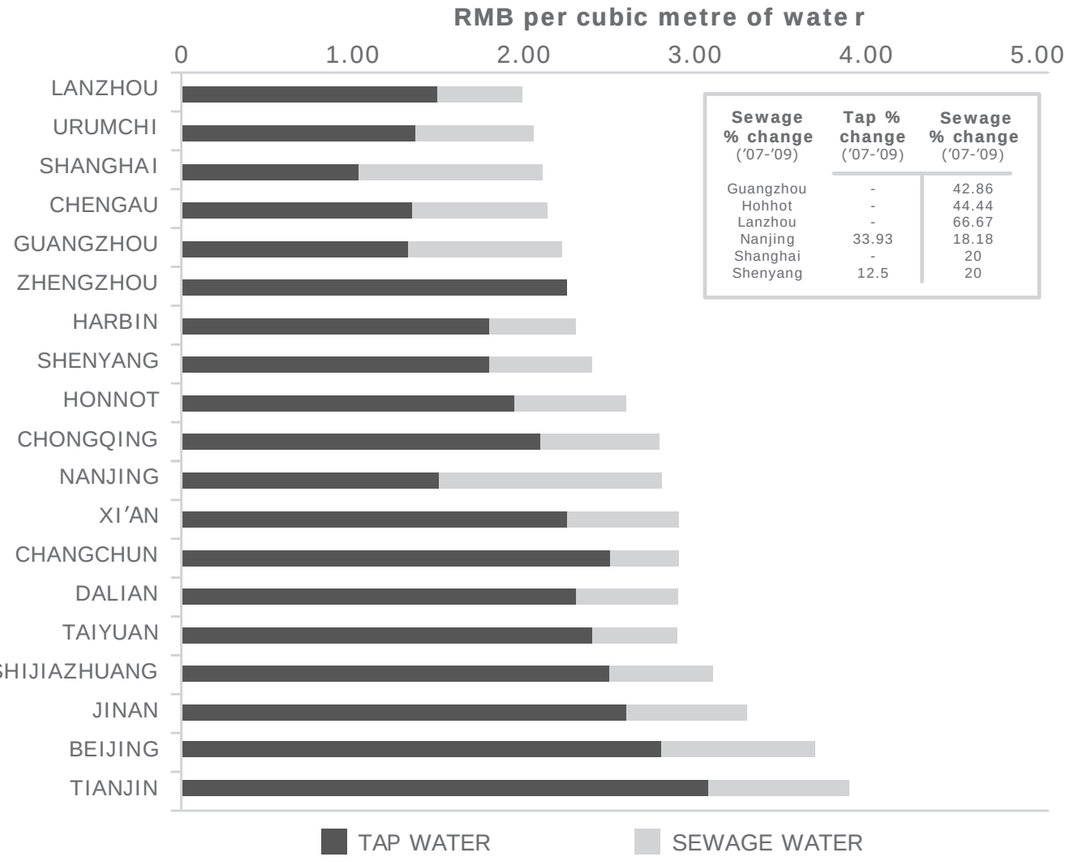


Source: Private Participation Infrastructure (PPI) database, World Bank, Responsible Research. The PPI database records total investment in infrastructure projects with private participation, not private investment alone.

Localised water pricing

One feature of this market reform of pricing will be a move towards more localised pricing. Figures 17 to 19 show the current prices for domestic water and sewerage and the increases between 2007 and 2009. We can see that domestic water prices increased considerably in the cities of Nanjing and Shijiazhuang. The picture is confusing, however, as in some cities, such as Tianjin, increases were seen in domestic water prices but not for industrial and commercial water treatment. Shijiazhuang even lowered prices for industrial and commercial use over this same period. The domestic water price in Beijing, at RMB 2.8/m^3, has not increased for the past few years and the price of industrial and commercial water in Beijing is higher than for domestic use at RMB 4.10 versus RMB 2.80 per m^3.

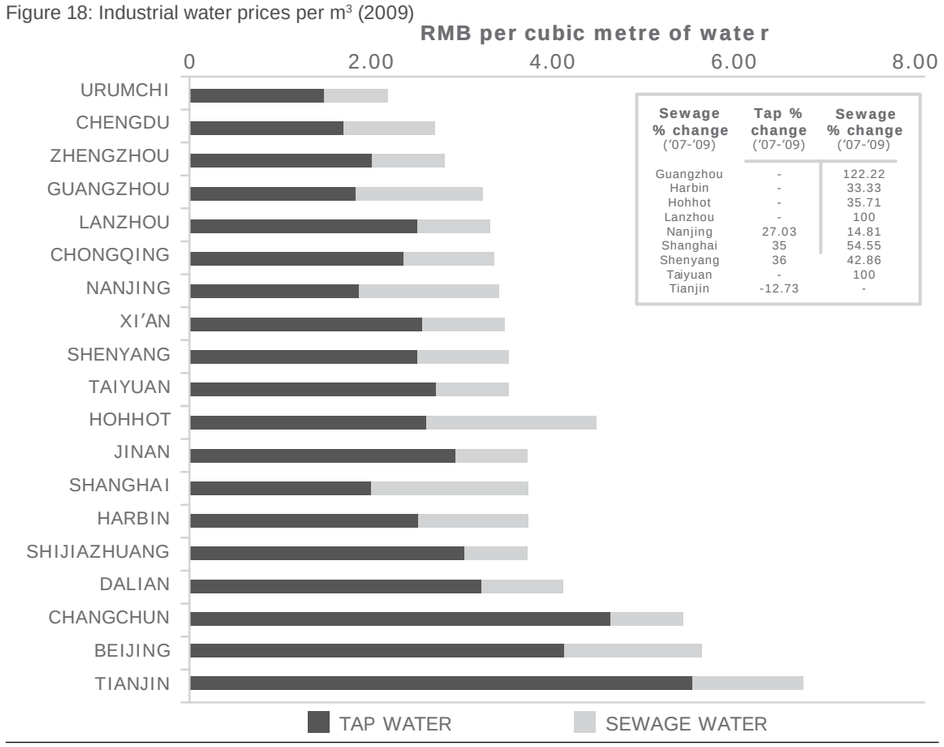
Figure 17: Household (domestic) water prices per m^3 (2009)



	Sewage % change ('07-'09)	Tap % change ('07-'09)	Sewage % change ('07-'09)
Guangzhou		-	42.86
Hohhot		-	44.44
Lanzhou		-	66.67
Nanjing		33.93	18.18
Shanghai		-	20
Shenyang		12.5	20

Source: China Water.net, Responsible Research.

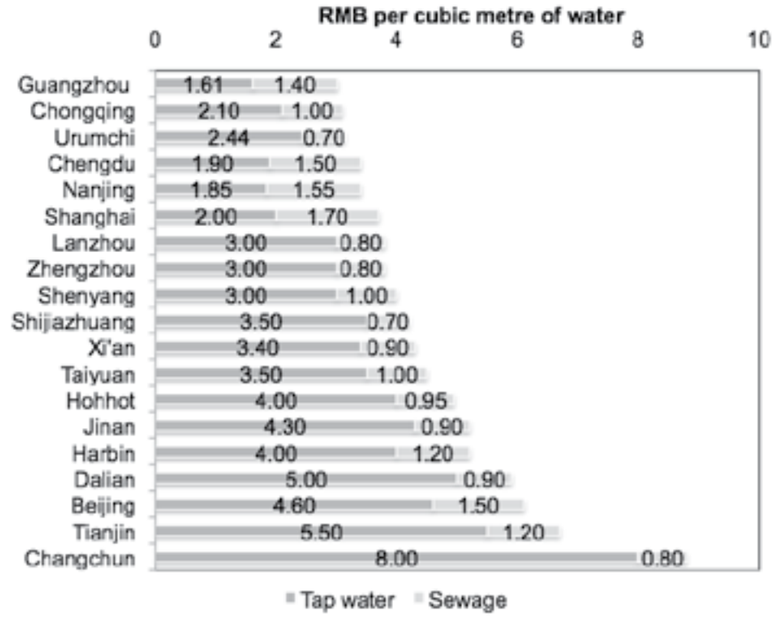
Figure 18: Industrial water prices per m^3 (2009)



	Sewage % change ('07-'09)	Tap % change ('07-'09)	Sewage % change ('07-'09)
Guangzhou		-	122.22
Harbin		-	33.33
Hohhot		-	35.71
Lanzhou		-	100
Nanjing		27.03	14.81
Shanghai		35	54.55
Shenyang		36	42.86
Taiyuan		-	100
Tianjin		-12.73	-

Source: China Water.net, Responsible Research.

Figure 19: Commercial water prices per m^3 of water (2009)



Source: China Water.net, Responsible Research.

MANAGEMENT RISKS

With water scarcity and pollution conflict coming higher up the agenda, Beijing is demonstrating its awareness of the risks that environment-related social unrest may pose on central authority.[103] In China government and company management are often closely linked through the Supervisory Board structure, where the Party tends to be represented within the company. This results in a different perspective on how companies publicly react and respond to ESG issues, and investors should be aware of this in their requests for greater disclosure.

Here we review how the management of ESG issues can contribute to financial risk for investors by looking at the following issues:

- Government handling of water pollution incidents
- The public right to complain
- NGO activity on water issues in China

Government handling of water pollution incidents
Despite the huge number of environment-related complaints it receives, approximately 600,000 in 2006, the Ministry of Environmental Protection records state that, in 2008, it handled directly only 135 environmental incidents, and 46 of them dealt with threats to drinking water safety.[104]

Public health concerns related to toxicity, in particular, are recognised as having the potential to produce widespread social discontent. In early 2008, for example, Chinese officials reportedly tried to censor a World Bank document that stated that filthy air and water prematurely kill 750,000 people every year in China.[105] Additionally, a statement by former SEPA deputy director, Pan Yue, in 2006, discussed findings from oncologists that linked 70% of China's 2 million annual deaths from cancer to pollution. The article was removed from the agency's official website shortly after publication and Pun yue has since been less visible as a commentator on government policy.[106]

As the World Bank commented in a 2007 report, the main focus to date of local Chinese government action against pollution has been post-crisis mitigation rather than prevention.[107] It has recommended a switch in policy to strict enforcement of appropriate regulations as a more cost effective long-term solution. Water pollution incidents are categorised into two types by this report: the first is when an accident causes a large amount of pollutant discharge in a short time, the second is the cumulative impact of long periods of unchecked pollutant discharge. Both can cause serious threats to local communities. Better training of local officials could lead to improved responses to and lessened impacts from both types of pollution. Regular inspection and dialogue with factories can have a significant impact on the frequency and impact of both types.[108]

The public right to complain
We cannot locate accurate recent figures but in 2006, it was reported that the government received around 600,000 environment-related complaints, a figure that has risen roughly 30% each year since 2002.[109] Additionally, Chinese newspapers state that around 50,000 environmental disputes took place during 2005.[110] These numbers mirror an overall trend in the number of protests in China over the past decade, fuelled by the perception of individuals having the right to complain, as a result of increasing openness and prosperity.[111]

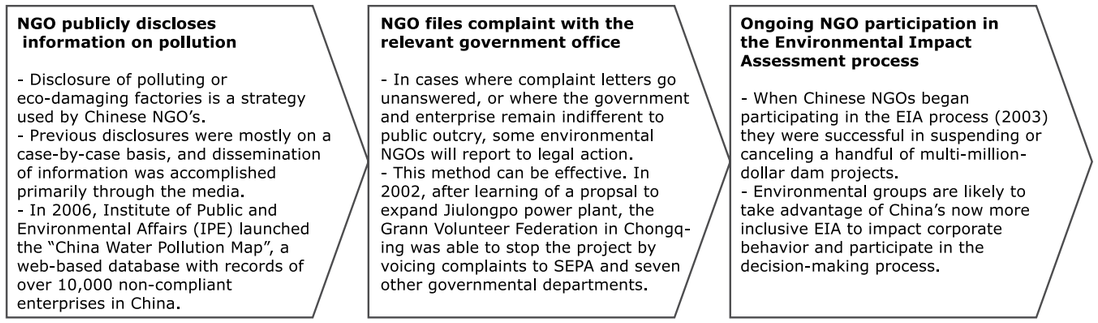
NGO activity on water issues in China
By the end of 2007, the number of registered NGOs in China reached 387,000. This is one 'NGO' per 3,400 people. The definition of 'NGO' here is unclear and we take it to include non-governmental social bodies including hobby and special interest groups. Most of the registered NGOs are best described as 'Government-Organised NGOs' (GONGOs) as Chinese government regulations require each registered NGO to place itself under the 'professional management' of a state agency with responsibilities in its area of work, in addition to being registered and vetted annually by Civil Affairs departments. Therefore, the current legal framework still seems to ensure that no fully autonomous NGO can lawfully exist in China. Although the NGO sector, as a whole, lacks autonomy, researchers generally assume that so-called 'popular NGOs' tend to be slightly more autonomous, can be started by private citizens, receive no government subsidies, have weaker bureaucratic connections, lower status and poorer experience of governmental procedures.[112] Reports state that there are also, apparently, a large number of unregistered NGOs, and that the total number of NGOs could be several million in total.[113]

The central government began a registry for environmental organisations in 1994, and 'Friends of Nature' was the first Chinese environmental NGO to be officially recognised.[114] By the end of 2008, China listed roughly 3,600 independent environmental NGOs[115], forming the largest segment of the country's civil organised society.

Most Chinese based environmental organisations depend on international organisations for funding and other resources.[116] Due to economic growth and improvements to China's environmental laws, advocacy groups and NGOs have matured in terms of their operations and scope. Firstly Chinese followed early environmental advocacy models and worked primarily to protect endangered species. Gradually NGO activities have moved beyond raising public awareness to providing policy advice, carrying out social supervision, safeguarding environmental rights and promoting sustainable development. Following the introduction of the EIA law in 2003, and more recently the Environmental Information Disclosure measures in 2008, there has been a steady increase in the number of Chinese NGOs involved in environmental legislation cases.[117]

Overall, we see a trend for GONGOs to operate as the MEP's 'eyes and ears' at a local level. Even on the most sensitive political issues such as dam construction, governmental authorities appear more and more willing to listen to discourse on the environmental impact on all stakeholders. For example, NGO representatives from Friends of Nature and Global Village were officially appointed as environmental consultants by the Beijing Organising Committee for the Olympic Games to participate in key levels of decision-making.[118]

Figure 20: How NGOs confront polluters in China



Source: CLSA[119], Responsible Research.

Type		NGO	Focused area			
			Education/ research	Public participation	Corporate	Funding/ capacity building
Local NGOs	Govern-mental NGOs	China Environment Culture Promotion Association		•		•
		All China Environment Federations		•	•	
		China Environmental Protection Foundation	•			•
		China Association for NGO Cooperation		•		•
	General NGOs	Friends of Nature	•	•		
		Global Village of Beijing	•	•		
		Green Earth Volunteers	•	•		
		Institute of Public and Environmental Affairs		•	•	
		Fuping Institute for Environment and Development		•		•
		Center for Legal Assistance to Pollution Victims		•	•	
		Friends of Green in Tianjin	•	•		
		Voice of Green in Shijiazhuang	•		•	
		Green Hanjiang	•		•	
		Huai River Guards	•		•	
		Green Camel Bell	•		•	
		Green Watershed		•	•	
	Student Environ-mental Societies	Senol in Beijing Forest University	•			
		Green Society in Beijing University of Clothing Technology	•			
		Green Students Forum	•			
		Tsinghua Environmental Protection Association	•			
		Green Family in Beijing Transportation University	•			
International NGOs		Greenpeace		•	•	
		Environmental Defence	•	•		
		Conservation International China Program		•		•
		WWF	•		•	
		The Nature Conservancy	•		•	

Figure 21: Select List of Environmental NGOs with Chinese operations Source: CLSA (data from IPE/WWF).[120]

Environmental NGO activity as monitored in the excellent CLSA report (China Greening 2008) is increasingly starting to have an impact on business and government decisions, as can be seen from the following recent case studies:

Case Study: Planned US$5bn petrochemical refinery relocated due to public protest

Public outcry forces multibillion dollar plant to relocate

In July 2009 the Financial Times reported that a US$5bn refinery and petrochemical plant planned to be located in Nansha, Guangzhou, would be relocated, after years of public outcry. The province decided to move the plant (a joint venture between China's Sinopec and the Kuwait Petroleum Corporation) due to sustained opposition from the community and officials.[122] Last year, 14 delegates to the Provincial People's Congress filed a motion opposing the refinery on the grounds that it could worsen regional air pollution. That opposition emboldened environmental officials, who also began to question the project's suitability, pending the completion of an environmental impact report. The decision to relocate this plant is the highest-profile victory so far for China's loosely organised but increasingly aggressive environmental and community activists. The plant is now most likely destined for the industrial port of Zhanjiang in western Guangdong, a much less populated and ecologically sensitive region.[123]
Charlie McElwee, from the China Environmental Law Blog, points out that the Communist Party secretary of Guangdong, Wang Yang, was never a fan of the Nansha location[124]. Yang stated: 'The Nansha refinery project had been criticised strongly by the community and by (officials) and scholars,' … 'After numerous studies and much effort, we have decided that we will relocate the project...I think this reflects how Guangdong values ecology and it is open to criticism'.[125]

Case Study: First lawsuit filed by an environmental group vs. local government

In July 2009, a court in Guizhou in southwest China accepted the country's first lawsuit filed by an environmental group against a local government. The All-China Environmental Federation, a group backed by the central government, filed the suit on behalf of residents against the local land resources bureau in Qingzhen city in Guizhou province. The bureau allegedly sold land to a drink and ice cream processing plant that leaks polluted wastewater into adjacent lakes from which the local community draws drinking water. The group filed another public lawsuit earlier this month against a company that operates a container port in eastern Jiangsu province's Wuxi city for failing to control pollution. At the time of writing we await the results of these trials.[121]

Case Study: MEP suspends approvals for new hydropower projects due to lack of EIAs

In June 2009 the MEP announced it was suspending its approval of hydropower construction applications for China Huaneng Group and China Huadian Corp. as punishment for the two power giants' illegal construction in January of two dams on the Jinshajiang River, at the upper reaches of the Yangtze. Neither dam received prior approval through the environmental impact assessment (EIA) process, as regulated by the Law on Environmental Impact Assessment.
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 RMB4tn (US$588bn) economic stimulus plan including many construction projects, MEP planned a new round of inspections, locally referred to as "green storms", starting in July 2009, on construction that began after July 2008. Between November 2008 and May 2009, the MEP suspended or rejected almost 30 new projects, representing lost or delayed investment of more than RMB145bn (US$21.3n).[126]

Case Study: Algae bloom in Lake Tai – Schindler, Sharp and Samsung factories blamed

Lake Tai algae bloom leaves 4 million people without drinking water

In May 2007, an estimated 4 million people were deprived of drinking water in Eastern China when a carpet of algae scum covered Lake Tai. A bloom of algae covered 70% of the lake's surface, turning it turquoise and making the tap water stink of decomposing vegetation. Experts blamed the explosive algae growth on unusually warm weather and low water levels, compounded by the unnaturally high levels of nutrients in the lake, pumped in by polluters. Nitrogen and phosphorous coming from effluent from chemical factories, household waste, and agricultural run-off favour development of algae. Environmental activists, using official data, have identified 300 local factories – including ones owned by the Swiss elevator manufacturer Schindler, the Japanese electronics firm Sharp, and South Korea's Samsung – as particular offenders.[127]

Case Study: Explosion at a PetroChina subsidiary caused massive water pollution

In November 2005 The World Bank/UNEP reported that an explosion took place at Jilin Chemical Industrial Co. plant (a PetroChina subsidiary). The incident, which reportedly occurred in Jilin, was caused by an attempt to clear a blockage in the nitration tower of a chemical plant producing benzene. Five people were confirmed dead and nearly 70 people were wounded. More than 10,000 residents were evacuated as a precaution against further explosions and severe pollution from the plant. The explosion led to around 100 tons of chemicals, including benzene, a known carcinogen, pouring into Songhua River. Ten days later, the contaminated

stretch of water reached Harbin and its Municipal Government had to temporarily shut down its water supply, leaving around 3.5 million people temporarily without access to tap water.[128]

Case Study: High incidence of cancer in some rural areas

The role of water pollution in the occurrence of cancer rates is a heavily debated topic. Research has found that long-term contact with or absorption of large quantities of chemical (or organic) pollutants, such as arsenic and nitrates, can increase the appearance of a number of cancers, including those of the liver, lungs, bladder and ovaries. (A survey by the Chinese Ministry of Health in 2003 found that over 480,000 people died from liver, stomach, intestinal and bladder cancers in rural areas annually). According to some estimates over 50,000 of those fatal cancers could have resulted from water pollution. Other estimates put the death toll as high as 200,000 annually.[129]

Case Study: Lead poisoning of children from industrial waste in Shaanxi

In August 2009 the main Chinese press reported that a six year old 100,000-ton zinc smelting and 700,000-ton zinc coking factory, owned by Dongling Lead and Zinc Smelting Co. in Changqing, a small town in Shaanxi, West China had been blamed by local environmental officials for lead poisoning in the local population. Later in the month, China Daily announced the blood test results of 731 under-14 year olds monitored in villages closest to the project. Over 80% showed excessive amounts of lead. Angry villagers then tore down fences, smashed trucks, and stormed the company offices. 'Lead content in the air along the main routes near the plant is 6.3 times that of monitoring sites 350 meters away,' said Han Qinyou, head of the Baoji Municipal Environmental Protection Monitoring Station. Remarkably, official lab tests showed that 'ground and surface water, soil and the smelter's waste discharge' had met all national standards. This incident has sparked doubts and controversies among villagers and, because the story has been played out on the internet across Asia, millions are now paying close attention to the situation. An executive of the zinc smelter plant admitted that it could still be 'way behind minimum requirements' for industrial discharge. The plant has subsequently been ordered to halt production, and the Shaanxi provincial environmental protection department has authorised RMB500,000 (US$73,500) to finance an environmental impact assessment of the company.[130]

Case Study: Massive South to North Water Diversion Project will relocate 300,000

The South-North water project was devised to unite the country's four rivers (the Yangtze, the Yellow River, Huai and Hai) and move water from China's central and southern regions up to the arid Northern provinces along three man-made channels. The project, at an estimated US$62bn, is expected to take decades to complete, to cost nearly three times the Three Gorges Dam and will require the relocation of around 300,000 people. The eastern route, which mostly follows the route of the ancient Grand Canal, is largely complete. The mountainous western route, which is the most controversial and technically challenging, is planned for completion in 2050. The central section was due to start operations in 2010, but officials now admit to administrative hold-ups due to funding issues. This route is now planned to launch in 2014.[131]
An official with the South-to-North Water Diversion Office of the State Council reportedly admitted housing relocation and construction issues have contributed to the postponement. When the project was initiated in 2007, the budgeted compensation for land acquisition and relocation was 10 times the average annual land value. However after the National Development and Reform Commission reviewed the feasibility report in late 2008, the budget had increased to 16 times land value.[132]
Other sources add that ecological arguments have halted progress. Officials remarked, 'We have taken appropriate measures to mitigate adverse environmental effects.' Critics, mostly scientists and environmentalists, but also local governments, have continued to voice opposition to the project, fearing it will waste tens of billions of dollars and damage the environment, while offering only a temporary fix to water distribution issues. Many are also concerned that the project could exacerbate water pollution problems as heavy industry along the Eastern Route may render the water unfit to drink.[133]

SOCIAL RISKS

In this section, we address the social risks to investments from the developing water crisis in China. These problems have received increased scrutiny recently, not only from business and investors, but also from Chinese government officials. Government actions indicate that officials seem to believe there is a greater possibility of social unrest as a result of economic losses and rising prices than from specifically environmental issues.[134] Risks to government stability and therefore loss of productivity could develop as a result of public demonstrations and protests due to higher water prices, conflict over human rights and access to safe water. Most recent conflict has been due to the perception of local government officials as corrupt or lax in enforcing new envirnmental laws.

The concept of water as a basic human right has been discussed already in this report and is receiving much attention globally. 'The human right to water,' notes the UN Committee on Economic, Social and Cultural Rights, 'entitles everyone to sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic uses'.[135] In the push towards a global convention on water we recommend asset owners, asset managers, NGOs and business leaders to contribute to stakeholder dialogue and negotiations. In particular we observe the activities of the newly formed Water Disclosure Project, the Global Water Initiative and the CEO Water Mandate, all of which should move the water issue along in 2010.

Access to safe water is a fundamental human need and therefore a basic human right. —Kofi Annan, former UN Secretary-General

In China, as in other emerging markets, arguments on water sustainability are coloured by the general perception that access to water should remain a basic public good and the state should shoulder the financial burden of providing most water services. There is no indication yet that, even with increased private participation, this premise is changing. Responsible investors are, at the same time, recognising the 'ethical' element to water being treated as a commodity rather than a basic necessity. The Interfaith Center on Corporate Responsibility, a network of 275 faith-based institutional investors with over US$100bn assets under management, frames the argument succinctly when it says, 'Full cost recovery for water services raises ethical concerns when poor people are priced out of the market for this necessity of life'.[136]

Unrest can be acute when local officials do not take allegations of environmental pollution seriously

For Chinese citizens, perhaps the most frightening consequence of environmental pollution has been the range of public health crises plaguing local communities throughout the country. [137] In 2007, the head of the State Environmental Protection Agency, now Minister of Environmental Protection, Zhou Shengxian, linked the rising number of riots, demonstrations and petitions across the country to public anger over pollution. Demonstrations against power and chemical plants have become increasingly common in recent years.[138] Researchers at the Institute of Rural Development at the Chinese Academy of Social Sciences state: '… in a time with so much social conflict, small contradictions can trigger mass unrest, affecting the whole society. If such incidences cannot be solved properly, both the society and the whole country will pay a heavy price'.[139]

Mass riots and anti-pollution protests are increasing at a rate of over 30% annually

According to the MEP, mass riots and anti-pollution protests have been increasing by a third every year[140]. The recent August 2009 clashes between 10,000 locals and 2,000 riot police in Fujian province where two government officials were held hostage demonstrated the type of clashes that could become more common. In this case, violence erupted due to allegations that local tannery and oil refineries have been discharging carcinogenic substances into drinking water used. State-run media has downplayed the violence and emphasised the ongoing dialogue between the local public and government. The hostages were swiftly released.[141] As media reports surface about other anti-pollution protests across the country, experts predict that environmental demonstrations will continue and could certainly intensify.



Zhejiang, 2005
Source: Epoch Times

Anti-pollution protests could start to affect large foreign joint ventures

So far, public reactions following pollution incidents have been quite local in nature. Demonstrations typically involve a local plant that has illegally discharged pollutants into rivers and streams and caused adverse health effects for the local population. However, there is growing concern that localised anti-pollution protests could spill over to large-scale joint venture projects involving domestic and foreign partners. For example, the violence in Fujian is close to the site of Fujian Refining & Petrochemical Co. Ltd., a US$5bn refinery joint venture between Sinopec Corp. Exxon Mobil and Saudi Aramco. This site produces vast quantities of refined oil products, feedstock and raw materials each year.[142]

Case Study: Largest protest ever reported in China in Dongyang, South of Shanghai

This story goes back to the spring of 2005 when citizens of this village in Zhejiang Province, first set up roadblocks around industrial plants to protest against pollution. Confronted with the prospect of an entrenched rebellion, the Dongyang local government ordered some of the worst offending factories to move out of the industrial park. By September 2006, the last plant of the 13 chemical companies was closed. In April 2005 a riot occurred in the same village involving more than 20,000 protestors. Other sources claimed up to 60,000 [143] people were involved, protesting against heavy pollution of drinking and ground water. Reports state that villagers established a blockade of the industrial park and forced its closure, after confronting the 3,000 police sent. On May 12, over 10,000 villagers assembled when trucks attempted to break their picket. Confronted with the prospect of an entrenched rebellion, the Dongyang government ordered factories to move out of the industrial park.[144] By September 2006, the last plant of the 13 chemical companies was shuttered, however reportedly two people have died and nearly a dozen farmers have been sent to prison for as long as five years.[145]

Case Study: Poor quality wastewater from a water treatment plant leads to conflict

Mass protests significantly increasing over the last 15 years

In August 2009 over 600 residents gathered around Quangang Urban Wastewater Treatment Plant in Fujian province to protest at the wastewater discharge from a 3km pipe into the ocean. Facilities, windows and a car were reportedly damaged during the protests. Residents said that their lives had been seriously affected since the factory was established, as the wastewater smells and their fishing resources had been polluted. 'The wastewater smells stinky. I feel dazed and want to vomit when I smell that water. Sometimes I just cannot eat anything,' one villager said. Villagers talked about their illnesses since the factory had opened and their declining earnings from oyster and shrimp farming. The local government has offered medicine to those affected by the wastewater and has said the discharges are being monitored. There will be an environmental assessment now that may lead to compensation. Two local government officials were injured and detained by the villgers but later freed. [146]

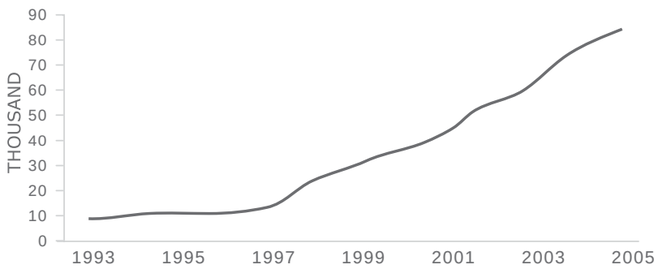


Figure 22: Incidents of 'Mass Disturbances' in China involving 15 or more people

Source: Carnegie Endowment. Keidel, A. (2006, September). 'China's Social Unrest: The Story Behind the Stories'. Figures taken from several original sources, Responsible Research. NB: 2001 data is not available.

ISSUES FOR RESPONSIBLE INVESTORS

WATER INTENSIVE INDUSTRIES

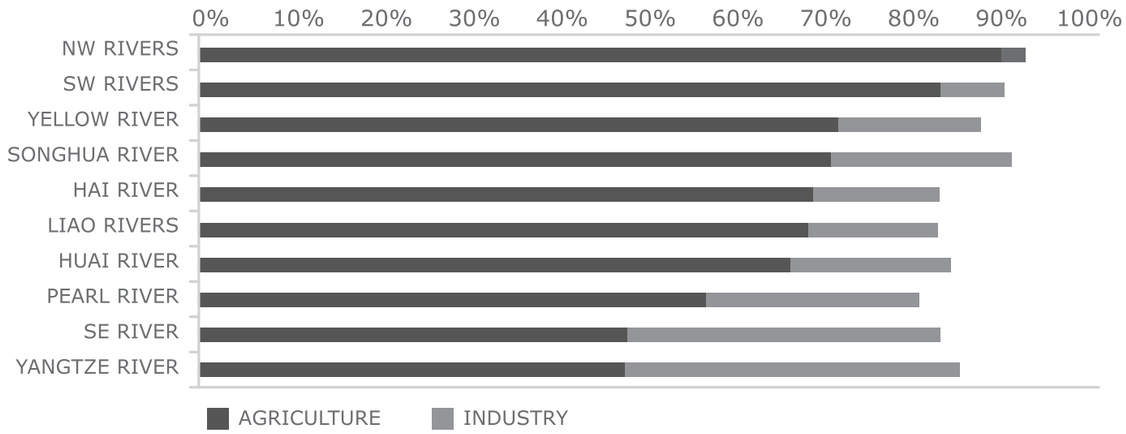
INTENSIVE WATER USERS IN CHINA

Here we highlight water issues and practices within specific categories of heavy users and polluters of water including households, bottlers, agriculture, banking, beverages, basic materials, hotels, hydroelectric power, metals and mining, paper and forest products and the textiles, footwear and apparel industry. These sectors all compete for water in China and deal with substantial water risks. Strategic corporate water planning and monitoring can provide managers with competitive advantages that incorporate responsible water use and wastewater practices.

Despite billions spent, many Chinese still live without options for clean water access

Unlike global warming, water risks and opportunities tend to be localised in a watershed. Therefore, investment analysts should examine water use within river basins because water for business interests is costly to transport. Figure 1 illustrates how, in almost all regions, agriculture uses at least 50% of all water, going up to as much as 85% in the North West basins. The Yangtze River system delivers the least water proportionally to agricultural use at around 48%. According to statistics provided by the Ministry of Water Resources, only 47% of China's over 120 million hectares of farmland is irrigated, the rest relies on direct precipitation.[147] When analysing the use of water for agriculture, it should be remembered that, depending on the location, between 60% and 80% of rainfall and runoff can occur in the flood season.[148]

Figure 1: Percentage of water use by sector



Source: China Water Resources Bulletin 2007 (published in 2009), Responsible Research.

It is important, in the Chinese context, to note that 'Water Use' refers to gross water use distributed to users, including loss during transportation, which can be significant. The publicly available 'Water Use' statistics, on close inspection, are not yet 'fit for purpose' as they are broken down only into agriculture, industry, 'households and services and 'ecological protection'. These last two categories are too general to be of much use for tracking improvements in domestic efficiencies and to monitor water price elasticity.

The 'households and services' sector seems to include any water taken from municipal suppliers and includes all commercial, governmental and municipal services as well as small scale animal husbandry. Agricultural use includes irrigation of forestry and fishing and could therefore be confusing. There is a final sector for 'ecological protection' that includes water used to 'green urban environments'. We also believe this last section to include water taken from aquifers to replenish lakes and rivers in times of drought.

There have been several recent reports outlining industry's impact on water in China. Business for Social Responsibility (BSR), for example, studied water quality in Guangdong Province in 2008 and found increasing levels of general pollution, with 28% of rivers experiencing 'severe' pollution. Their findings showed that the current pollutant discharge regulations has had a limited impact in Guangdong. As a result, BSR launched the 'Water Quality Initiative' in China 'in an effort to uncover additional innovative tools and approaches to compliance strategies that can accommodate specific local economic and social interests, with a longer term objective of bringing into alignment economic growth and responsible management of water and natural resources in the region'.[149]

In Figure 2 we summarise the very high intensity impacts on water within the value chain - from high impact on withdrawals to discharge. We also note that water's materiality of the impacts on the banking sector comes not from its direct operations but in the loan and corporate financing policies across all sectors and along the entire value chain. In China, because debt capital markets are relatively underdeveloped, businesses rely to an overwhelming extent on commercial loans. The China Banking Regulatory Commission, the industry regulator, now has specific mandates to promote green credit.

Since less than half of China's farmland is irrigated, drip irrigation investments has significant upside potential

Figure 2: Water withdrawal and discharge impacts across industries in China

		Raw Material Production	Suppliers	Direct Operations	Product Use and End of Life
Water Withdrawal	Agriculture	Freshwater for irrigation and cleaning crops; freshwater for livestock – drinking, sanitation and grazing	Washing, water for feedstock	Water as a key ingredient; washing, cleaning, steam pasteurization	Water to wash and cook products, wash and recycle products
	Basic Materials and Construction	Water for dust control, drilling and as slurry for limestone and other product transportation	Water used in cleaning, mixing and other processes	Water is a key ingredient in construction materials including cement	Water to clean and rinse
	Beverage	Freshwater for irrigating, rinsing and cleaning crops	Freshwater to manufacture containers and packaging, washing and cooling	Water is a key product ingredient; dispensing products, water withdrawal for bottled water; washing, cleaning, steam pasteurization	Water use to wash and recycle beverage containers
	Hospitality	Fresh water for Food production	Water used by the food processing industry, equipment manufacturers	Washing and rinsing during food preparation; water for cooling and boiler; landscaping, swimming pools and golf courses	Water to wash and cook products, wash and recycle products
	Hydroelectric Power	Dam construction requires water for dust control, drilling and as slurry for limestone and other products (concrete) transportation as well	Freshwater diverted to dams to drive turbines	Hydropower generation requires a reliable water flow	
	Metals and Mining	Water used for dust control, drilling and as slurry for product transportation	Waste water may contain heavy metals	Freshwater use for cooling, boiler, and mining	Waste water may contain heavy metals
	Paper and Forest Products	Irrigation requirements and water use for forest fires	Freshwater used to manufacture containers, packaging, washing cooling	Freshwater use in pulp and paper-making process; cooling water and steam generation	Water use to manufacture paper using recycled material
	Textile and Apparel	Freshwater withdrawal cotton crop irrigation (22,000 L/kg)	Freshwater for textile manufacture, dyeing and bleaching	Water use in apparel factories, commercial facilities, dyeing operations	Water use to wash garments (1,650 L/kg)
Water Discharge	Agriculture	Agri-chem runoff, waste water from food processing which have fertilizer, pesticides, and herbicides, animal waste	Wastewater discharge and toxic chemicals	Waste water from cleaning and processing	Wastewater and impact of discarded packaging
	Basic Materials and Construction	Runoff and wastewater containing dust, sediments, and metals and toxic chemicals; drainage water from mines that require pre-discharge treatment	Suppliers may use water for cooling and cleaning	Wastewater containing dust, heavy metals, and chemical toxins in the building materials	Recycling of building materials and road breaking uses large quantities of water
	Hydroelectric Power	Runoff and wastewater containing dust, sediments, and metals and toxic chemicals; drainage water from mines that require pre-discharge treatment		Water can be heated in the process which may affect ecosystems downstream of dams	
	Beverage	Agricultural runoff, wastewater from processing raw materials could contain fertlizer, pesticides, herbicides	Wastewater could contain toxic chemicals	Discharge could contain toxic chemicals e.g. from brewing, fermentation	Impact of packaging recycling and discarded bottles
	Metals and Mining	Runoff and wastewater containing dust, sediments, and metals and toxic chemicals; drainage water from mines that require pre-discharge treatment	Wastewater could contain toxic chemicals and heavy metals	Wastewater containing heavy metals and other toxic chemicals	Recycling of metals requires large amounts of water
	Paper and Forest Products	Agricultural runoff, wastewater from processing raw materials could contain fertilizer, pesticides, herbicides	Wastewater discharge from cleaning, cooling	Wastewater discharge has high concentrations of cleaning and bleaching chemicals, inks, oils; wastewater discharge from retail and commercial facilities	High water use for recycling paper. High use of bleach, inks and oils
	Textile and Apparel	Agricultural runoff containing pesticides from cotton etc	Wastewater discharge containing dye, detergent, and other processing chemicals	Wastewater discharge from commercial operations, retail and factories	Wastewater containing fibres and detergent

Source: Ceres/Pacific Institute,[150] Responsible Research. Note: Hospitality and Beverage do not have very high water discharge impacts.

HOUSEHOLD WATER USE AND WASTE

Differences in urban and rural water use is evident

Household water usage varies across regions, and differences between urban and rural populations have emerged in China. A survey taken in 2007 of 14,000 young Chinese, for instance, shows that urban populations consume vastly more water than rural ones at 195 litres/capita/day versus 101 litres.[151] According to research by Beijing Normal University, populations in the North West and South West economic regions have significantly higher access to water resources than in other regions, while also consuming more water. Of the other regions where water is scarcer, only the Yellow River area consumes much less water per capita.[152]

Figures 3 and 4 shows the difference in water consumption habits in urban and rural households in China. In urban areas, people tend to use most water for bathing (32%) and washing clothes (15%); whereas in rural areas, people tend to use the most water to wash clothes (20%) and for cooking (20%) with much less being used for bathing (18%).

Figure 3: Breakdown of water consumption (urban households)

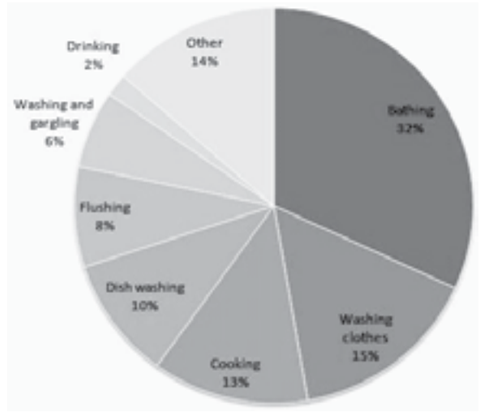
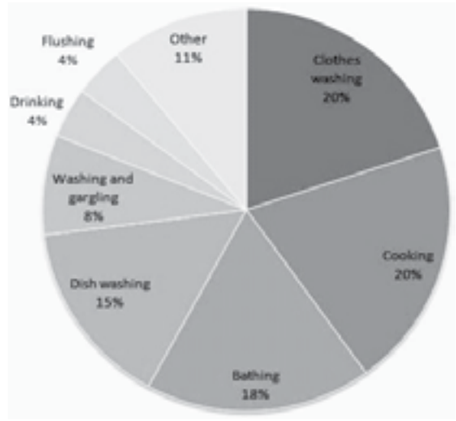


Figure 4: Breakdown of water consumption (rural households)



Source: Beijing Normal University, Responsible Research.

Household wastewater and pipe leakages complicate water management

Due to chronic under-investment in pipes and infrastructure it seems there could be vastly more domestic than industrial wastewater in China.[153] According to Vice Minister Qiu Baoxin, of the Housing and Urban-Rural Development Ministry, leaky pipes account for an estimated 10 billion m^3 of wasted tap water, a leakage rate of over 20% of the total drawn.[154] Promoting domestic wastewater and efficiency measures is, therefore, seen as a priority issue for the Chinese government. Heavy investments have recently been made in urban sewerage systems. By the end of 2007 there were over 1100 operational sewage treatment plants across the country, increasing the urban sewage treatment rate to 60%. Rural areas, which are less densely populated than urban areas, still require additional decentralised sewage treatment capacity to cover relatively highly populated area. Systems with low construction, maintenance, and ongoing operation costs are more likely to succeed in these areas.[155]

DRINKING AND BOTTLED WATER

Rivers and lakes are still commonly used as a direct source for drinking water in China even though over 70% of China's rivers and lakes are listed by the government as 'seriously degraded.' People have few alternatives for drinking treated water except in major urban areas.[156]

Access to treated water is improving but rural populations are still exposed to high levels of water-borne diseases from contaminated water

Despite billions spent, many Chinese still live without options for clean water access

Access to safe drinking water is improving. Over 75% of the population now has access to 'improved water' and 69% have water pumped into their homes. The number of Chinese still drinking untreated water stands at around 300 million, equivalent to the entire population of the U.S. There is a clear distinction between rural and urban areas, with more than 60% of rural populations having no access to treated tap water. Even piped water supplies generally provide an inefficient and unreliable supply, and maintenance and treatment of this supply tends to be poor.[157] Despite over US$2bn having been spent by the government on over 800,000 drinking-water projects in rural areas since 2000, a 2009 International Finance Corporation (IFC) report notes that many Chinese still live without options for accessing cleaner water.[158]

Compliance with new standards by 2012 'fundamentally impossible'

China's new national drinking water standards for urban and rural areas were introduced in 2007. They have become much more stringent, with the addition of over 70 more quality indicators, raising the total to 106.[159] The Chinese government intends to increase the potable water quality standards again by 1 July 2012 but reports suggest that these standards are unlikely to be achieved on schedule, due to lack of funding and technical difficulties in upgrading water treatment plants.[160]

The Vice-Head of the China Municipal Planning Research Academy, also the Chief-Secretary of the China Urban Water Supply Association, said that for the water supply in all cities to comply fully to the new standards before 2012 would be 'fundamentally impossible.' In his view, around half of all cities at county-level or higher have not yet achieved even 1985 water standards. In the western part of China, water-treatment plants for a number of small cities lack basic cleaning or supervision facilities, so water quality is fundamentally determined by the water sources themselves. In addition, the majority of China's water plants use standard, traditional technologies for the treatment of water, including 'coagulation, precipitation, filtering and sterilisation.' Although this is adequate for removing suspended particles, it is unsuitable for the treatment of microscopic organic pollution and disease-causing bacteria. Also, the age and deterioration of the pipes can cause 'secondary pollution', which affects the quality of water for end-users.[161]

The water market will see strong demand growth of 15% annually for the next 5-10 years

China is already the third-largest consumer of bottled water in the world, behind the United States and Mexico.[162] Bottled water now has a 40% share of the soft drink market in China with output rising 13.7% and 16.5% in 2006 and 2007, respectively.[163] 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 report estimates that the market will maintain around 15% growth for the next 5-10 years and forecasts that sales of drinking water would exceed 30 million m^3 in 2010.[164]

Consumers demanding healthier drinks including water

The market has developed rapidly due to understandable consumer demand for purity, hygiene, and convenience. The top four bottled water manufacturers in China are Wahaha (purified), C'estbon (purified), MasterKong (mineral) of Tingyi <322:HK>, and privately held Nongfu Spring (natural water). The latter two both achieved very high growth rates (over 50%) in both 2006 and 2007. Other emerging manufacturers such as Runtian and Maling have also achieved remarkable growth in recent years. All serve middle- to upper-income urban markets.[165]

Branded bottled water is normally sold regionally or nationally and success is dependent on reputation for quality, advertising, marketing and distribution. Bulk water sales (filling domestic water tanks and replenishing water 'fountains') on the other hand, are more locally driven. Success relies both on the quality of the product and containers but also on the level of customer service. Sales of bulk drinking water have sharply increased in recent years, rising to over 18 million m^3 in 2007 from 3.4 million m^3 in 1999. Bulk water makes up only around 20% of the market in value but just under half of the market by volume in 2008.[166]

Zenith International, a food and beverage consultancy, reports a continued positive outlook for the Chinese bottled water industry. The sector has grown rapidly and achieved high volumes on still very low overall market penetration. It is estimated that, in 2008, 78% of the value in the Chinese bottled water market was attributable to still water in retail size packs – almost 60% in sizes of one litre and below. Zenith highlights that the Chinese bottled water market is highly fragmented and still only three brands are sold nationwide.[167]

In 2008, Chinese consumption of bottled water increased by over 11% to an average of 15.5 litres per person. Zenith International expects that this trend will continue, as health-conscious young consumers drive volume growth, with bottled water consumption per person expected to reach 18 litres by 2010, equivalent to a total market volume of almost 24 billion litres. The two significant challenges to growth seem to be the regulation of water quality and legislation against unscrupulous operators. In all likelihood, until the quality of tap water is consistently reliable, Chinese consumers will continue to purchase bottled water as a replacement with preferences shaped by price and perceptions of purity (often nothing more than clever marketing).[168]

Regulation of water quality and legislation against operators may stifle growth but foster responsible practices

Quality control is a significant barrier to growth in the bottled water segment

According to recent media reports, the quality of bottled water may cause consumers to be less inclined to pay premium prices for the product. Some tests have even suggested that some water on the market may be completely untreated.[169] [170] The IFC reports, however, that the market for point-of-use (POU) filter systems is growing, despite a lack of regulation in this market.[171] On current estimates, POU devices are used in approximately 5% of households in China, almost exclusively in urban middle- and upper-income households.

Case Study: Rejection of Coca-Cola's US$2.3bn planned acquisition of Huiyuan Juice

The Chinese government in March 2009 rejected Coca-Cola's bid for Huiyuan Juice <1886:HK>. The deal was worth a reported HK$17.9bn (US$2.3bn), with Coca-Cola promising to committing an additional US$2bn. The planned acquisition was officially rejected on anti-competitive grounds. Huiyuan's significant market presence in small and medium-sized Chinese cities, as well as its healthier drinks, is attractive to potential foreign acquirers. However Huiyuan is already a large company in its own right and, deal closure, therefore, was always going to be difficult. It was felt that Coca-Cola was not substantially delivering any of the following required elements for such a significant transaction to occur: 'transfer of technology, management skills, access to foreign markets'.[176] The deal valued Huiyuan at over 46 times estimated 2009 earnings or over double the prospective PER of Shanghai-based food products company Uni-President China Holdings Ltd <220:HK> at the time the deal was announced in September 2008.[177]



Bottled water companies in China

Danone <DN:FP>, which recently agreed to end its troubled relationship with Hangzhou Wahaha, is still the leading international bottler despite the problems of this joint venture. Danone dominated the Chinese bottled water market through its joint venture with Hangzhou Wahaha. The company also has a stake in Shanghai-based bulk water supplier Aquarius and has additional water brands, 'Robust' and 'Health'.[172]

In 2007 the relationship between Wahaha and Danone soured when Danone accused the local company of trademark infringement by marketing beverages under the 'Wahaha' brand outside of the joint venture. Danone claimed to own the rights to the trademark. The three-year dispute has resulted in a series of lawsuits worldwide which, to date, have all found in Wahaha's favour.[173] At the end of September 2009 Danone agreed to sell its 51% stake, ending the tumultuous relationship.[174]

Nestlé <NESN:VX> markets leading international brands such as Vittel, Perrier, Pellegrino, Pure Life and Aquarel. However, due to the substantially higher prices for these brands, most of the contribution made in the country comes from key domestic brands. Other international bottled water brands such as Evian and Volvic have some penetration into the Chinese market, albeit in much smaller volumes.

Coca-Cola <KO:US> also has a share of the Chinese bottled water market, predominantly through its Ice Dew brand. PepsiCo <PEP:US> relies largely on volume sales of Atlantis in rural areas.

There are many small bottlers throughout China; two notable bottlers are Nongfu San Quan and Hong Kong-based AS Watson. Following these brands there are around another 1,500 local water brands that splinter the market further - around two-thirds of the Chinese market is accounted for by these mostly local brands.[175]

AGRICULTURE

It is generally agreed that it is vital to improve agricultural yield in China but that these improvements will require vast quantities of water. In order for water to be delivered sustainably to the agricultural sector, certain changes to policy, pricing and practices are necessary. Better choices of crops and seeds and greater investment in irrigation and new technologies will increase the efficiency of water for agricultural use. This should secure China's future supplies of rice, grains, vegetables and feedstock to fuel the huge growth in demand for water intensive meat proteins.[178]

As China develops, agriculture as a percentage of GDP has declined. In 2005 the figure was down to around 15% compared to almost 19% in 1996. The amount of land dedicated to agriculture, however, is increasing, from 10% in 1996 to 14% in 2005.[179] This figure is still less than 0.1 ha per person, only 40% of average global levels dedicated to agriculture.[180] [181] Despite these declines, even as late as 2006, almost 56% of China's working population is still active in agriculture, which is equivalent to over 250,000 farming households.

As groundwater declines in quality and quantity, the management and financing of agricultural irrigation systems becomes more challenging.[182] It is estimated that between 15% and 20% of farmland is regularly affected by drought[183] and that polluted waterways are causing billions of RMB in damages to agricultural yields.[184] In addition, there is a great regional disparity between location and demand for water for irrigation, as can be seen from Figure 5 below.

Figure 5: Regional differences in water and land availability

Chinese Region	Water Available	Arable Land	Population	GDP
South	81%	36%	54%	56%
North	19%	64%	46%	44%

Source: UNDP[185]

In recent years, industrial growth has been prioritised and water has been diverted to urban and industrial usage, exacerbating agricultural water shortages.

Water saving incentives are slowly being introduced to rural communities

Remarkably, although the rural water supply is tight, the average utilisation ratio of irrigation water in China is only around 45%[186], far below the world average of 70%.[187] It is estimated that if agricultural water were used more efficiently, the current supply would be sufficient to support irrigation.[188] Chinese officials have only recently begun to introduce new water management methods for rural communities in order to respond to this situation.

Since the late 1990s, policymakers have promoted surface water management reform, especially in the Yellow River basin. The reforms are supposed to gradually switch management of local irrigation systems from the village leader (local government) to private individuals (typically a prominent farmer from the village).[189] As part of this strategy, local Water User Associations were set up to manage individual projects under the Irrigation Districts with farmer elected managers. Private 'canal contracts' were also established to encourage investment efficiency in local canal systems; canal owners are then able to collect fees for services and usage.

Current pricing of water remains a major challenge to water conservation initiatives. Prices are almost always too low to cover operating costs of water treatment and distribution to irrigation channels. District offices need incentives to improve, maintain and monitor water delivery technology to reduce water use. Even when local initiatives are successful they rarely influence Irrigation Districts that are in charge of long-term planning and district-wide improvement. It has been suggested that prices

need to rise significantly to deliver water savings but this runs contrary to the stated government policy of lowering operating costs for farmers and encouraging greater food production.[190]

Innovations supporting water saving are slowly being introduced. Major agricultural areas still use flood irrigation, while the majority of recent water conservancy investment has gone into the restoration of large rivers rather than on irrigation and water conservancy in agriculture. When projects focused on water conservancy in irrigation have taken place, the long-term sustainability is jeopardised as there has been little consideration of ongoing management and maintenance.[191]

Excessive nutrients from fertilizer are a significant contributor to source water pollution

According to government statistics, China's nitrogenous fertilizer use has increased significantly over the past few years, vastly exceeding per unit of production usage by the United States and northern Europe. Much of this fertilizer is lost to the environment in gases or through run-off, without entering the soil system. As can be seen from recent algae bloom cases, this has a major impact on both air and water quality.[192] Some reports suggest that nitrogen use in agriculture could be cut by at least 30%, with no loss of crop production.[193] China needs to strike a balance in fertilizer use between increasing crop yields and causing long term environmental damage. A shift from high to low impact, ecologically sensitive agriculture is imperative if rural water systems are to survive and thrive.

Organic food in China: too many cooks?

Between 2000 and 2006, China rose from 45th to 2nd globally in terms of land under organic management, according to information provided by the Organic Food Development Centre of China.[195] In 2005 the China National Organic Product Standard (CNOPS) came into force to monitor the scope, standards, certification procedure, requirements for certification bodies, use of organic product certification seals, labelling and import of organic food products to China. All products sold in China as 'fully organic' and/or organic 'in conversion' must be in compliance with the CNOPS. According to this body, all certification bodies and inspectors have to be registered with the China National Auditor and Training Accreditation Board (CNAT) which is under the responsibility of the General Administration of Quality Supervision, Inspection and Quarantine of China (www.aqsiq.org.cn).

Large international supermarket chains, such as Carrefour <CA:FP>, heavily promote their organic produce, with posters tracing the vegetables' journey from farm to store.[196] The Chinese labelling standards are generally lower than those set by other international organic certification standards and consumers who are willing to pay the premium for Chinese certified organic food are often unaware of the differences.

This rapid embrace of organic farming in China serves to promote water saving techniques but also food safety, social and health benefits. There are substantial export opportunities for organic product processors, and the price premiums that organic products can bring could help stem the migration of rural workers to the cities. The Chinese Ministry of Agriculture website has a section on 'sustainable development of agriculture'. It states that one of the top priorities is to develop water efficient farming and protect agricultural environments through agronomic and biological measures. Efforts are apparently being been made to introduce water-saving farming practices to drier areas. Adoption of modern arid farming practices and water-saving techniques at over 500 arid farming test sites have proved they reduce agricultural water consumption and improve agricultural production and environmental management.[197]

Case Study: Organic fertilizer increases water holding capacity of soil

The NYSE AMEX-listed company China Green Agriculture Inc. <CGA:US> is one of the largest organic fertilizer producers in China. Operations are conducted through a wholly owned PRC subsidiary, Shaanxi TechTeam Jinong Humic Acid Product Co. Ltd., which produces and distributes humic acid liquid compound fertilizer throughout 27 provinces in China. The companys products are humic acid (HA) organic liquid compound fertilizers. Humic substances are naturally derived from weathered coal, found in "oxidation rims" along boundaries and fissures of coal. Humic products can help achieve sustainability and, through bioremediation, help reclaim polluted soil and water. Compounds can be sprayed onto plant foliage, sprayed directly on soil, or injected into irrigation systems. Manufacturers claim that the products both increase the water holding capacity of soil, help plants to resist drought, reduce fertilizer requirements and increase yields in most crops.

Case Study: Lake Tai algae blooms

An investigation by Greenpeace China (published in Chinadialogue[194]) conducted between March and November 2008 reveals that, despite the Ministry of Agriculture's year-long efforts to prevent algal bloom in the Lake Tai (Wuxi Province), Wu Liangsuhai Lake (Inner Mongolia) and Chao Lake (Anhui), water in these lakes is still not fit for human use by Chinese national standards. The Ministry spent RMB100m (US$14.7m) in 2007 focusing on encouraging ecological farming and recycling bio-waste. The pollution is largely the result of an increase in fertilizer usage in recent years, from 43.4 million tonnes in 2002 to 51.0 million tonnes in 2007, an increase of about two million tonnes every year.

Organic product certification seals used in China

	Chinese Organic Certification Bodies are also allowed to inspect and certify against their own private organic standards as long as certified products also adhere to the national regulation. The China Environment and Sustainable Development Reference and Research Centre (CESDRRC) is also a player due to its involvement in the promotion of organic farming. It is a sub-unit of the State Environmental Protection Administration (SEPA) and claims to be China's largest public-sector information centre dedicated to the environment and sustainable development.
	Other reports state that the Chinese Ministry of Agriculture itself also certifies 'organic' products through the China Green Food Development Centre (CGFDC: www.greenfood.org.cn). This label guarantees food that has reduced pesticides via oversight of production and residue testing and a relatively pollution-free growing environment. It's popular "Green Food" label, designates food produced with fewer chemicals. This label can be seen on many Chinese products such as fruit, noodles, tea, beer and also appears on genetically modified food.
	The 'Certified organic' label seen below is from the China Organic Food Certification Center (COFCC). No pesticides, fertilizers, growth regulators, fodder additives or genetically modified organisms allowed. www.ofcc.org.cn
	The Good Agricultural Practices (GAP) certification of China is based European GAP and, apparently has strict international compliance standards. GAP aims to control the "microbial harms when planting, harvesting, cleaning, placing, packing and conveying" products to consumers. GAP certification includes all the processes of the whole food chain from farm to table. In China, GAP Certification comes from the China Quality Certification Centre (CQC), which is administered by the CNCA.

BANKING

The materiality of water within banking sector practices comes not so much from its direct operations but in its loan and investment policies. These affect corporate activities across all sectors and along the entire value chain. Water scarcity and pollution also impacts on its loan book in terms of increases to financial risk in water intensive companies operating in China. Debt capital markets are relatively underdeveloped in China so businesses rely to an overwhelming extent on commercial loans for growth.

Chinese Banking Industry guidelines for Corporate Responsibility - little mention of water

The banking industry in China is just starting to review its responsibilities on various environmental, social and governance (ESG) criteria, and the China Banking Association (CBA, a Chinese industry association) has been proactive in issuing relevant guidelines for financial institutions in January 2009.[198] The Xinhua report covering the story suggested that the industry also donated more than RMB1bn (US$147m) to public welfare issues and environmental protection in 2008. It also highlighted the RMB200bn (US$29.4bn) of loans extended to earthquake-hit areas for relief and reconstruction.[199] There was no mention of specific recommended environmental policies or water shortage issues in the report, which focused almost exclusively on community investment.

The Equator Principles

This is a framework for banks to manage social and environmental risks in project finance transactions of US$10m or more. The 10 principles include banks having to conduct social and environmental assessments, appropriate consultation procedures for projects and for independent monitoring and reporting to be conducted prior to loan approvals on project financing. While the principles do not bind the banks to certain actions, they indicate the responsible course of action. For example, requirements for climate change issues are based on the International Financial Corporation (IFC's) Performance Standard 3 which states that projects releasing over 100,000 tons of CO2 equivalent[200] banks should ask the borrower to investigate opportunities to reduce greenhouse gas emissions, and require monitoring of emissions.

The new "Green Credit" policies will have an impact on banking operations

The proposed 'Green Credit Policy' is currently being integrated within the banking industry and may result in some water-specific policies (covering pollution and hydro-power in particular). Below we highlight the Industrial and Commercial Bank of China Ltd <1399:HK> and Industrial Bank Co Ltd (China) <<601166:CH> as banks which are integrating green credit policies.

Case Study: Industrial and Commercial Bank of China Ltd

We note that ICBC, one of the largest banks in the world with a FY2008 market cap of market value of almost US$175bn, seems to be moving ahead of its peer group in terms of an environmental overlay into its credit management system. ICBC was nominated as the third best State Owned Enterprise in terms of CSR and has won international awards for corporate governance. ICBC's sustainability reporting is improving each month and company management have already implemented a 'Green Lending Labelling' system, classifying all project loans under this standard. Projects that fail to meet requirements will not be able to receive loans. There are currently over 60,000 companies on the ICBC loan book and the bank claims 98.6% pass internal environmental guidelines with only 1% of loans outstanding covering projects that do not meet Green Lending policies. These are undergoing a review process by the bank, along with relevant government departments. ICBC is also lending aggressively into the new energy and Clean Tech sectors. As of June 2009, outstanding loans to green projects stood at RMB390bn (US$57.4bn).[201]

Case Study: Industrial Bank Co Ltd

Another bank to watch as a potential leader in water policies in lending is IBC, based in Fujian. The bank won the 2009 Green Banking Innovation Award for integrating social and environmental standards into its core business strategies. It also won a Financial Times Sustainable Banking Award in 2007 and was the first bank in China to adopt the Equator Principles.

As the first adopter of the principles in China, Industrial Bank has started to integrate sustainability issues into its strategy, and made some progress, such as the establishment of the "Environmental and Social Risk Management" policy. It has also supported a China-based Centre for Sustainable Finance. In addition, China Industrial Bank is a signatory of the Carbon Disclosure Project (CDP). We assume it will be a leader in the forthcoming CEO Water Mandate 'Water Reporting Initiative' in the coming months.

Other 'sustainability' initiatives

Many other Chinese banks are starting to release sustainability reports. The earliest were in 2007 with publications from China Construction Bank <939:HK>, Shanghai Pudong Development Bank <600000:CH> and China Merchants Bank Co Ltd <600036:CH>. The People's Bank of China (PBOC), the Central Bank, began collaborating with the State Environmental Protection Administration (now MEP) back in 2006, and has since urged other commercial banks to integrate environmental screening when lending money. The China Banking Regulatory Commission (CBRC) has provided guidance linking a company's energy efficiency and emissions to its credit standing. Industrial Bank Co Ltd (China) has successfully implemented these guidelines, resulting in the Financial Times awarding them a Sustainable Banking Award in 2007.

One area of interest for future study is to look at how banks can have an impact on preventing a water crisis in Asia, including the adoption of the Equator Principles and financing water projects with an ESG overlay. They could also develop more micro water-credit initiatives for rural water supply and help to fund water-ecosystem service markets such as clean water credits and loans to support water initiatives for arid areas. In addition, banks could also look into the water policies of their real estate portfolios.

Domestic environmental standards not followed in overseas hydropower projects

An unfortunate trend for Chinese banks seems to be the funding of large-scale hydropower plants in developing countries that do not comply with the same environmental standards as in their domestic projects. In countries such as Myanmar, Cambodia and the Sudan, Chinese banks have been welcomed as they generally have less burdensome environmental and social policies than Western banks.

Most of these countries are party to international environmental treaties such as the Convention on Biological Diversity and have enacted some environmental legislation but the breakdown of the rule of law tends to prevent destructive projects from being halted due to environmental concerns. Investors in Chinese banks could encourage management to extend the regulations that govern their domestic activities to overseas operations.[202] We strongly recommend global responsible investors to look at these issues pertaining to of overseas lending policies.

International Rivers, an NGO that focuses on biodiversity and environmental risks in hydropower, produced Ten Perspectives on How Financial Institutions Can Protect the Environment.[203] Mostly using source material from this report, we look at five country case studies involving Chinese financing of hydropower projects in Myanmar, Thailand, Cambodia, Laos, and Sudan.

Case Study: Hydropower projects in Myanmar accused by NGOs of forced relocation, labour and destruction of biodiversity

In Myanmar, Thai companies have partnered with Chinese banks to develop hydropower dams on the environmentally sensitive Salween River (Nujiang River). It is thought that close links between government agencies and Myanmar's military junta have facilitated the projects. The Chinese companies currently involved in the dams in Myanmar include Sinohydro, China Cezhouba Group Company, Yunnan Power Grid Corporation and Farsighted Group, a privately held group that is a signatory to the UN Global Compact. The largest Salween dam is expected to be the 7,100 MW Tasang Dam in Shan State. The China Gezhouba Group Company is jointly involved in financing the dam with MDX <MDX:TB> from Thailand. As a result of the dam building, as many as 300,000 people in the past decade are thought to have been relocated against their wishes. China Power Investment Corporation also plans to build several dams, many in Kachin State in Myanmar. The first of these, the 3,600 MW Myitsone Dam, could potentially displace an estimated 10,000 people and have a devastating impact on biodiversity in the area. As with the other Myanmar projects, there have been suspicions raised of bonded labour and forced portering activities by the construction companies with the assistance of the Myanmar military.

Case Study: Hydropower projects in Thailand causing social conflict

On the other side of the border, in Thailand, Sinohydro Corporation is developing the Hat Gyi dam in the Karen State where the rights of indigenous peoples are of paramount importance. The 1,200 MW Hat Gyi Dam resulted in over 43,000 newly displaced people from 2006-2007, many said to have been forcibly relocated. The dam is being constructed in an unstable region that has frequently seen active fighting between the Karen National Union (KNU) and the Burmese military due to the KNU's desire for independence. After a long period of stalled construction, following the suspected murder of two Thai employees, work started again in July 2009, despite opposition from environmental groups. Concerns over environmental and social impacts have prevented Western donors and multilateral development banks from supporting hydropower projects in SE Asia in the past. Progress in political and economic links with China have provided an alternative source of funding, with indications from the Beijing government that hydropower projects will continue to be supported. Approval for these projects has been conducted with little participation from communities or other stakeholders.

Case Study: Dam building in Cambodian National Park

The first large-scale dam in Cambodia, the Kamchay project, was financed with Chinese government aid, with China EXIM Bank providing the concessionary loan to Sinohydro. The dam is to be located in Bokor National Park and will flood over 20 square kilometres of protected forest that is home to 31 mammal species, including 10 endangered species, such as Asian elephants and tigers. The forest is currently also a significant source of revenue for local people and water quality and quantity has declined significantly since construction activities started. The China Southern Power Grid Company is also active in Cambodia with the Stung Cheay Areng Dam. This project intends to flood an important ecological area with protected forests and rivers where the rare Siamese Crocodile breeds.

Case Study: Laos water projects will potentially cause social conflict

MOUs have been signed in Laos with China International Water and Electric Corporation and China Exim Bank. There are allegations here, also, of forced resettlements taking place, resulting in local riots.

Case Study: Sudanese hydropower project could cause massive displacement

China International Water and Electric, China Exim Bank and China National Water Resources and Hydropower Engineering Corporation are involved in the construction of The Merowe Dam, one of the largest hydropower projects in Africa. It will possibly displace up to 50,000 people from the Nile Valley to less desirable locations in the Nubian Desert and cause disruption to fish breeding patterns and irrigation of fertile agricultural areas. There was apparently no formal little environmental impact assessment performed, although Sudanese law prohibits projects taking place without one.

BEVERAGES

The Chinese domestic beverage industry has been growing rapidly in recent years and there are now around 6,000 individual companies operating in the sector. The industry employs more than 200,000 people and has annual revenues of over RMB60bn (US$8.8bn).[204] The China International Beverage Industry Conference on Science & Technology 2009 (CBST2009) reports on its website that the Chinese beverage industry has not only been less affected by the global financial crisis, but the sector has begun to grow substantially because of the 'defensive nature of the F&B industry, the abundance of raw materials in China and the lower levels of market saturation.'[205]

Swire Pacific reported a total water consumption in 2007 of 5.15 million m3, based on its share holding in individual business divisions

As we have seen already, despite the increased Chinese appetite for bottled water, standards still vary greatly across regions and product lines and there is no one set standard for natural, mineral and distilled water. There is a greater focus on labelling, as well as indications of more stringent testing by regulators and consumers. There is also some initial interest in new forms of packaging, such as biodegradable, corn-based plastics.

Of course, bottled drinks are a major source of landfill and the price of recycling plastic and treating landfill is certainly not currently reflected in the cost of bottled water in China. In this report's Solutions section, we examine the issues of water bottle recycling and the high water impact of recycling itself.

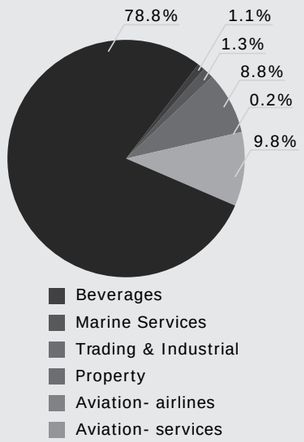
Case Study: Swire Beverages, a subsidiary of Swire Pacific Ltd

Swire Beverages <87:HK> is an example of a company that recognises that water is an increasingly precious resource in China and it takes its water responsibilities seriously. In 2007 they used around 6.3 billion litres of water, up 13% from 2005 but production grew 18% in the same period, showing their enhanced water efficiencies. Swire's WUR (water usage ratio: litres of water used per litre of beverage produced) dropped 4% from 2006 to 2007, saving 280 million litres in a single year (see table below). Five operating units showed improvements of over 10%. Its Hangzhou plant is classified as one of the best performing plants in the Coca Cola global system, with a WUR of 1.56 L/L. Swire Beverages has also started to minimise its water discharge and monitor the quality of its outputs. Some of their units supply their wastewater effluent to other uses such as cleaning and gardening.

Swire's explanation about the differences of water usage at different plants helps provide a context for investment professionals

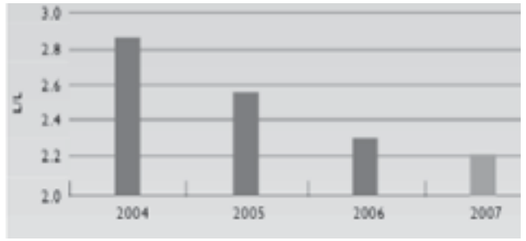
Management notes: "Hong Kong and Taiwan have higher usage ratios due to shorter product runs and a higher proportion of water-intensive products such as teas and juices. Swire Beverages' plant in Hangzhou, which has long production runs of carbonated product, has ... one of the best performances in the entire Coca-Cola production network worldwide."

Water used by division



Source: Swire Pacific

Figure 6: Swire Beverages' Water Usage Ratio (2004-2008)



Region	2008	2007	Change %
Hong Kong	2.69	2.86	5.9
Taiwan	2.85	2.93	2.7
USA	2.03	2.21	8.1
Mainland China	1.76	2.07	15.0
Average	1.95	2.23	12.6

Source: Swire Beverage Sustainability Report 2008.

Polluting bottlers identified and respond to pollution charges

In July 2009, the Beijing Development and Reform Commission released a list of major water-polluting and energy consuming companies in efforts to achieve the water pollution-reduction targets mapped out in its 11th five-year plan. The list included both foreign and local brewers, dairy companies and beverage producers, such as Coca-Cola <KO:US>, PepsiCo. <PEP:US>, Beijing Huiyuan Beverage, Beijing Together and Tsingtao Brewery Co Ltd <168:HK>.[206]

In their research, pollution is measured in terms of COD, chemical oxygen demand; a measure of the amount of oxygen required to breakdown the organic matter in a sample under very strong oxidising conditions. According to the research, the total COD in the beverage industrial wastewater is around 60,000 m^3 per year. Most of the larger beverage bottlers have sophisticated wastewater treatment facilities and advanced sewage treatment systems are widely used. In fact, when one reviews the waste water test reports provided by local environmental protection departments, the COD levels in the waste water of these four companies mentioned is much lower (ranging from 39 mg/L to 60 mg/L than the Beijing limit which is 100mg/L).[207]

Beijing is reportedly working with local authorities to persuade businesses to cooperate with China's environment targets to reduce per-unit GDP energy consumption, sulphur dioxide emissions and COD in water by the end of this year. It is still not clear how this will occur and which water strategy incentive or management tools the city will offer companies to help them to manage its corporate water use.[208] [209]

Following the publication of this list, both Coca-Cola and PepsiCo released statements querying their inclusion saying that their plants corresponded to strict company and national emission and waste water standards. The Chinese news agency, Xinhua, reported later that Beijing authorities backed down and verified that Coca-Cola and PepsiCo had already reached national standards for wastewater emission, although there was 'still room for improvement'. A spokesman with the Beijing Environmental Protection Bureau told Xinhua that any enterprise that discharges pollutants into the public water system, whether they reached standards or not, will be considered as a 'polluting factory'.[210]

Healthy beverages sector growing fast

Carbonated soft drinks are still the largest category in the soft drinks industry. Juices, canned tea drinks, sports drinks and dairy drinks, however, are set to be a key battleground as Chinese consumers seek healthier alternatives to sweetened, carbonated soft drinks. Michael Deng, management consultant AT Kearney predicts that ready-to-drink tea drinks will soon overtake carbonated drinks as the largest soft drinks category.[211] A number of Chinese companies have made inroads in the healthier drinks sector, most notably Wong Lo Kat, which makes herbal teas. Other local successes include Xiangpiaopiao from Zhejiang province, which makes instant milk tea and generates more than RMB1bn (US$147m) sales.[212] The juice and tea markets are large users of treated water and therefore water demand is set to grow still further surrounding these plants.

Case Study: PepsiCo investing in agriculture

In addition to expanding its manufacturing facilities, PepsiCo is increasing investments in agriculture in China. As a large buyer of agricultural commodities such as corn, oats, oranges and potatoes, PepsiCo is working with local farmers to secure stable supplies of high-quality raw materials. The U.S.-based company also is helping farmers adopt advanced agricultural technologies and increase their incomes. Indra K. Nooyi, PepsiCo CEO, announced a four-year, US$1bn investment plan for China during her previous visit to the country last November. Agriculture projects will focus on high-quality, environmentally sustainable operations, with water-saving irrigation and scientific crop-rotation methods, and also on increasing the technological skills and income levels of participating farmers, the company said. The food sector has become an important profit engine for PepsiCo, since the snacks sector makes up over 60% of the company's revenues. In China, food accounts for nearly 20% of PepsiCo's business, and is the fastest-growing market for PepsiCo's food globally. PepsiCo opened a new plant on June 26 2009 in Chongqing, a municipality in south-western China. The Chongqing facility is PepsiCo's first "green" plant outside the USA. It was designed to use 22% less water and 23% less energy than the average PepsiCo plants in China.[213]

Case Study: Coca-Cola Co admits to long-term threat to its future

In 2007 the Coca-Cola Co. CEO admitted that falling water resources threatened its future. Coke which, along with its bottlers, used 290 billion litres of water for beverage production globally in 2006, said more than half was dedicated to processes such as rinsing, cleaning, heating and cooling, rather than going into the drinks themselves. The company said it would put more effort into recycling the water it uses in manufacturing and spend US$20m protecting seven major global watersheds around the world with the World Wildlife Fund. The joint statement by WWF and Coca-Cola said that drought, rising populations and overuse by industry and agriculture means that by 2025 two-thirds of the world could face a serious lack of water. Coke has, itself, been accused of overly impacting the water table in the southern Indian state of Kerala. The plant in question was shut down, and Coke became a community pariah.
The company has already made some improvements, and by 2008 the figures suggest it uses slightly more than 2.5 litres of water to make one litre of Coke, compared with over 3 litres five years ago.

BASIC MATERIALS AND CONSTRUCTION

China's development is seen in the robust growth of its basic materials sector. Its cement production, for example, has grown 10% annually over the last five years. The sector poses huge challenges for environmental management. China is by far the world's largest cement producer: China's 1.4 billion tonnes of cement production in 2008 accounts for about half the world's cement production, dwarfing India, coming in second place with just 200 million tonnes.[214] In terms of users, with 5.8 million m3 total volume of dam concrete, Sinohydro's Longtan Hydropower Station on the Hongshuihe River in Guangxi is a world record holder. Water is, of course, a key ingredient in cement and concrete production, which require a reliable water supply, ideally located to near a construction site. The building materials industry, therefore, has a very highly localised impact on water resource management and performance.

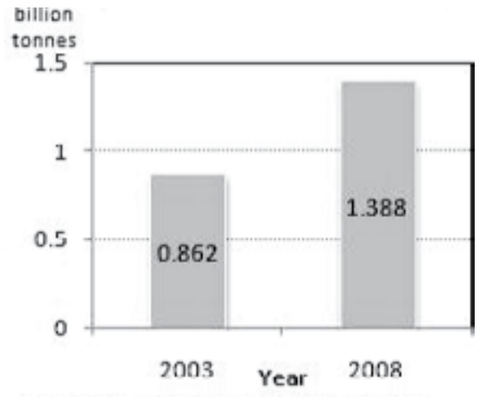
As disclosure in this section is quite poor, we analyse the industry's water use and management through a review of the US$768m initial public offering of BBMG Corporation <2009.HK>, the largest building materials supplier to the 2008 Olympic Games construction projects.

Lack of due diligence at IPO on water performance: BBMG Corporation

BBMG listed on the Hong Kong Stock Exchange in July 2009. Its main competitors include China National Building Material Co Ltd. <3323.HK>, China Sinoma International Engineering <600970.CH> and Tianjin Building Materials and Shandong Shanshui Cement Group Ltd. We reviewed the listing documents and spoke with responsible investors to gain insight into its water policies and risks to earnings from potential disruption of the water supply. Any shortage of water could impact the company's reputation, relationships and cash flow as building materials manufacturers rely on an uninterrupted supply of water.

BBMG does not disclose its water sources and does not report on the impact of water scarcity issues. Water is a highly localised and scarce resource and some investors felt, therefore, that management should clearly disclose whether existing plants are located in water-stressed areas as part of the pre-IPO due diligence. Investors also felt that the company's past and current water consumption and discharge figures should be made public.

The company is located in the water-stressed Beijing, Tianjin and Hebei areas so water management and performance should be high on the corporate agenda. Yet there is no indication how the company plans to secure long-term water supplies. More robust scenario planning and mapping of water resources could minimise future risks to earnings and allow for easier mitigation and adaption to scarce water.The management of BBMG does, however, note that volatility in energy and fuel costs will have an adverse impact on business and financial performance. Likewise, BBMG specifically mentions that the 'insurance coverage does not extend to damage resulting from interruption of our power supply'. The company should probably take the prudent step and highlight lack of insurance coverage for interruption of water supply as well.



China's cement production has grown 10% annually for the past five years

Source: National Bureau of Statistics of China

BBMG is no laggard on environmental systems
Most of BBMG's manufacturing subsidiaries have received ISO 14001 certifications. Other accomplishments include recognition as a 'China Model Base' and a 'China Production (Procurement) Base for Green Quality Building Products' by the Green Building Decoration Industry. In addition, the Beijing Building Materials Association awarded some of its products certificates for 'green' and 'water-saving' building materials. The 'Beijing Energy Saving & Environmental Protection Centre', a BBMG project, is currently under LEED certification review.[215] Several of the company's subsidiaries have enjoyed tax benefits to date on the basis of its green credentials.

BMG identifies several environmental protection laws and regulations that have a potential impact on company earnings:

1. Production Safety Law of the People's Republic of China (PRC)
2. The Environmental Protection Law of the PRC
3. The Law of the PRC on the Prevention and Control of Atmospheric Pollution
4. The Law of the PRC on the Prevention and Control of Water Pollution
5. The Law of the PRC on the Prevention and Control of Environmental Pollution by Solid Waste

Company management does not include, however, the Environmental Information Disclosure guidelines, launched in 2008, which mandate the disclosure of environmental performance by enterprises (covered here in the section on Regulatory Risk). We consider that this omission indicates that management is either not certain how to implement this particular legislation or does not consider it to be a principal legal environmental protection provision. Regardless, we expect this law, combined with the Environmental Impact Assessments, to compel management to consult the public on a more regular basis that will, of course, mean additional costs to the company and, also additional risks for non-compliance.[216]

We would recommend management clarify their strakeholder engagement strategy:

- Assessing water use and discharge in direct operations
- Engaging limestone and other raw materials suppliers to manage watershed issues
- Promoting and raising awareness on water resource management within China's basic materials industry
- Engaging public officials on watershed management issues and eco-market mechanisms such as water demand management through water pricing adjustments
- Partnering with community leaders to secure it social 'license to operate'
- Aligning water performance and other environmental information disclosure with global industry standards so that investors, customers and the public can make more informed decisions.

HOSPITALITY

According to the latest statistics released by the Chinese Ministry of Industry and Information Technology, in the first half of 2009, China's hospitality industry showed a year-on-year growth of more than 18% with total sales of over RMB850bn (US$125bn), despite the impact of the global financial crisis.[217] Another article, however, reports a year on year decline in the industry of over 5% and an average occupancy rate of only 30% in high star-graded hotels in first tier cities.[218] The MICE (Meeting Incentive Convention Event) business certainly suffered big losses in 2008-9 with business travellers staying at home or opting for more economical accommodation or video conferiencing.

According to statistics from Jones Lang LaSalle Hotels, in the last four years, the supply of five-star hotels in the top 5 hotel markets (Sanya, Beijing, Shanghai, Lijiang and Tianjin) has increased by 15% whilst demand has only grown by 10%.[219] [220] For example, and anecdotally, the five-star Beijing Westin Hotel, which accommodated President Bush during the Olympic Games, was experiencing occupancy rates of only 40-50% in October 2009. In addition, many luxury hotels in Shanghai saw their booking rates drop to as low as 10% from the start of 2009.[221]

Chinese hotels to be ranked on the newly released National Green Hotel Standard
In 2009 it was announced that, in addition to the five-star system based on the National Hotel Rating System which mirrors international hotel ratings, hotels in China will now be ranked on the newly released National Green Hotel Standard, using one to five ginkgo leaves to rate green hotels. Based on the new standard, a green hotel should maximise resource efficiency, minimise its impact on environment, and ensure safety and health services. The rating matrix includes green design, environmental policy, green consumption, green action, clean production and hazardous waste treatment.[222]

A national level Appraisal Department will review five-leaf 'green hotels', and hotels designated with a four-leaf rating or fewer will be accredited by provincial-level departments. The China Hotel Association explained that a national green hotel 'working commission' has been established which includes the Ministry of Commerce, the National Development and Reform Commission, the Ministry of Environmental Protection, the State-owned Assets Supervision, the Administration Commission of the State Council, the National Standards Commission and the China Hotel Association.

10,000 new green hotels by 2012
Di Jiankai, the director of the Trade Service Division of China's Ministry of Commerce, announced in May 2009 that China intends to build 10,000 'green hotels' by 2012. Compared to mainstream hotels in China, these green versions are expected to have 20% lower water consumption, 20% lower electricity consumption and to cut carbon dioxide emissions by 45,000 tonnes over four years. [223] It remains unclear whether EIAs are to be performed for the proposed 10,000 new hotels. An editor from Green Lodging News, Glenn Hasek, points out that it is good news that the government is focusing on implementing green building regulations but wonders whether China needs so many new hotels in the next four years when existing ones are suffering from low occupancy.[224]

Kevin Mo, the Senior Sustainable Building Specialist for the Natural Resources Defense Council (NRDC), a U.S. based NGO that has operated in China for over 12 years, has blogged about the green hotels plan and provided some background on the Chinese hotel industry. He points out that China opened less than 400 new hotels annually over the past three years (even though they hosted the Olympics) and the country currently has around 15,000 star-rated hotels.[225] Mo warns that given the existing stock and market conditions, the goal of building 10,000 green hotels in four years seems like a push to promote the newly released 'green hotel standard' rather than a response to a real shortfall in supply of rooms. Since many local governments like to build good quality hotels to attract investors, the 10,000-green-hotel campaign could give them support to build hotels that will lie empty. Mo would rather see

Concern mounts as the push to promote the newly released 'green hotel standard' may backfire, with existing stock outpacing demand

at least part of the investment go towards retrofitting existing hotels to the green standard. In addition, Mo remarks that it is uncertain how the well-established five-star rating system will integrate with the new five-leaf green rating system.[226]

'Green Hotel' energy savings goals vs. green building standard goals?
It seems unclear whether the Ministry of Housing and Urban-Development (MOHURD, formerly Ministry of Construction) was involved in the drafting of the green hotel standards. MOHURD is in charge of the construction industry and recently issued the 'Building Energy Efficiency Standard' and the 'Green Building Standard' for commercial and residential buildings, which should also cover hotels. Instead, the 'green hotel standard' appears to be written without the involvement of MOHURD. Therefore, it remains unclear how the 20% energy green hotel savings goal would be benchmarked to the MOHURD's green building standard.[227] Hotels that want to be listed as 'green' reportedly need to change their policies on 'six small items': toothbrushes, toothpaste, slippers, combs and small bottles of shampoo and shower gel. Many green hotels and economy hotels have already stopped changing bedding daily, and are starting to wash and change bedding according to guests' requirements.[228]

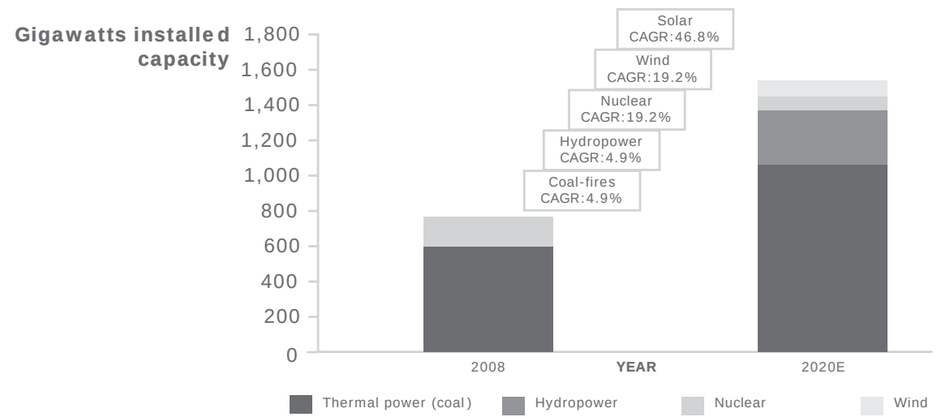
HYDROELECTRIC POWER

China's hydropower industry is regulated by a large and confusing array of ministries, departments and agencies. The Ministry of Water Resources (MWR) and the National Development and Reform Commission (NDRC) are involved in the construction and administration of hydropower plants. MWR is in charge of the program planning and site selection, while the NDRC is responsible for the proposal, bidding and making general industrial policies. The Ministry of Environmental Protection provides overall project supervision. There is also another department called the State Flood Control and Drought Relief Headquarters that influences the planning and operation of large hydropower stations. On a local level, the local NDRC and Bureau of Water Resources are responsible.

Successful bidders for hydropower projects are often eligible for preferential rate loans from China Development Bank. Due to these low borrowing costs and seemingly preferential offtake agreements, the sector has looked attractive to some. China Yangtze Power Co. <600900:CH>, for example, a near pure play in China's hydropower sector, posted Q2 2009 operating margins of 62% and a return on equity of about 12%. However, dam construction involves huge up front capital expenditures and, with water shortages looming, the 'feedstock' supply cannot always be guaranteed for the life of the project. This situation has tended to hurt rather than deteriorate the risk profile of these large-scale power plants.[229] [230]

Government aims for 300GW hydropower capacity by 2020
By 2020 China aims to have 20% of total electrical capacity supplied by renewable sources. The National Energy Administration is targeting installed hydropower capacity at 300GW by 2020, implying a 4.9% compound annual growth rate (CAGR) from the 2008 level (See Figure 7). The sector is currently made up of around two-thirds large hydropower projects and one-third small hydro projects (25MW or less per year). To reach the capacity target China will need to invest an additional US$130bn in large projects and US$40bn on smaller plants.[231] The State Council is expected to approve these revised energy targets later this year.

Figure 7: China's electricity installed capacity by fuel source (2006 and 2020E)



Source: National Energy Administration, Energy Research Institute, China Electricity Council,[232] Responsible Research.
Estimates for total installed capacity range from 1,400-1,500GW by 2020 so our figures use a midpoint of 1,450GW.

Large hydro projects will, in general, continue to be government backed due to the high capital requirements (the Three Gorges Dam Project, for example, cost US$24bn) and the need for legal authority to displace whole communities.[233] In contrast, small hydro projects often provide rural communities with much-needed electricity and can be funded by private companies and their bankers. Tax incentives and favourable bank loans are offered to attract private capital to the small-scale hydropower sector

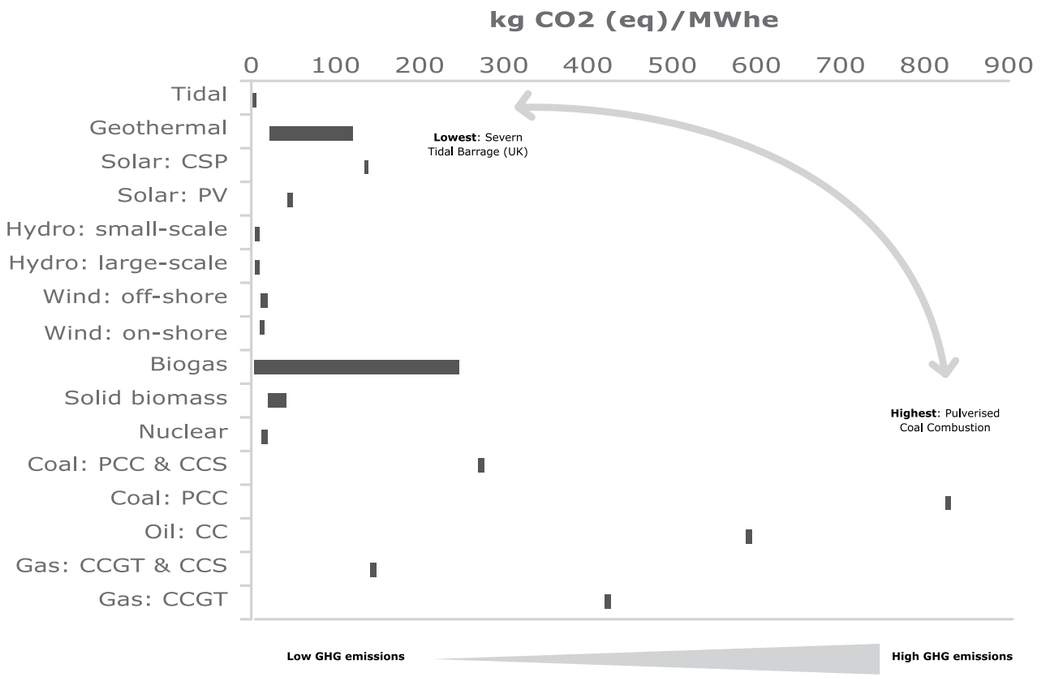
in China. Investors looking to participate have been encouraged to partner with the International Finance Corporation (IFC), a member of The World Bank Group, which is actively promoting small hydro to bring electricity to rural China. IFC is experimenting in this field by offering financial assistance to Zhongda Sanchuan Hydropower Development Co. Ltd (Zhongda Hydro), investing up to US$10m equity in Zhongda Yunshui Clean Energy Holding Co. (Yunshui Energy). Yunshi Energy is an off-balance sheet holding company for the hydropower assets of Zhongda Hydro and will invest in seven new hydropower stations (with a combined capacity of almost 180MW in the pipeline).[234]

Hydropower: lower cost power with lower emissions?

Hydropower is a complex issue for responsible investors. When compared with electricity from hydrocarbons (petroleum, natural gas and coal), hydropower avoids large amounts of greenhouse gas (GHG) emissions by relying on a renewable fuel source: water. Trucost estimated an avoidance of 3,200mt of GHG by global hydropower in 2006. International Rivers, an NGO focused on the conservation of rivers, reports, however, that the assumed carbon emission reduction may not be as large as claimed by dam proponents due to the indirect emissions involved.[235]

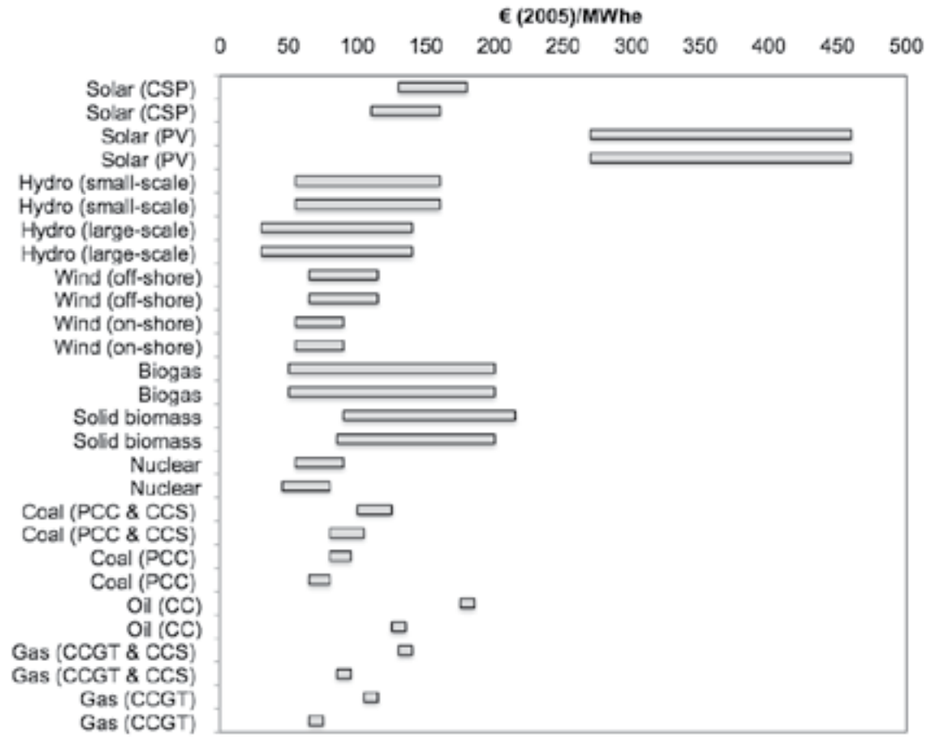
Figure 8 clearly illustrates the attraction for China of hydropower projects - they appear to emit only about 6 kgCO2e/MWh, the second lowest level behind tidal barrages. Coal fired stations emit between 275 and 825 kgCO2e/MWh. Hydropower does also seem to be cost competitive, as a recent European Commission report demonstrates. (See Figure 9 next page.)

Figure 8: Lifecycle greenhouse gas emissions of power generating technologies



Source: European Commission,[236] UK Sustainable Development Commission (Tidal figure),[237] Responsible Research. Abbreviations are CCGT: Combined Cycle Gas Turbine; CCS: Carbon Capture and Storage; CC: Combined Cycle; PCC: Pulverised Coal Combustion; CSP: Concentrating Solar Power. Nuclear is the only technology that includes decommissioning and waste management cost.

Figure 9: Cost of electricity by power generation technology (2020 estimates)



Source: European Commission,[238] Responsible Research. NB: The EC models two fuel price scenarios: moderate (US61_{2005}$ bbl in 2020) and high (US100_{2005}$ bbl in 2020), meaning, for instance, that the moderate scenario has the price of a barrel of oil at US$61 normalised at 2005 price level. The top bar for each technology assumes the moderate fuel price scenario and the bottom bar assumes the high fuel price scenario. The carbon price was fixed at €41/tCO2 for this exercise.

Environmental and social risks include loss of biodiversity and community displacement

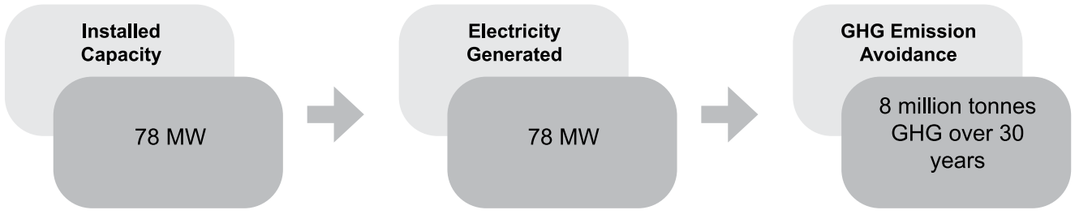
Hydropower is the ultimate 'double-edged sword' for investors. Alongside emissions reductions there are significant energy intensity, social and governance issues to consider when reviewing hydropower projects from an ESG perspective. Even at smaller sizes, dams affect river ecosystems and deliver risks to local, up- and downstream biodiversity. The breeding patterns of a variety of animals, fish and birds can be affected by the disappearance of marshland and riverbanks.

Regarding dam construction, there is a lengthy history of poor consultation, with frequent instances of forced resettlement and insufficient compensation. The social impact of large-scale hydropower projects can be quite devastating, displacing hundreds of thousands of people every year in Asia. China Yangtze Power Co Ltd, which operates The Three Gorges Dam, has experienced intense reputational risks due to the displacement of over 1 million people. The project will continue to cause social upheaval; by 2020 an additional 4 million people in the upstream city of Chongqing are expected to be relocated. Commenting on China's gradual shift away from coal-producing power plants towards population-displacing large hydro projects, Jonathan Sinton, China program manager at the International Energy Agency says, 'There are no ideal choices,' it is 'a no-win situation'.[239]

No winners, perhaps, but one potential solution may be to promote small hydropower projects (generating capacity of up to 10MW) with preferential loans or invest in manufacturers that make components for these smaller projects.[240] There are also smaller categories of plant that could be funded for rural locations: mini hydropower projects which generate up to 1MW;and micro hydropower projects generating up to 100KW. The ecological and social footprint of these small hydropower projects is far less damaging.

Figure 10 illustrates the GHG emissions reductions that can be achieved from small hydropower projects, in this case totalling 78MW capacity. IFC studies show that these plants will collectively avoid about 8 million tonnes of GHG emissions over 30 years. As of the end of 2008, the global small hydropower market had an installed capacity of 85GW. While China's strategic focus appears to be on mega hydropower projects, China is also the global market leader in small hydro, adding 4-6 GW each year from 2004-2008.[241]

Figure 10: Zhongda's Small Hydropower Projects in Yunnan, China



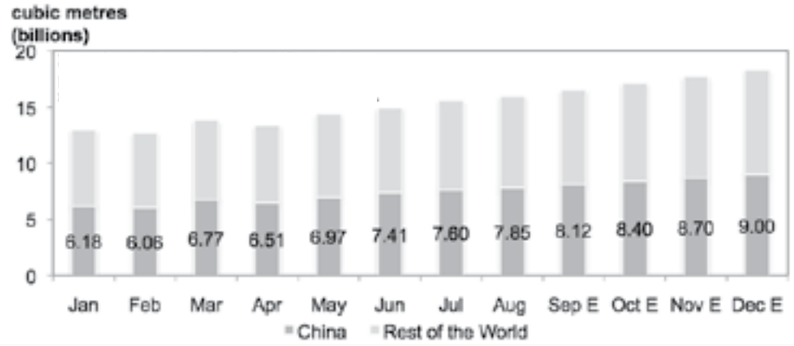
Source: IFC, Responsible Research.

METALS AND MINING

Steel

China, the global leader in steel production now produces almost half the world's steel. The World Steel Association reports that China's steel production increased 27% year-to-date to over 52.3 million metric tonnes in August 2009, the highest monthly figure ever. Figure 11 shows the amount of water needed for forecast steel production. Veolia Water estimates that the processing of 1 metric ton of crude steel requires up to 150 m^3 of water.[242] Using this metric, China's steel industry needs access to about 90 billion m^3 of water in 2009 to meet its contribution to global demand. We have reviewed international best practices that show up to 95% of the water used in steel production can be recovered and re-circulated, with sophisticated water treatment processes.

Figure 11: Amount of water needed for steel production (2009), China vs. ROW



In the first eight months of 2009, China's steel production increased 3.5% per month to a record 52.3 million tonnes in August 2009.

Source: World Steel Association, Responsible Research estimates. Based on estimates of 150 m^3 of water per 1 metric tonne of steel produced, according to Veolia Water. September and October figures had not been reported at time of writing.

In August 2009 China's Ministry of Industry and Information Technology (MIIT) announced a three-year moratorium on approvals for expansion in the iron and steel industry as concerns of overcapacity grew. The MIIT is also expected to release sector guidelines on energy conservation and emissions reductions as well as direction on industry consolidation plans.[243] It is not expected that the moratorium and new guidelines will have an immediate impact on the industry's water use and discharge, as the moratorium does not cover projects already under construction, which total 58 million metric tonnes capacity.

Mining

The Chinese mining industry has substantial hurdles to overcome in terms of sustainability. Regulators, owners, lenders and management must to begin to consider the entire life cycle of a mine including post-closure water management plans. The International Council on Mining and Metals (ICMM), a CEO-led industry group, has a toolkit which shares good business practices[244] covering the entire mine life cycle. Managers who consider financial issuses and assurance on mine closings demonstrate a responsible approach to doing business. Mine decommissioning without a post-closure water management plan can entail unforeseen closure costs, such as water pollution liabilities. The ICMM toolkit advises mine owners to 'continue surface and groundwater quality monitoring for 5 years, including 'void-water quality and levels' as one of its post-closure activities.

International metals and mining companies operating in China have begun collaborating on industry improvements to environmental and water performance. Representing the international metals and mining community in China, the China International Mining Group promotes sustainable investment and best business practice in the sector by working with a number of Chinese partners including the National Development and Reform Commission, the China Coal Information Institute Ministry of Environmental Protection, the Ministry of Land and Resources, the Ministry of Commerce, the National Institute for Occupational Safety and a number of Chinese industry associations.

Case Study: Anglo American demonstrates good water practices in metals and mining

Anglo American <AAL:LN> has long been considered a sustainable leader in an industry where reputational risk is well documented. According to the Pacific Institute,[245] it is because it has been one of the global operators who have been forced to deal with serious community and environmental impacts for years in order to establish a 'social license to operate.' In South Africa, in order to secure smooth operations, Anglo American has funded a US$33.3m water pipeline project. The company has now developed a Socio-Economic Assessment Toolbox that is focused on project level risk management. This identifies a range of water-related issues, including health risks from ground or surface water contamination, water extraction permits, water contamination (ground, surface and marine), water supply and treatment infrastructure and managing water shortages.[246]

Case Study: Baoshan Iron and Steel discloses erratic environmental data indicating new measuring techniques

The sustainability report of Baoshan Iron & Steel Ltd. <600019:CH> provides a glimpse into their sustainability performance measures. Baoshan reports that, in 2007 it required 5.1m tonnes to produce 1 tonne of steel which was a 15.2% reduction over the previous year. Its COD emissions per ton, a measure of water discharge pollution, are difficult to interpret. From 2000-2004, emissions averaged 0.04 kg per tonne, then jumped 84% to 0.25 in 2005 and have subsequently declined 70% to 0.076 in 2007.[247] The data's erratic behaviour may signal that new, more accurate, measurement techniques are being employed. Our general assessment is that metals and mining companies worldwide are struggling with how best to assess corporate water performance and report to stakeholders.

Case Study: Zinc factory dumps heavy metals in the Xiang River

In 2009, a severe case of cadmium toxicity in the water supply in a village in Hunan province was reported as being related to the production of zinc in the nearby factory. More than 1,100 villagers had high levels of the metal in their blood and 200 had severely excessive levels. Due to the cadmium pollution, farmland in the area surrounding the affected village is now largely deserted and local farmers have to buy food from outside. Expensive drinking water is brought in from over 10km away. In the local industrial area where there are large scale zinc and lead production facilities, very high levels of cadmium, mercury and zinc have been found in vegetables, up to 186 times the national safety standards. There has been recent progress on policy development in this region. In 2008 an environmental pollution liability insurance program was implemented and then, in April 2009, Hunan's governor initiated some pilot environmental policy reforms. The local Environmental Protection Bureau (EPB) listed 18 enterprises from heavily polluting sectors such as chemicals, nonferrous metals, iron and steel, for this pilot program.[248]

Misallocation of tax revenue causing lack of local funding and accountability

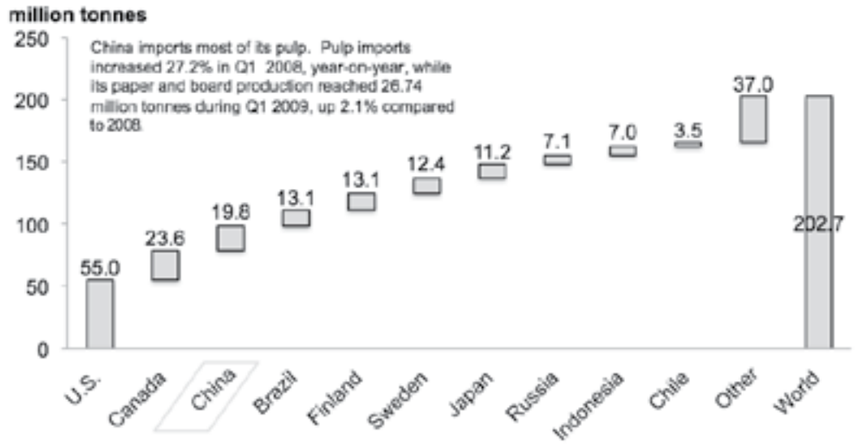
In June 2009 the local EPB was upgraded to a 'Department' and given more responsibilities to coordinate heavy metal pollution control on the Xiang River. There has been some concern regarding lack of funding to meet the increased expectations. Part of the problem seems to be allocation of tax revenue from the polluting industries, which mostly goes to central government coffers, whilst the local EPD receives little in contributions. There are now indications of support from central agencies, however, and the existing 5 Year Plan allocates almost US$15m to heavy metal control research projects on the Xiang River. The MEP has also proposed to add the Xiang River to its priority list of rivers and for the Central Government to invest RMB70bn (US$10.3m) by 2010 on the clean up.[249]

The Xiang River supplies water to 20 million people and is one of the worst polluted sources in China due to the metals, mining and smelting industries in the area. There are widely reported incidents of lead and mercury toxicity in this area and the Chief of the Technology Division of Hunan's Environmental Protection Department (EPD) has been quoted as saying that the levels of heavy metals exceed national standards by several hundred times. Dredging has been offered as a solution, but this is likely to only stir up dangerous levels of heavy metals. The pollution issues in this area are widely known and the mayors of 8 local cities have committed to support the Hunan Governor in his efforts to clean up the river. Factories are gradually upgrading to new technology and introducing environmental protection measures but there are many mines without wastewater treatment facilities still operating along the Xiang River.

PAPER AND FOREST PRODUCTS

China is one of the world's largest producers of paper and forest products, having emerged as a global competitor to the traditional powerhouses (U.S., Finland, Sweden, and Japan). Its pulp production, for example, now ranks 3rd with almost 20 billion tonnes in 2007, as Figure 12 indicates. The industry as a whole appears to be rebounding after a lacklustre 2008. Paper and board production in China surpassed 26 million tonnes in Q1 2009, growing over 2% year-on-year.[250]

Figure 12: Pulp production by country (2007)



Source: Pulp and Paper Industry Strategy Group's Issues Paper adapted from Industry Edge 2008 Pulp and Paper Strategic Review,[251] Responsible Research.

There is a huge and growing demand for timber in China and, as a result of over-logging, there has been a devastating loss of biodiversity and first growth forests. Investors should consider the impacts of deforestation, desertification and monoculture tree plantations when reviewing forestry and water in China. Plantation monoculture is notoriously poor for creating sustainable environments and is also prone to devastating infestation and insect attacks. Paper manufacturing itself is also a large user of water in some areas and can contribute to toxicity in water ecosystems if wastewater is not treated to extract the bleaches. Timber processing and MDF production uses large quantities of aldehydes that can cause health problems. [252] Wastewater discharge typically has high concentrations of cleaning and bleaching chemicals, inks and oils.

One of the most water intensive and polluting industries in China

Pulp and paper mills use between 75-225 m^3 of freshwater per tonne of paper manufactured.[253] This does not include the cooling water used in their power plants. Hence, the 4.2MT capacity of Lee & Man Paper Manufacturing <2314:HK>, a leading containerboard manufacturer, would require at least 840 million m^3 of water per year.[254]

Strategy of aggressively closing old, heavily polluting mills is having a positive environmental impact

The Department of Science and Technology Standards, MEP, has reported that 'the industry's waste water discharge accounts for 10-12% of China's total waste water discharge, ranking top among all industries. What's more, COD discharge in the industry accounts for' up to 50% of the total in China.[255] Yet as new large-scale, highly efficient mills replace older, highly polluting ones, environmental performance should improve.

Zhao Wei, Secretary-General of the China Paper Association notes that of China's almost 3500 paper mills in 2008, the number of small mills was around 3100 while the number of the medium and larger scale mills is around 400. These larger mills account for 80% of the total production, but contribute less than one third of pollutant discharge in the industry.[256]Although the China Paper Association does not have any water-related initiatives, industry and government officials stress that they are aggressively shutting down old, polluting mills. Progress is evident: The 11th Five-Year Plan (2006-2010) mandated that 6.5 million tonnes of capacity be closed. In May 2009 media reports indicate that that the goal now is to close an additional 7.5 million tonnes by 2011. The actual figure could be as high as 10 million tonnes.[257]

In terms of recycling of wastewater, a 2009 Centre for Paper Business and Industry survey indicates that, even in developed countries, recycling is not yet standard. Only about 60% of pulp and paper mills in the state of Georgia, USA, recycle water in their operations.[258] Data on water recycling in China's paper and forest products industry is limited, but would be well below the U.S. example.

New wastewater pollution standards announced (May 2009)

New Discharge Standards for Water Pollutants were announced in 2009. They attempt to restrict COD discharge from both new and old mills. Even tighter standards will be introduced by July 2011.[259] Interestingly, mill and government officials who are faced with calls for mill closure will be expected to engage with two groups: community members opposed to the closure because of employment reasons (the mills are normally the largest local employers) and community members in favour of closure because of environmental and health reasons. Whether local mill and government officials have developed conflict resolution and stakeholder engagement plans is doubtful.

Deforestation in the North West and water intensive plantations in the South West

In much of Heilongjiang province, near the Siberian border, just 50 years ago the forests were vast and thick. Now, despite the introduction of the 1998 ban on logging, the area has very little mature timber left to cut and soil erosion has led to sandstorms and floods.

The demand for paper products has, of course, also contributed to the shortage of wood. In 2000 China introduced a 'Fast-growing and High-yielding Timber Plantations Program' with tax breaks and other incentives aimed at plantation growth in the South Western provinces. The programme aims to plant 44 million hectares by 2012 through PPPs. These plantations, particularly the eucalyptus, are extremely water intensive and will continue to contribute to worsening drought conditions in the southwest.

The Globalisation of the Timber Trade

Several international pulp and paper companies have been set up to take advantage of China as a new source of plantation timber, for example Stora Enso <STEAV:FH> which has leased over 90,000 ha in Guangxi to plant eucalyptus. The controversial Asia Pulp and Paper (with Jakarta listings of Indah Kiat Pulp & Paper <INKP:IJ> and Pabrik Kertas Tjiwi Kimia <TKIM:IJ>) is a subsidiary of the Sinar Mas Group <SMMA:IJ>. It has stakes in many pulp and paper companies in China and is understood to own stakes in over 20 plantations.

Chinese timber companies now focus primarily on resources in other developing countries that do not have a legal framework to protect their own national resources – particularly Siberia, Myanmar, Cambodia and Russia.

Australia: Water issues in forestry investment
Examining industry-wide projects to make the industry competitive and sustainable, there are some interesting recent initiatives. For example, the Australian Minister for Innovation, Industry, Science and Research established the Pulp and Paper Industry Strategy Group (PPISG) in June 2009. The group is developing a plan to encourage innovation and sustainable business practices and attract investment in pulp and paper manufacturing in Australia.[260] It recently released a paper that noted the following water-related issues:

Water as a key manufacturing input has not changed

Water is used during the pulping and cleaning processes and apart from access to resources, the location of mills is also influenced by access to water, energy, effluent disposal facilities and proximity to shipping ports.

Access to water is more critical in a water-scarce future

Effects of climate change and reduced water availability on the forestry industry will also need to be considered and planned for.

Water efficiency is improving

Given the increasing importance of water conservation in many countries, improved water utilisation is a growing issue for many pulp and paper companies, particularly in Australia (In 2005, the amount of water used per unit of output in the world-wide pulp and paper industry was nearly half that used in 1990. The water saving in relation to the Australian industry was even greater — nearly 64%).

Better public promotion of the industry's sustainable practices needs to occur

Australian community needs to become more aware of the pulp and paper industry's strong environmental credentials in terms of water reduction and use of biofuels.[i]

TEXTILES, FOOTWEAR AND APPAREL

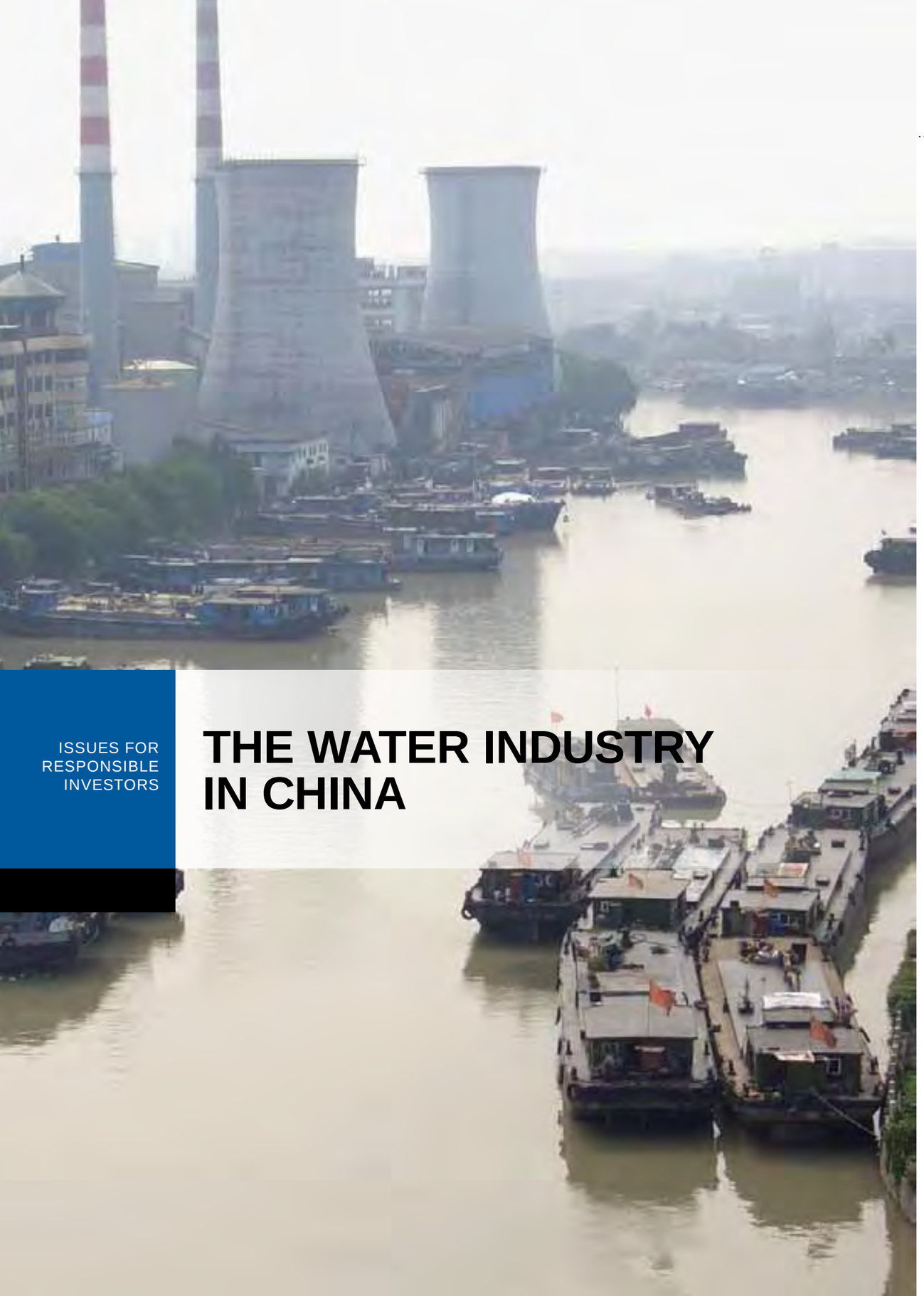
Apparel companies operating in China are often criticized for their activities in relation to water, normally with regards downstream pollution. Minimal criticism has been leveled at them to date for operating water intensive operations in areas where water for the local population is in short supply, although we believe this situation is set to change.

The textile industry is not only one of the largest polluters but is also one of the largest consumers of water and energy and the industry has high levels of wastewater discharge (a stunning 600 litres of wastewater per kg of textile on average). It is estimated that around 25% of the chemical compounds produced worldwide are used in the textile industry and it also takes up to 40,000 litres to irrigate the cotton to maturity and provide finishing for 1kg of textile.

The success of the textile industry in China illustrates both the globalization of an industry and the historic export of environmental degradation by western nations to China. Before the Second World War, textile mills were common on the riverbanks of the NE USA. These mills dumped wastewater from dyeing processes directly into rivers. Some rivers were so polluted they were unusable. Today, most of the USA NE rivers are back to healthy levels since most of the textile sourcing moved to China in the late 1960s due to lower production costs. When stricter environmental laws, such as the 1972 Federal Water Pollution Control Act Amendments, began driving up costs for U.S. fabric mills, the transfer to HK, then to southern China, accelerated.

Prices for clothing imported to the U.S. have fallen 25% in real terms since 1995, partly due to the pressure from discount retail chains that has led to low pricing for textiles. This constant need to slash margins has led some factories to dump wastewater directly into rivers instead of treating it. Treating contaminated water costs around US$0.13/mt and factories can increase margins substantially by sending waste water directly into rivers, violating China's water-pollution laws. Substances found in high concentrations near textile plants include heavy metals, known carcinogens, fabric fibres and many organic materials (for example the starch which is used to treat threads before they are woven). The oxygen required to breakdown large amounts of organic compounds can lead to a reduction in fish populations and stagnant water.

Responsible textile and apparel companies and responsible investors in this sector are beginning to engage with Chinese manufacturers and their MNC partners to demand more transparency on this issue, in particular regular supply chain audits from third party auditors. As Business for Social Responsibility says in its report 'Water Management in China's Textile and Apparel Factories', 'a unified message from global investors to companies sourcing from Chinese textile companies on best practices and standards for water usage, discharge and pollution is vital for the sector to improve in its us of water'.[261]



ISSUES FOR RESPONSIBLE INVESTORS

THE WATER INDUSTRY IN CHINA

GLOBAL WATER COMPANIES

The China Water Network has highlighted that, as of the end of 2008, the six most influential foreign water service companies (Veolia, Sino-French Water Works, Hong Kong and China Gas, Golden State Environment, China Water Company Limited and the Western Water Corporation) had collectively signed concessions in China for over 50 watersupply projects. These have a combined capacity of over 20 million m3/day, or 8% of the total national water supply.

In this section, we focus on the ESG activities and reporting of the following global water companies where we see developing management focus on the water issue:

- Veolia (France)
- Suez Environment (France)
- General Electric Water (USA)
- Hyflux
- Siemens AG (Germany)
- Dow Water & Process Solutions (USA)
- China Water Company (USA)
- United Engineers Ltd. (Singapore)

Veolia Water

Veolia <VIE:FP> has active global coverage on ESG issues and a stated corporate goal of halving the number of people who have no access to drinking water and sanitation globally by 2015. They have an impressive focus on access to water and responsible pricing issues and state that they follow the Charter on Access to Basic Services (2002) in terms of ethics, good governance and transparency. The company also notes that it will not tender for a project that is incompatible with the interests of local communities, or where the cost of production of water will mean local people cannot pay for the end product. Management appears to be committed to encouraging local communities to become more involved in the management of public water and wastewater services and to encourage better dialogue with consumers and their representatives.

Veolia's 'Charter on Access to Basic Services' covers ethics, good governance and transparency

Veolia states that it encourages suppliers and subcontractors to behave responsibly through their preferred supplier process and procurement initiative - so that they follow good practices in the areas of safety, quality of service, quality assurance, workers rights and employee and environment protection. There is also reference on the website to a 'pilot' Environment Management System but, unfortunately, this is not publicly disclosed.

In terms of collaborative initiatives, the company is a member of Global Compact and Aqua Fed. Aqua Fed is organised by the International Federation of Private Water Operators and aims to combat corruption and promote greater integrity in the management of water and wastewater services. They joined the Water Integrity Network in August 2006 where they debate with peers on how best to achieve the United Nations 'Millennium Development Goals'.

Veolia also has committed to provide humanitarian assistance and keep it independent from its business activities. A global foundation has been set up but has yet to be involved in significant Chinese community water investment projects in China, although they are involved in a rural biogas project in Sichuan province.

Veolia is involved in over 25 separate projects in China including the 50-year full-service water contract for Shanghai's Pudong business district, signed in 2002. This contract requires Veolia to provide water to over 2.6 million residents and service over 3,300 km of piping. The project has 6 treatment plants and 8 pumping stations. In 2003 they signed a similar term municipal contract to supply water and treat wastewater in Shenzhen. The company is also active in Tianjin with another full service key contract covering water production, distribution and customer services for 3 million inhabitants.

Veolia has a strong presence in China

Suez Environnment
Suez <SEV:FP> offers water production and industrial and municipal sewage treatment services. They are involved in over 20 joint ventures for water and wastewater in 17 municipalities in China and operate over 190 water treatment plants designed & built by their subsidiary, Degrémont. Suez also provides water to Sanya, China's 'tropical tourism city' with a 1m m^3 water treatment plant and Tianjin, one of the largest harbours in China. In Shanghai, where competition for water projects is the greatest, they have focused on providing an integrated water supply and wastewater treatment service to Shanghai Chemical Industry Park (SCIP), one of Asia's largest petrochemical complexes. Other projects, handled through a partnership with Hong Kong firm New World Services, include a contract with the Macau government for the production and distribution of potable water for 500,000 residents and a US$214m investment in a 15% stake in the Chongqing Water Group which supplies water to about 32 million people in the south west of China.

Suez has opened its first R&D centre in China, focusing on industrial water supply and treatment

In terms of addressing its local ESG issues, the company has opened the first R&D centre in China dedicated to industrial water supply and wastewater treatment research and says it promotes environmental awareness in all that it does. Its focus seems to be on building long-term relationships with local partners and transferring experience and expertise to these local partners. There is very little specific reporting of its activities in China or emphasis on environmental impacts on the website. We see no evidence of a sustainability report on the China operations.

GE Water
GE <GE:US> focuses on water purification, utilities optimisation and protection, wastewater treatment and reuse in its water business in China. For the Beijing Olympics they installed China's first advanced membrane rainwater recycling system at the National Stadium to help maintain a sustainable supply of water for landscape irrigation, facility maintenance and a fire-suppression system; the stadium was also fitted with a nano-filtration system that provides up to 16m^3 of drinking water per hour—equivalent to 32,000 bottles of water.

In light of the 2007 algae outbreak at Lake Tai, GE has installed an advanced treatment system in Wuxi

Another interesting GE water project that began in 2008 is the Lake Tai Wastewater Treatment Plant in Wuxi. The lake is the main water source for over 30 million people, but suffers from excessive accumulation of nutrients from wastewater and industrial discharge. GE has installed a US$10m membrane bioreactor (MBR) advanced treatment system which uses micro-organisms and ultra filtration membranes to breakdown organic nutrients and filter solids to produce cleaner effluent which can then be reused in industry, irrigation or aquifer recharge.

The first phase can treat 30,000 m^3 per day and there is a potential to expand to 100,000 m^3 per day. This would then be one of the largest MBR facilities in the world. The company claims that this technology can transform wastewater into a valuable and sustainable new water source that can help mitigate water scarcity.

Whilst there is not much coverage of specific ESG issues or reporting in China, the company has donated over 60 water purification systems as part of its overall efforts totalling more than US$4.3m to help support people and towns in the Sichuan earthquake-affected region. The company is not yet a signatory to the CEO Water Mandate, but they do respond to the Carbon Disclosure Project. Their main drive towards sustainable business models is intrinsic to the overall long-term strategy and is described here: http://ge.ecomagination.com/site/water

Hyflux
Hyflux <HYF:SP>, a Singaporean company founded by Olivia Lum, has been active in China for the past 10 years in industrial water treatment, wastewater treatment, desalination recycling and membrane applications. They are involved in almost all of China's provinces with over 500 clients in the biotechnology, pharmaceutical, food, electronics, chemical and petro-chemical sectors. They won their first municipal project in 2004. Hyflux also claims to operate the largest seawater desalination facility in China, in Tianjin. This is a 30-year BOT concession with a capacity of 100,000 m^3/day expandable to 150,000 m^3/day. It uses proprietary ultra filtration membrane and reverse osmosis technology.

Another interesting specialisation is wastewater treatment for heavy industrial areas, especially focused on printing, dyeing and textile plants where they have to deal with colour and fibre impurities as well as toxins. They have a 25 BOT project in Changshu with a final capacity of 60,000 m^3/day. The system uses biochemical treatment processes including activated sludge processes.

Hyflux has launched the Hyflux Water Trust (see case study on page 139) which is listed on the Singapore Stock Exchange. The initial portfolio assets included 13 water plants, eight wastewater treatment plants and two water-recycling plants. These water plants in China are operating under exclusive long-term concession agreements with local authorities. Major shareholders at listing were Hyflux Water Projects and Fidelity Investment Management (Hong Kong) Limited. The codes for the Trust are Reuters: HYWT.SI and Bloomberg: HYFT SP.

Hyflux CEO elected to the Chair of the Singapore branch of the UN Global Compact

The company has a strong commitment to CSR and Olivia Lum, CEO, has recently been elected to the Chair of Singapore Compact, the local branch of Global Compact. Hyflux states that they focus on environment, education and entrepreneurship in their community initiatives. They also set themselves high Environmental Management System standards, in general following ISO 14001.

A stream of environmental initiatives (unverified) include an Air Emissions Management Programme, electing Environmental Health and Safety (EHS) coordinators and setting goals for reduction of waste and emissions. The Hyflux Waste and Water Management Programmes seem to be well structured and strategic. Each programme provides site-specific data for use in reporting. The management takes compliance seriously and monitors national, state, provincial and local wastewater discharge requirements. They also have an Emergency Response plan in place in case of accidents.

Hyflux seems to go beyond required standards set for this sector and has an especially pastoral approach to its employees – their Industrial Hygiene Programme, which controls employees' exposure to potentially harmful chemicals, is evidence of this. In terms of governance, the company is unusually progressive. They have a Code of Ethics and Conduct for all its employees and the Financial Report for 2008 includes a Corporate Governance Report. Separate committees have been set up for audit, nominations, remunerations and risk management.

Siemens
Siemens <SIE:GR> operations in China are focused on enabling industry to meet its specific water quality requirements to ensure consistent processes and production. The long-term goal is to help businesses in China improve efficiency, meet ever more stringent wastewater regulations and reduce disposal costs. They have provided water technology solutions to the following sectors: automotive, F&B, metals and mining, oil and gas, pharma, power, pulp and paper, semiconductors and solar.

Siemens overall reporting standards are improved

Since its corporate governance scandal in 2007, the Siemens global reporting standards are much improved, although there could be more information on their corporate website about specific initiatives and water usage in China. Siemens AG is a signatory to the CEO Water Mandate which and is a member of Global Compact.

In terms of community investment, the company supports the global SkyJuice Foundation, an organisation that delivers low cost drinking water solutions to the world's poorest. The Foundation mentions some work in China but there are no specifics. Siemens also inaugurated its Green Village pilot project this year and handed over a "Water Boy" water purification system facility to Shangba Village in Guangdong

Province. The facility will be used to deliver safe water to the 3,500 Shangba villagers.

Dow Water
Dow Water & Process Solutions, a subsidiary of Dow Chemical <DOW:US> provides water separations solutions for drinking, waste and process water. It is also involved in water transportation and building treatment plants.

The company has stated publicly its intentions to sustainability, addressing the more than 1 billion people who lack access to clean and safe drinking water globally. Dow Water intends to deliver success in this area through a collaborative approach with government, businesses, humanitarian organisations and consumers. The company works with agencies and NGOs that are attempting to address the global water issue. For example, the company owns 30% of a company called Water Health International (WHI) that has assisted with financing 2,000 small water systems that will supply clean water in developing countries. They are also assisting a project to develop plastic bio-sand filters for low cost water filtration. Additionally, the company is working towards setting targets on community contributions, energy efficiency, conservation, climate change and product safety.

Dow is developing crops to alleviate water scarcity in China

Within the group there are also some interesting developments that will alleviate water scarcity in China over the long term, including work at Dow Agro-Sciences developing drought-tolerant crops, including corn and canola. Dow is a leading signatory of the United Nations CEO Water Mandate and has set out to improve water usage efficiency at manufacturing sites and aim for zero water discharge. From 2004 to 2007 the company globally reduced its overall use of fresh water by over 10%. Dow is a leading sustainability reporter, using GRI Reporting standards and responding to the Carbon Disclosure online. The company is a member of Global Compact.

China Water
China Water Company Ltd was set up in 1996 by AIDC Limited, an Australian Federal Government owned Investment Company. A decade later, Cascal <HOO:US>, a NYSE listed entity, acquired 87% of CWC Ltd in order to participate in the Chinese water sector. Cascal is the water service division of Biwater, a company that has designed and constructed water and wastewater plants, provided consultancy services and operated water systems in over a thousand projects in over 90 countries. In China the company has exposure to six water supply projects, including a 30-year concession in Yancheng, to supply 600,000 people with 235m litres/day. This project uses horizontal flow sedimentation tanks. A second project in Zhumadian, signed in June 2008, will have a total capacity by the end of 2009, of 220m l/day.

A key objective of China Water is to develop Chinese management and operating expertise

CWC Ltd targets long term investments in water resources, municipal water supply and wastewater treatment facilities and other water-related infrastructure. Their projects range from individual water or sewage treatment plants to participation in total municipal water production and distribution systems. A key objective is to develop Chinese management and operating expertise and skills of its local partners. The company claims to conduct a thorough socio-economic appraisal of every project to ensure that local development is enhanced and environmental protection guidelines are met.

In terms of ESG disclosure, there is very little in the public domain. The company has donated to the Changing Young Lives Foundation, a Hong Kong-based organisation, to provide clean water in rural Qinhai and were also involved in the Sichuan earthquake relief effort, as were almost all Chinese companies. CWC Ltd has seven separate ISO accreditations but does not appear to disclose on the impact of its activities through a sustainability report or statement.

United Engineers
UEL <UEM:SP>, a Singaporean company, is involved in over 40 water projects in China including a large wastewater treatment project in the Hunnan New District, Shenyang. It offers services in the treatment of surface & groundwater for drinking, Industrial and processed water supply, water recovery (recycling and circulating water), treatment of municipal sewage and industrial wastewater. UEL have also developed technologies in seawater and brackish water desalination, sludge treatment and disposal and aquaculture water treatment. There is no publicly disclosed information about CSR activities or environmental monitoring in China.

CHINESE WATER COMPANIES

Whist we are not able to cover, in detail, the many Chinese listed companies involved in the water industry in this report, Figure 1 highlights the main companies which an investor may want to monitor and review their ESG reporting and activities. Disappointingly for such an environmentally sensitive sector, less than one in 10 companies have any reporting whatsoever and those that do, report in a very limited fashion. The two exceptions to the rule seem to be Zhongshan Public Utilities Group Co Ltd. and Nanhai Development Co Ltd.

Figure 10: ESG reporting of Chinese water companies (Nov 2009)

Company	ESG reporting	Website	Ticker	Market cap
Shanghai Chengtou Holding Co	None	http://web.chengtou.com/English/Overview/subordinateEnterprises.aspx	600649:CH	RMB30.4bn (US$4.47bn)
Guangdong Investment	None disclosed	http://www.gdi.com.hk/english/main_e.php	270:HK	HK$27.3bn (US$3.50bn)
Zhongshan Public Utilities Group Co	Environmental activities	http://www.zpug.net/community/news_view.php?id=22&page_id=46	000685:CH	RMB17.8bn (US$2.62bn)
Beijing Capital Co	None disclosed	http://www.capitalwater.cn/eindex.asp	600008:CH	RMB15.6bn (US$2.30bn)
China Everbright International	None disclosed	http://www.ebchinaintl.com/e/index.php	257:HK	HK$12.8bn (US$1.64bn)
Tianjin Capital Environmental Protection Group Co	None disclosed	http://www.tjcep.com/index22.aspx	1065:HK	HK$9.6bn (US$1.24bn)
EGUARD Resources Development Co	None disclosed	http://www.eguard-rd.com/main.aspx	000826:CH	RMB5.9bn (US$872.9m)
Epure International	None disclosed	http://www.epure.com.sg/	EPUR:SP	S$ 754.65m (US$531.44m)
Qian jiang Water Resources Development Co	None disclosed	http://www.qjwater.com/	600283:CH	RMB3.69bn (US$542.13m)
China Water Affairs Group	None disclosed	http://www.chinawatergroup.com/index_eng.asp	855:HK	HK$3.60bn (US$461.25m)
Nanhai Development Co	Responsibilities to shareholders, society and environment	http://www.nhd.net.cn/society.jsp?catid=10	600323:CH	RMB2.91bn (US$428.13m)
Interchina Holdings Co	None disclosed	http://www.equitynet.com.hk/interchina/	202:HK	HK$1.98bn (US$253.22m)
Sinomem Technology	None disclosed	http://www.sinomem.com/	SINO:SP	S$ 271.24m (US$191.02m)
Memstar Technology	None disclosed	http://www.memstar.com.sg/english/	MSL:SP	S$ 265.58m (US$187.03m)
United Envirotech	None disclosed	http://www.unitedenvirotech.com/	UENV:SP	S$ 137.60m (US$ 96.9m)
Pan Asia Env Protection Group	None disclosed	http://www.paep.com.cn/einto.asp	556:HK	HK$960.0m (US$123.08m)
Asia Environment Holdings	None disclosed	http://www.asiaenv.com/home.html	AENV:SP	S$ 128.48m (US$90.48m)
Xinjiang Tianye Water Saving Irrigation	None disclosed	http://www.tianyejieshui.com.cn/	840:HK	HK$467.57m (US$59.94m)
Bio-Treat Technology	None disclosed	http://www.bio-treattechnology.com/	BIOT:SP	S$ 59.61m (US$ 41.98m)
Eco-Tek Holdings	None disclosed	http://www.eco-tek.com.hk/	8169:HK	HK$100.68m (US$ 12.91m)
Pan Asian Water Solutions	None disclosed	http://www.pawater.com.sg/	PAWS:SP	S$ 10.63m (US$ 7.48m)
Sino-Environment Technology Group	None disclosed	http://www.sino-env.com/about.html	SINE:SP	Suspended
Asia Water Technology	None disclosed	http://www.asiawatertech.com/	AWT:SP	Suspended

Source: Company websites, Bloomberg. Market capitalisations as of market close 13 November 2009. Receivers are disposing of Asia Water Technology's assets after the firm was unable to make payment on a US$33.5m CLSA Mezzanine Management payment. In early October a restructuring proposal fell through. Trading of Sino-Environment has also been suspended, as of 13 November 2009. An investigation is ongoing.



ISSUES FOR RESPONSIBLE INVESTORS

CORPORATE POLICIES, PRACTICES AND REPORTING

INTRODUCTION

Many commentators believe that water will be 'the oil of the 21st century' and that water shortages and quality will increasingly become a constraint to doing business. The UNESCO World Water Assessment Program stated earlier in 2009 that, while there are several problems with the management of global water resources, they are not insurmountable and China can act as a role model in the field.[262] The coordinator of the Program, Olcay Unver, also spoke of the essential significance of 'leadership development' for the corporate sector in China as companies begin to be seriously affected by water scarcity, local social conflict, regulatory and legal issues surrounding pollution.

Waterfootprint.org has resources for managers developing water strategies and investors engaging with companies

Companies therefore need to assess to what extent they, and their suppliers, depend on water and how they can best manage the required processes and infrastructure. An 2009 estimate by Business for Social Responsibility (BSR) suggests that currently only six or seven companies in the world think systematically and holistically about their water risk exposure (highlighting **SABMiller**, **Coca-Cola**, **Unilever**, **Rio Tinto**, **Pepsi** and **Nestlé**) as best case examples of major water users.[263] 'These firms know which watersheds their facilities draw from. They know how their supply chains are water-impacted and impactful. Within a given facility, they can then break down their water usage. With each new investment, they analyse the availability and quality of nearby water sources. And all of their strategic water-related goals are made with local communities' interests in mind'.[264] In 2008, SAB Miller, for example, determined that its entire supply chain, including the cultivation of ingredients, required nearly 8.4 trillion litres of water – nearly double the amount of water used by Iceland in 2004. Other global water use statistics show that the footprint of a single glass of beer is 75 litres, a glass of wine is 120 litres of water and a cup of coffee 140 litres.

Facilities in poor Chinese communities must balance public and private benefits

There is every chance of social conflict in China if businesses set up water intensive operations in areas with poor water sustainability. Frequently, the jobs created by new factories in poorer areas are insufficient to divert local citizens concerns from the realities of having their irrigation compromised. If residents discover that they are paying more per unit of water than a nearby foreign-owned factory, this, too, could cause antagonism. Balancing these public and private benefits is a challenge increasingly facing regulators and corporations with facilities (and extensive water use) in poor communities.[266]

Global developments in the area of managing water risks have been rapid over the past few years. We describe here how companies can integrate comprehensive water strategies. Excellent further reports for managers include 'Water Scarcity & Climate Change: Growing Risks for Businesses & Investors' and 'Freshwater Resources: Managing the Risks Facing the Private Sector' by the Pacific Institute. We also recommend the UNEPFI report 'Half full or half empty?'[267]

Case Study: Coca-Cola and Pepsi and reputational risk in emerging markets

Corporate practices with respect to water can also go spectacularly wrong. In Kerala, India, for example, both Pepsi and Coca-Cola lost their licenses to use local groundwater at bottling plants after successive droughts.[265] Coca-Cola was criticised repeatedly throughout 2003 for extracting 1.5 million litres of water a day from the deep wells it has drilled into the aquifer to produce Coke, Fanta, Sprite and the local cola, Thums-Up, whilst farmers walked up to six miles twice a day to fetch water. Agricultural irrigation wells became brackish and unusable as water was diverted to the bottling plant. There were recriminations from local government of pesticides being found in both Pepsi and Coca-Cola products, which led to a subsequent ban in 2006. (See letter in Appendix for response from Kerala Government Health and Family Welfare Department.) It is unclear how the Kerala issue will play out, as the court appeals process in this state are a lengthy procss.

Figure 1: Five basic steps to improve water performane

Measure water footprint
-Measure a company's water use and wastewater discharge throughout the complete value chain including suppliers and buyers.
-Information will provide the baseline data to assess risks, prioritise efforts, and measure progress.
-Begin internal reporting to build confidence in systems.

Assess risk
-Assess the range of risks associated with the company's water footprint and align findings with the company's energy and climate risk assessments.
-Because of water's regional and time-specific character, companies need to convert waste footprint data into actual water impacts and risks.

Consult and engage
-Consult stakeholders and engage with suppliers as part of the water risk assessment, long-term planning and implementation activities to form strategic partnerships.
-Strengthen ESG/water management systems and data gathering techniques.

Establish water policy, set goals and targets
-Integrate water issues into strategic business planning and governance.
-Implement best available technology and factor water risk into relevant business decisions.

Report on water management
-Disclose water performance and related risks.
-Publicly report management activities and performance over time.
-Information can help shareholders assess how companies are addressing their water risks and seizing opportunities.

Source: Adapted from Ceres/Pacific Institute's Water Scarcity & Climate Change, Responsible Research.

Chinese companies are not yet publicly engaging on contingency water strategy and planning

Our preliminary research in this area, in mid 2009, shows that Chinese companies are not yet publicly engaging in the types of scenario and contingency water strategy planning, which the best managed MNCs are undertaking. Mostly there are no water contingency measures set in place and no understanding of water materiality to business models. As prices rise, however, more and more businesses with Chinese operations are taking measures to increase water efficiency. BSR, stresses that it is not enough to merely be water efficient. Companies should also focus on protecting water resources and the ecosystems they support.[268]

CORPORATE POLICIES AND BEST PRACTICES

Because nearly every industry requires water at some point in the value chain, it is likely to emerge as **the** strategic sustainability issue in resource-strapped China, potentially even more influential than carbon.

There are various recommendations on how companies should be managing their water risks in China. It is important to realise that firms here are still in the very early stages of measuring water footprints and developing water management strategies. Carbon footprint management systems have only recently started to be adopted and water measurements are still way behind. Water planning and reviewing sustainability issues will take considerable time to be adopted by businesses. Government should be consulted at local and regional levels before embarking on water management strategies as they may have valuable information that will affect levels and direction of expenditure.

Water tools can be used by companies but their effectiveness is still unclear

Companies and analysts can measure water use by reviewing water utility invoices for key operations and conducting surveys with key suppliers. Additionally, a free online risk-mapping tool developed by the World Business Council for Sustainable Development is available on the website (www.wbcsd.org/web/watertool.htm). For more information, the Water Footprint Network (www.waterfootprint.org) raises awareness on standards and guidelines on water footprint accounting and measurement and aims to develop practical water footprint tools for its constituencies.[269]

The Global Environmental Management Initiative (GEMI) recently released a tool intended to help individual factory and facility managers translate their company's water strategies into action on the ground. 'Connecting the Drops Towards Creative Water Strategies: A Water Sustainability Planner' (www.gemi.org/waterplanner/index.htm) contains three modules that help site managers conduct water risk assessments. These review:

- A facility's specific water needs in comparison to the availability of water in the region
- Operational impact on available water resources
- Case studies on reducing water use and impacts

CHINESE COMPANIES WITH WATER POLICIES

Thus far, very few Chinese companies disclose water policies and usage. Below we examine six Chinese companies that represent a cross-section of the economy – from marine transport to beverages and coal-fired power generation. We hope to follow up this work with a report describing sector developments to examine specific industry challenges and potential solutions. Here we used the excellent RepRisk® tool to screen for water risk in China. (www.reprisk.com)

China COSCO Holdings Company Ltd

China COSCO <1919:HK> is a dry bulk and container shipping company and a subsidiary of COSCO, the second largest shipping company in the world, which also leases containers and provides logistics services. It employs almost 34,000 people globally and 2008 revenues were just over US$19bn. The group publishes a sustainability report that includes some basic water reporting data. The company claims that all ships are equipped with seawater desalination devices. Driven by waste heat energy, these systems meet the crews' daily water demands and reduce the need for fresh water supply and consumption.[270] The website of Cosco Container Lines also currently indicates that the company reduced annual fresh water consumption by 6.8% in 2008 but one would presumably expect this with the decline in global transhipments over the same period. It would be useful, in this instance, to see data that relates water usage to revenue or tons shipped to show increasing water efficiency.

Figure 2 summarises COSCO group water consumption in 2008. While there is a good trend in water consumption reduction (final row), some of the numbers appear to be inaccurately disclosed. Since ESG/water management systems and data gathering techniques are evolving in corporate China, investors can help by engaging managers to help improve water performance data collection and reporting.

Figure 2: Water consumption as reported by the COSCO Group (2008)

Indicator (m^3)	2004	2005	2006	2007	2008
Total water consumption	8,662,064	4,320,209	5,687,118	732,179,068	5,471,942
Seawater de-salting volume	960,145	959,196	976,719	760,269	883,940
Underground water consumption	65,700	72,100	77,800	568,766	50,000
Consumption of water from water supply system	3,197,193	870,763	1,774,445	3,953,004	4,452,944,58
Water consumption in ship-building	1,523,196	1,743,688	1,690,551	6,069,398	7,191,311
Reduction of water consumption (compared with that of the previous year)	50,737	45,415	52,669	58,134	120,924

Investors can engage managers to improve water performance data collection and reporting systems

Source: COSCO Sustainable Development Report 2008.[271] The highlighted cells contain water performance data that appear to be mistakes or outliers.

China Shenhua Energy Co. Ltd

China Shenhua Energy <1088:HK> is a diversified industrial group involved in coal, railways, ports and power generation businesses. It is one of the largest coal companies in the world, producing more than 185 million tonnes in 2008. Its 14 coal-fired power plants have a combined installed power generating capacity of over 18GW. China Shenhua intends to invest almost US$40bn through 2013 to expand capacity to meet China's ever increasing demand for coal.[272]

Despite its heavy fossil fuel consumption, China Shenhua appears to be forward-thinking in its water reporting

The company appears to be quite forward thinking in its water performance reporting and illustrates the conflicted situation for responsible investors who, on the whole, do not support the growth in fossil fuel consumption due to climate change impacts. If investors take the 'best in class' approach, however, by supporting the more sustainable companies within emissions intensive, yet economically necessary, industries, then this type of reporting is useful in analysing future financial risk from water shortages.

China Shenhua discloses that the company's major coal mining operations are in arid areas and so it attempts to recycle water as much as possible. In 2008 two water treatment facilities were built in the Shendong Mining Concession, increasing annual water treatment capacity by almost 8 million m^3. The Shendong Coal Branch was also awarded several prizes, including the First Prize in the Scientific Technology Advancement Award for its research on and application of water resource-protective mining technology in this area.

The company has completed several projects including a domestic sewage project at Shenhua Tianjin Coal Dock (60 m^3/hour capacity) and coal sewage works (50 m^3/hour capacity). Here the sewage effluent undergoes treatment to meet applicable discharge standards and then is sprayed on the coal to achieve zero sewage emission and reduce coal dust dispersion while in transport. At Huanghua Port and Shenhua Tianjin Coal Dock, saltwater recycling facilities on vessels are used to remove dust and offset freshwater water shortages at the ports.

China Shenhua also reports examples of declining water use in 2008. The water consumption at Guohua Power Branch, for example, decreased to 0.9 kg/kwh; water produced from seawater desalination was almost 3 million m^3, and the reclaimed water produced by urban sewage treatment was about 13.7 million tones.[273] Figures like these are a good start but are hard for analysts to contextualise. It would be helpful if company management provided trend data, which allows for better comparison across time. Benchmarking competitors' water performance and producing figures on water usage by business unit would also be valuable.

In 2008 WWF and other environmental groups criticised a large number of global companies (and the U.S. Defense Department) for developing high water intensity coal-to-liquid (CTL) technologies as alternative to burning raw fossil fuel instead of focusing on renewable energy technologies. The new technologies were also criticised for emitting excessive levels of carbon dioxide. China Shenhua Group's CTL facility in Inner Mongolia was one of the facilities criticised.

F & C engages China Shenhua on biodiversity risk management

Global asset manager F & C, based in the UK, actively engages China Shenhua as part of its Responsible Engagement Overlay and exercises its proxy voting rights. The focus tends to be on biodiversity risk management.[274]

Kweichow Moutai Distillery Co. Ltd

Kweichow Moutai <600519:CH>, one of the largest Chinese beverage and liquor companies, employs over 8,000 people and generates profits of over US$1bn (2008). Its Moutai brand is one of the premium liquor brands in China, famous for its distinctive aroma and taste. It became a state-owned enterprise in the 1950s and, since then, its water policies have been the responsibility of the local government. Even in 1972, Prime Minister Zhou ordered that no chemical enterprises along the Chishui River, where it is based, could be built within 100km of the Moutai factory in order to preserve the water quality for the liquor.[275] The company is thought to have implemented sewage disposal standards that have substantially exceeded other companie.

Government heavily regulates the Chishui River to protect the business interests of Kweichow Moutai

The Chishui River has recently been assessed as heavily polluted by the local environmental protection bureau. This is thought to be due to several private operators along the Chishui River that discharge untreated sewage. Based on a report filed by the local congress, the water of Chishui River was classified as Class V, almost the worst quality within the rating system.[276] In response, Moutai Company announced they would invest over RMB1bn (US$147m) to establish a new industrial park to protect the ecological system around the factory, while the local government is investing more than RMB2.6bn (US$382m) in environmental protection in the surrounding areas.[277]

Shanghai Jin Jiang International Hotels Group

Shanghai Jin Jiang <2006:HK> is one of the largest hotel operators and managers in China, with revenues of over RMB3bn (US$441m) in 2008. It is principally engaged in the operation and management or 'star-rated' hotels, budget hotels and franchising, as well as operating restaurants. The website Green Hotels (www.chinahotel.org.cn) indicates that water and energy efficient equipment is widely implemented in all Jin Jiang Hotels and most use water systems that reclaim rainwater for green areas. Also, the hotels recycle condensed water and bathing water to flush toilets and irrigate plants. According to statistics produced by Jing Jiang Hotels, the wastewater discharge amount has decreased by 2-6 million cubic metres since their water conservation programme was implemented.[278] Unfortunately this range is overly broad to deliver any material meaning.[279]

Texwinca Holdings Ltd

Texwinca <321:HK> centralises its knitting and dyeing production activities at its production facility in northern Dongguan, Guangdong province. The factory produces a combined 42 million pounds of dyed yarn, knitted fabric, and dyed and finished fabric annually. There are reports that the company's wastewater discharge complies with the Ministry of Environmental Protection regulations but its water performance is not disclosed. Texwinca does not publish a Sustainability or Corporate Social Responsibility Report.

When reporting on large scale environmental capex, it is helpful to articulate the rationale behind the purchase

Texwinca's 2009 Annual Report notes that the Group had capex of HK$104m (US$13.3m) which included 'improvements to environmental protection facilities'. The company is not transparent about what the expenditure was or what it hoped to achieve in terms of additional reporting or environmental performance. The lack of transparency is surprising because the textile business unit has only one production facility in Dongguan so this should be a straightforward process.[280] We hope that Texwinca may become a leader in the sector and that subsequent annual reports (or sustainability reports) may shed more light on the management of their water usage and treatment.

Zijin Mining Group Co. Ltd

Zijin Mining Group <2899:HK>, China's largest listed gold company, is a mining conglomerate of gold and other non-ferrous metals in China. It is involved in exploration, mining, production, refining, selling of metals. In 2008 the company produced more than 57 tonnes of gold, including over 28 tonnes of mine-produced gold. In June 2009, the Group announced that its holding company, Minxi Xinghang State-owned Assets Investment Co., Ltd., and Fujian Zijin Investment Co. Ltd., the group's investment arm will increase their investment in Shanghang Xinyuan Water Supply Co. Ltd.[281] Shanghang is located in Fujian province, headquarters of the Zijin Mining Group.

Zijin Mining extends its license to operate by investing in the local water supply

The investment is a way for the company to secure and extend its 'license to operate' as a large water user and head off any community complaints about environmental degradation at its mining operations. We prefer these investments to be targeted at communities as close to the actual mines as possible since are the communities most directly impacted by the mining operations. There are recent media reports that the Group has discovered copper and gold reserves in Fujian province and is awaiting provincial approval to begin exploration.[282] In addition, we watch with interest as to how the jointly owned company prices water to its various user categories.

Zijin has also been criticised for its proposed copper mining activities in Northern Peru at the Rio Blanco project that it now owns. Oxfam reported on conflicts with local farmers who have been growing organic coffee and fruit in the area.[283]



A mining facility of Zijin Mining Group.

MULTI NATIONAL COMPANIES

This section examines the water policies and practices of seven multinational corporations operating in China. These companies are The Gap, Nike, Wal-Mart, Unilever, The Coca-Cola Company, Nestlé, and GlaxoSmithKline. All companies have a renewed focus on water sustainability issues as they have identified access to clean water as a major business issue in emerging markets in the coming years. They are concerned not only with promoting a positive brand image by communicating with stakeholders on their environmental efforts, but also with cost savings through adopting water efficient processes in an environment of increasing prices. These companies are also seeking to reduce the likelihood of litigation in the future and to increasing production consistency, which is likely to move their product quality ahead of their competitors.

The Gap

Gap <GPS:US> employs a full-time social-responsibility staff of 93 people involved in monitoring 2,000 factories around the world for labour issues and environmental practices. In 2008 The Gap launched an environmental footprint assessment that will lay the framework for setting long-term goals on water and direct resources, resulting in more efficient and sustainable global manufacturing operations. Their focus is firstly to clean up their owned operations in their 11 global HQs and 2800 stores in the USA. In this phase they will examine water usage, effluents and wastes. In early 2010 they will assess their supply chains for water usage, efficiencies and links to their social goals and human rights in China. They are also set to establish a Vendor Code of Conduct for supplier factories.

Factories supplying to group companies are supposed to follow the Clean Water

All factories in China that supply The Gap are supposed to have Environmental Management Systems and an Environmental Emergency Plan in place, which should include procedures for notifying local authorities in case of accidental discharge of hazardous materials. The factories supplying all group companies (Gap, Banana Republic, Old Navy etc) are also supposed to follow the basic Clean Water programme, including special treatment of water used to prewash and preshrink denim. If these waste treatment processes are not followed, toxic chemicals, such as copper and mercury, can enter the water system from the dyes used.

The company has measured progress on water temperature, colour gradations and chemical water composition since 2004. They use an independent environmental consultancy, CH2M Hill, to review data from the laundries, identify non-compliant denim laundries and then work with the factories to develop corrective action plans.

Nike

Nike <NKE:US> looks at water use and discharge in its supplier factories but also reviews the efficiency of design and processes used to make the product. They recommend that their factories (often not owned) ensure that their suppliers comply with the regulations of their apparel water program, which is often stricter than local or national regulations. Nike developed the guidelines through their work with the Business for Social Responsibility Apparel Water Quality Working Group. This effort took advice from academic and scientific communities to set goals for water quality, and focused on training, reducing 'audit fatigue' for suppliers and collaboration on best practices in wastewater treatment and water conservation

Nike uses a web-based reporting tool to encourage suppliers to self-report on sustainability

Apparel suppliers to Nike in China have to complete a questionnaire and provide copies of their discharge permit, water quality regulations specific to their location, and test results from an accredited laboratory demonstrating compliance. The company then evaluates suppliers based on both the quantity and quality of wastewater and then ensures that the suppliers have enrolled their main subcontractors in the program. By 2007 there were over 70 subcontractor vendors in this program in China (22% of the total) who contribute to over 40% of the total discharge monitored from China (over 13m gallons). Although water use is considerably lower in footwear factories, the company also conducts extensive quarterly wastewater audits on all Nike contract footwear factories in China. Nike has subsequently developed a web-based reporting tool that will allow suppliers to enrol in the water program online, check their ratings, upload current permits and regulations, and provide updated test results for annual reviews. It is hoped that this tool will enable all apparel, footwear and equipment suppliers to be part of this self-reporting programme so that the Nike team can move on to efforts on conservation and sustainability innovation.

Wal-Mart Stores

Wal-Mart China aims to cut water use in all of its stores by half by 2010 (2005 Baseline). According to their 2009 Sustainability Report, they already achieved a 35% reduction in water use from the previous year. One main method of reducing water is by adding a secondary loop to the refrigeration systems in stores and warehouses. Over the next few years, stores will also be fitted with advanced water-saving technologies in the restrooms such as sinks with sensor-activation and half-gallon-per-minute, high-efficiency faucets. Electronic sensors regulate a maximum 10-second run time per cycle. In addition, there are water turbines built into each faucet. Water flowing through this turbine generates the electricity needed to operate the sensors. Automatic flush valves on toilets and urinals have water turbines that work in a similar way. These turbines not only save energy, but also save material by eliminating the need for electrical conduits and wiring otherwise required to power automatic flush valve sensors.

Pressure from MNCs like Wal-Mart can improve environmental performance in the supply chain

In 2007 Wal-Mart <WMT:US> engaged with the Redbud cotton mill in China, a very poor performer in the Chinese EPA's Green Watch Programme. Wal-Mart issued an ultimatum to this mill and, by 2008, it had achieved a reduction of 35% in water use and 5% in energy use. The owner of the plant reported that, using the lessons learnt during this process, he managed to reduce water consumption in another plant he owned by around 70%. In another example, given by Wal-Mart to highlight its green credentials, one of its distribution centres in Tianjin was awarded a 2008 prize by the Green Supply Chain Council of China.

Unilever

In 2007 the Unilever <UNIA:NA> plant in Hefei (Anhui), which manufactures well-known household brands such as Dove, Lux, Kellogg's and Lipton, was found, in a spot check by SEPA, to be discharging waste containing banned chemical substances. The pipe suspected of carrying the substandard water was disabled, a chemical oxygen demand (COD) monitor was installed and water treatment facilities were upgraded.

Unilever has found its water footprint is embedded in its supply chain as well as consumer usage

At the time the State Environmental Protection Administration official said that they 'were surprised to find environmental pollution problems at both spot checks since they were one of only two foreign companies selected at random for the inspection.' Unilever was fined RMB150,000 (US$22,100) and ordered to remedy the situation.

Unilever estimates that manufacturing makes up less than 5% of its total water footprint. There are no publicly disclosed case studies from Unilever regarding successes in China but there is more information about their impacts and targets here: http://www.unilever.com/sustainability/environment/water

Unilever now has a Sustainable Development Group that provides the business with specialist external advice on corporate responsibility and sustainability. It meets twice a year with Unilever's senior managers to discuss issues such as sustainable water usage. One of their panel of experts is Ma Jun, a Chinese specialist on water whose work we reference in this document. Author of 'China's Water Crisis', a book describing the flooding and pollution of the country's water resources, he also led the development of a public database detailing China's water quality in 31 provinces. Previously a journalist and environmental consultant, in 2006 Ma set up the Institute of Public and Environmental Affairs, a Beijing-based non-government think tank that focuses on environmental policy and governance research.

The Coca-Cola Company
The Coca-Cola Company <KO:US> has a stated aim to 'safely return to nature an amount of water equivalent to that used in all beverages and their production'. Following their shock in Kerala, outlined previously, they partnered with WWF in 2007 to develop a programme to support water conservation globally. Among the key goals of the partnership is to improve water efficiency in manufacturing plants by 20% by 2012, with the intention of becoming the most efficient user of water among peer companies. They are also working together to measurably improve conservation in seven key freshwater basins, one of which is the Yangtze River.

Coca-Cola introduces am interactive toolkit for bottling plant managers to understand water performance

To improve water efficiency at its plants Coca-Cola has introduced an interactive toolkit that will allow bottling plant managers to understand where the water they use goes and to compare this to other plants. The company aims to return 100% of wastewater back to the environment, treated so that it can support aquatic life. This must be in accordance with local laws and regulations and, if municipal treatment facilities are not sufficient, on-site treatment systems must be constructed. By 2007 there was 85% compliance with strict internal standards, with the aim of 100% compliance by 2010.

In addition to monitoring water usage and wastewater in production Coca-Cola is now leading the field in considering water usage within the supply chain. Initially their focus is on sugarcane, a crop that requires about 180 litres of water for the sugar required to produce 1 litre of Coke. The company has also issued Water Scarcity Guidelines and revised their Standard for Source Water Protection in order to address the increasing risk factor of water scarcity within their business.

In 2006 The Coca-Cola Company funded the inception of the Global Water Challenge. This works to activate the international community to address water challenges and provide safe drinking water. Coca-Cola is also a member of the CEO Water Mandate and is involved with the 'Water Footprint Working Group' to develop industry standards and a definition of water neutrality. The company also works closely with USAID on community water initiatives.

Nestlé
Nestlé <NESN:VX> China has highlighted water as being among its top three environmental priorities (the other two are energy and packaging).

Globally, they are involved in improving water management in agriculture and access to clean water in rural areas. Water management, particularly the overall reduction and treatment of wastewater is now a key part of Nestlé's environmental strategy globally. They have reduced global consumption of water in their factories by 30% over the last decade, while increasing production by 68%. They are now focused on water saving initiatives where they will have the most impact at a local level, e.g. in Pakistan or China, primarily by teaching and promoting new technologies within the supply chain. They are also developing an internal water stress index, combining a national-level Water Poverty index with a local-level index near factory locations.

From 1999 to 2008 Nestlé China reduced its water consumption per ton of products by over 50%, with the aim of a further withdrawal of 2-3% over the next five years. The Government of Harbin named their Shuangcheng factory a top 'Water Conservation Enterprise', while Nestlé Sources Shanghai Ltd. won the 'Water Saving Enterprise Award' from the Shanghai Water Affairs Bureau in 2009.

Nestlé has been involved in the production of bottled water in China since 1997. In 2009 Nestlé Waters committed to reduce water consumption per litre of water produced by 5%. They claim to be one of the most efficient water users in the beverage industry, cutting the water needed for its operations by 34% in the last six years.

The company is also involved in the research and promoting of sustainable agricultural techniques and technologies. In China their involvement in this area has mainly involved the use of cheap, moderately sized biogas digesters for manure storage, preventing contamination of ground water. Nestlé has also helped to train farmers throughout China to install over 1,500 small biogas plants, limiting pollution of water sources and creating energy sufficient for basic activities such as cooking. In 2005 the Shuangcheng factory pioneered a project to use water from fresh milk production in boiling and cooling towers, and for cleaning in the factory, reducing the total water usage by 23%.

Nestlé promotes sustainable agriculture techniques including the use to small biogas plants

Nestlé's excellent online Water Management Report is found at www.nestle.com

GlaxoSmithKline
GSK <GSK:LN> have said that, in order to minimise their global impact on water, the company aims to reduce water consumption by 2% per annum per unit of sales. This is the best type of target setting we have seen – achievable and relevant. In 2008, they managed to decrease their water use by over 10% from 2006, mostly through facilities maintenance and conservation.

GSK's water performance target is achievable and relevant

They already excel in water usage reporting and setting targets for water conservation but will extend the programme now to collect and report water usage from their key suppliers. GSK has also worked with local communities to conserve water and preserve wetlands and claims to have education programmes for employees. Additionally they are working on a 'philanthropic' project known as PHASE to educate people in developing countries about the importance of hand washing, although one could cynically assume that this involves some strategic product marketing as well.

GSK has also acknowledged the part it must play in conserving water for its future operations in China to be successful. They use water in their pharmaceutical production process (for manufacturing, cooling and cleaning) and for general site uses, including drinking, food services and sanitation. Although R&D sites and offices use relatively little water, sites that manufacture active pharmaceutical ingredients can use large amounts.

GSK has endorsed the UN Global Compact's CEO Water Mandate in order to promote the use of water more responsibly and are committed to taking action in six areas identified in the mandate:

- Direct Operations
- Supply Chain and Watershed Management
- Collective Action
- Public Policy
- Community Engagement
- Transparency.

RECOMMENDATIONS CORPORATE REPORTING

Here we make recommendations on the measures companies can take to ensure they are disclosing material water-related risks. We also consider the overlap between "reporting" and "disclosing." To illustrate, managers contemplating ESG disclosure on water typically spend two years or more internally collecting and reporting data. Only once they are comfortable with the internal ESG management system and data gathering techniques are they willing to disclose publicly. That is the typical pattern: managers initially report internally, build confidence, and then disclose publicly.

Water reporting consists of internal reporting and external disclosure

Reporting is a crucial step towards improving performance in the efficient use of water within an organization. Water disclosure allows investors to identify the companies which are implementing the best management systems and data gathering techniques to ensure that they will be able to respond appropriately to water shortages, toxicity and increases in tariffs, taxes and regulations.

There have been several global reports that advise companies on how to manage their water risks, but it is important to realize that corporate China is still in the very early stages of measuring its water footprint and developing water management strategies. Carbon footprint management systems have only recently started to be adopted and water is still way behind.

In all likelihood it will be some time before Chinese businesses will adopt strategic water planning techniques. In figure 3, below, we review, again, what company managers can do to immediately improve water performance, regardless of industry sector or location.

Chinese companies in very early stages of development of corporate water strategies

For more information on global developments in managing water risk and how companies can integrate comprehensive water strategies we recommend the reader to review *Water Scarcity & Climate Change: Growing Risks for Businesses & Investors* and *Freshwater Resources: Managing the Risks Facing the Private Sector* by the Pacific Institute or the UNEPFI report *Half full or half empty?*[284]

Figure 3: Five basic steps to improve water performance

Measure water footprint
-Measure a company's water use and wastewater discharge throughout the complete value chain including suppliers and buyers.
-Information will provide the baseline data to assess risks, prioritise efforts, and measure progress.
-Begin internal reporting to build confidence in systems.

Assess risk
-Assess the range of risks associated with the company's water footprint and align findings with the company's energy and climate risk assessments.
-Because of water's regional and time-specific character, companies need to convert waste footprint data into actual water impacts and risks.

Consult and engage
-Consult stakeholders and engage with suppliers as part of the water risk assessment, long-term planning and implementation activities to form strategic partnerships.
-Strengthen ESG/water management systems and data gathering techniques.

Establish water policy, set goals and targets
-Integrate water issues into strategic business planning and governance.
-Implement best available technology and factor water risk into relevant business decisions.

Report on water management
-Disclose water performance and related risks.
-Publicly report management activities and performance over time.
-Information can help shareholders assess how companies are addressing their water risks and seizing opportunities.

Source: Adapted from Ceres/Pacific Institute's Water Scarcity & Climate Change, Responsible Research.

Companies can only manage what they measure. Before embarking on the measurement, disclosure and adoption of Water Management Systems, all companies across sectors should first address two important issues:

Determine materiality

Companies should distinguish "relevant information" to report on. This determination is crucial in China where resources for reporting are limited. Companies should outline the process used to determine and prioritize report content.

Engage stakeholders

Discuss material water issues with other stakeholders (NGOs, agencies, local community, employees) and decide what to include in water reporting. Such engagement will ensure more understanding of the complexity of the processes and ensure buy-in of the data gathering stage, which can cause strains on over-worked managers with limited budgets.

Managers must determine materiality for the firm within the industry competitive landscape

A basic 10-step plan for Chinese companies to implement a water management system

1	Conduct a water audit throughout the value chain including main suppliers and users.
2	Develop an integrated action plan that incorporates water use, energy use and carbon emissions.
3	Perform a study of local water conditions, including hydrological, social, economic, and political factors. Understand any upstream water supply issues, including the potential competition for water supply
4	Perform water risk assessments including physical, regulatory and reputational risks.
5	Develop a long term strategic water management plan, including a view on the climate change impacts on water supply
6	Integrate water planning and management into the overall business plan and operational activities e.g. In building design, factory siting and new product development
7	Offer investors information about risks and trade-offs required to reach targets and conduct active engagement to understand any additional environmental issues
8	Set goals for water use and wastewater quality, monitor and communicate progress and quantify financial savings
9	Introduce a company-wide Water Management Plan and training for employees to understand risks and water wastage
10	Collaborate with other local businesses, NGOs and agencies to develop regional action plans to educate and address scarcity and pollution issues.

A selection of reporting criteria for water:

Direct operations	Specific Programs, Policies, or Targets for Water Performance
	Quantified Water Quantity Data
	Quantified Water Quality Data
	Trend Water Performance Data
Supply chain and watershed management	Assess Prospective or Current Suppliers on Environmental Performance
	Engage Suppliers on Water Impacts and Management
	Specific Policies for Water-Scarce Regions
	Measure Supplier Water Performance
Collective action	Actions with Intergovernmental Bodies
	Actions with Civil Society
	Peer-to-Peer Actions
	Multi-Stakeholder Actions
Public policy	Participation in Water Governance and Decision Making
	Water Sustainability Advocacy
	Commitment to Respect Internationally Recognized Human Rights
Community engagement	Corporate Action on Water at the Community Level
	Local Water Infrastructure Development
Transparency	Use of Global Reporting Initiative (GRI) Guidelines
	Statement from CEO or Senior Management Regarding Water
	Third-party Verification/Assurance Assessment

Source: Adapted from GRI Guidelines and AccountAbility 1000.



ISSUES FOR RESPONSIBLE INVESTORS

INVESTING IN WATER IN CHINA

STIMULI FOR FOREIGN INVESTMENT

Since China first permitted foreign investors to invest in water supply, drainage and urban pipe networks in 2002, major water investments in many cities have been operated jointly by foreign-funded joint ventures. These entities normally acquire stakes in domestic water companies at premium prices and most are still suffering losses in their major water supply business, having to depend on subsidiaries for cash flow.

Any foreseeable price hikes will be good news for the more patient joint ventures although the users are still unprepared for increases when they occur.[285] Shanghai Pudong Veolia Water Co. Ltd was the French water giant's first Chinese joint venture. It supplies integrated water services including production, distribution and customer service. In the seven years it has been operating, it has gradually increased the price of water, causing some risk to its reputation in China. The latest increase was in July 2009, when the water price in Shanghai was raised from 1.84 RMB (US$0.27)/m3 to 2.30 RMB (US$0.34 USD)/m3, a 26% price hike.[286] Local reaction to the price hikes in Shanghai has been strong.

The new RMB4tn (US$588bn) two-year economic stimulus package, approved in November 2008, was designed not only to limit the impact of the economic downturn in China, but also to provide incentives for foreign investors in environmental protection service projects.[287] A total of RMB210bn (US$30.9bn) has been earmarked for investment in eco-projects such as wastewater treatment plants and renewable energy facilities, with RMB20bn (US$2.9bn) reserved for safe drinking water in rural areas and project financing. A further RMB7bn (US$1.0bn) was allocated to water resources projects in Liaoning, Jilin and Gansu provinces and RMB700m (US$103m) for construction of water use programs around the Beijing area.[288]

Incentivising local governments to invest in less energy-intensive and low-polluting firms is a challenge

In January, following the stimulus package announcement, the Ministry of Environmental Protection (MEP) said it would monitor private investments to ensure there was no funding going to energy-intensive and heavy-polluting firms.[289] It is always important to observe, however, that whilst central government intentions concerning the environment seem to improve, local governments often ignore the new requirements and continue to allow investments that are environmentally damaging.[290] Even though none of the stimulus package was supposed to support these industries, it is obvious in hindsight that much of the credit loosening policies from the beginning of 2009 had this exact impact, by stimulating demand for cars and electric appliances in particular. There is still a feeling amongst environmentalists that China does not necessarily need to reserve money for environmental protection if it develops stringent "green" criteria when creating investment guidelines for its other industries.

INVESTING IN WATER IN CHINA

Several thematic funds have launched recently to invest in the emerging Asian or China water markets. These funds analyse the financials of the various companies mentioned in this report and, even though many are not managed with a 'sustainable' or ESG mandate, we expect them to invest with a delicate touch in China, where access to water is a basic human need, a political issue and a potential environmental and social catastrophe.

Whilst this report does not advise on particular investment opportunities, we would steer investors towards review of the following specific water services which take advantage of the developing themes of scarcity, rising prices and water treatment in China.

SEGMENT	INVESTMENT CATEGORY
Water delivery	Desalination membrane technology - although this has a high carbon footprint so should be combined with renewable energy solutions.
	Manufacturers of pumps, piping and valves
	Infrastructure for storage and distribution of water (reservoirs, aqueducts, bladder transport)
	Engineering and consulting services
	Wastewater treatment solutions and management systems
Agricultural services	Efficient irrigation systems and equipment e.g. GPS for precision irrigation
	Drought resistant crops and seeds
Consumption and hygiene	Demand-side efficiency and water efficient household products (e.g. ultra low flush toilets saves the average family 8000 gallons of water a year)
	Bottled water producers and biodegradable bottles
	Disinfection/filtration/purification of drinking water
	Treatment for water-related diseases such as cholera, dengue, diarrhoea, malaria, river blindness, ringworm and typhoid
	Treatments of pollution related disease such as arsenicosis, cyanobacterial toxins, lead poisoning and fluorosis
Monitoring	Technology to measure the water intensity of supply chain
	Technology to map water resources
	Water contaminant detection technologies
	Water metering and electronic billing services

Case Study: Engagement by the Norwegian Government Pension Fund

Norges Bank Investment Management (NBIM), which runs the assets of the Norwegian Government Pension Fund (the largest pension scheme in Europe) has begun to put pressure on more than a thousand companies in sectors with high water-related risks (food, agriculture, pulp and paper, pharmaceuticals, mining, manufacturing and power, and water supply) to improve on their water reporting so the fund can assess risk to earnings. The fund has holdings worth almost US$50 bn in these companies where it believes good water risk management could be critical to future performance.

NBIM is publishing water-related "expectations" for portfolio companies

The fund is shortly due to publish a list of water reporting and risk management "expectations" it has for portfolio companies. The new policy is aimed at companies with operations in sectors and regions that are exposed to water scarcity, water pollution and water-related risk. The fund has identified seven high-risk sectors when they review global investments, one of which is the water supply industry.



The Norwegian Pension Fund uses RepRisk® to screen for environmental risks in their portfolio. Kristin Halvorsen, Minister of Finance, Norway, spoke at the World Economic Forum on the need for Responsible Management of Government Pension Funds. Her team is one of the leaders in engagement on global ESG issues and is currently focused on water sustainability.

The Head of Corporate Governance of NBIM, Anne Kvam, stated in August 2009 "The global water shortage represents a financial risk to the fund. We believe that investors should receive sufficient information to be able to assess how risk related to water scarcity, regulations and higher water purifications costs can affect a company's profits."

Case Study: Hyflux Water Trust

One interesting business model, championed by Hyflux Ltd <HYF:SP>, is to focus on water infrastructure for private sector players with specific water quality needs. This results in an asset-heavy balance sheet and high funding costs. Hyflux manages its exposure to this via the launch of the Hyflux Water Trust <HYFT:SP> on the SGX. This Trust was the first pure-play global Water Investment Trust to be listed on a securities exchange in Asia and it provides investors with an opportunity to invest in water-related infrastructure assets in China as well as other high-growth global markets such as India. On listing it had invested in 13 water plants in China with a total designed capacity of 445,000 m^3/day and, as of Q2 2009, it has 533,000 m^3/day designed capacity. Its target over the next five years is to increase plant portfolio to 1,000,000 m^3/day in total designed capacity. Its managers pursue yield accretive acquisitions and attempt to deliver long term, regular and predictable distributable income for investors. Target companies are involved primarily in the treatment, clarification, purification and/or distribution of raw water, seawater, wastewater, and/or recycled water.

Hyflux Water Trust is the first Asian-listed water trust



Source: Hyflux Water Trust.

Figure 1: Assets in Hyflux Water Trust's portfolio (as of Q2 2009)

Facility	Site	Industries in Concession Area	Type	Period Concession	Concession Capacity
Beichen Wastewater Treatment & Water Recycling Plant	Tianjin	Electromech. Manufacturing, biopharma, auto parts, food & beverage processing, new materials, rubber	BOT	30 years, from Dec 2008	WWTP: 100,000m3/day WRP: 50,000m3/day
Changshu Wastewater Treatment Plant	Jiangsu	Telecom, sophisticated machinery, auto spare parts, high tech textile, modern service	BOT	27 years and 2 months, from Oct 2004	60,000m3/day
Dafeng Water Treatment Plant	Jiangsu	Biochem	BOT	30 years, from Feb 2008	20,000m3/day
Guanyun Water Treatment Plant 1 & 2	Jiangsu	Auto, pharma, steel, tyre manufacturing	BOT	WTP 1: 30 years, from Nov 2008; WTP 2: 30 years, from Dec 2008	100,000m3/day
Langfang Wastewater Treatment & Water Recycling	Hebei	Water recycling, machinery, telecom and auto component manufacturers	TOT	25 years, from Jun 2007	WWTP: 80,000m3/day, in discussion to expand the concession capacity to 150,000 m3/day WRP: 40,000m3/day
Liaoyang Wastewater Treatment Plant (with Recycled Output)	Liaoning	Mining, metallurgical, cement and tourism	BOT	Liaoyang WWTP, 30 years, from Oct 2007; Liaoyang WRP, 30 years, from Apr 2008	WWTP: 60,000m3/day WRP: 50,000m3/day
Mingguang Wastewater Treatment Plant	Anhui	Food Processing, pharma, machinery, electronics	TOT	30 years, from Jul 2008	30,000m3/day
Taizhou Wastewater Treatment Plant	Jiangsu	Machinery, electronics, textiles, garments, auto parts, petrochems,	BOT	21 years and 4 months, from May 2005	20,000m3/day
Tiantai Wastewater Treatment Plant	Zhejiang	Breweries, pharma, chems, tourism, rubber products, silk, textiles and car interiors	BOT	21 years, from Jun 2004	20,000m3/day, currently in discussion to expand the concession capacity to 40,000 m3/day
Wuxi Wastewater Treatment Plant 1& 2	Jiangsu	Machinery and textile dyeing	WWTP 1: BOT WWTP 2: TOT	WWTP 1: 30 years, from Nov 2005; WWTP 2: 30 years, from Jun 2008	30,000m3/day (Combined)
Yangkou Water Treatment Plant	Jiangsu	Fine chems, pesticides, pharma intermediates	BOT	30 years, from Nov 2005	20,000m3/day
Yangkou Rudong Wastewater Treatment Plant	Jiangsu	Chems, textile, machinery, leather processing	BOT	30 years from expiry of transition agreement with administrative authority	100,000m3/day
Yangzhou Wastewater Treatment Plant	Jiangsu	Petrochem, basic chems, synthetic materials, fine chems, petrochem logistic	BOT	20 years, from Jul 2008	40,000m3/day
Zunhua Water Treatment Plant	Hebei	Processing	BOT	30 years, from Dec 2008	40,000m3/day

Source: Hyflux Water Trust. NB: Hyflux has granted the Trustee-Manager a ROFOAR on all water-related infrastructure assets owned by the Hyflux Group. ROFOAR is the 'rights of first offer, rights of first refusal' agreement between Hyflux Ltd (the 'Sponsor') and Hyflux Water Trust.

SPOTLIGHT: WATER TREATMENT COMPANIES LISTED ON THE SINGAPORE EXCHANGE

There are many advanced water treatment companies operating in China that are listed on the Singapore Stock Exchange (SGX). Many are involved in implementing technologies for the analysis and monitoring of water quality, wastewater treatment, and drinking water purification. SGX aims to establish itself as a hub for listing of water companies, many of whom are providing solutions to the complexities of water management in China.

Company	Description	Large Institutional Holders (% Held)	Stock Code	Market cap ($$m)	Free Float (m)
Hyflux Ltd.	Designs, builds and sells water and wastewater treatment plants including seawater desalination plants and membrane systems. Also focuses on raw water purification, wastewater	- Pictet Asset Management (2.28%) - SAM (2.00%) - Invesco PowerShares Capital Management (1.72%)	HYF:SP	1,586.62	334.4
Epure International Ltd.	Manufactures, constructs and operates turnkey water and wastewater treatment plants.	- SAM (5.37%) - Nordea Investment Management (Denmark) (1.84%) - HSZ (Hong Kong) (1.49%) - Nomura Asset Management (1.18%)	EPUR:SP	748.2	460.5
Sinomem Technology Ltd.	Develops advanced membrane materials and processes employed for water and wastewater treatment and environmentally friendly production processes in various industries.	- SAM (4.35%) - RBC Asset Management (Ireland) (3.83%)	SINO:SP	773.602	230.5
Memstar Technology Ltd.	Conducts R&D activities as well as manufactures polyvinylidene fluoride	none disclosed	MEL:SP	252.302	80.5
United Envirotech Ltd.	Designs, fabricates, installs and commissions membrane based water and	- Dimensional Fund Advisors (0.08%)	UENV:SP	135.414	174.3
Asia Environment Holdings Ltd.	Provides consultancy design, production, construction and engineering services for water and wastewater treatment systems; R&D on water and wastewater treatment equipment and techniques; manufactures fabricates, and installs generic and custom-manufactured	- Kumpulan Sentosa Cemerlang Sdn. Bhd. (11.68%) - Morgan Stanley IM (Singapore) (3.52%) - UBS Global Asset Management (Singapore) (3.51%)	AENV:SP	126.478	201.6
Bin-Treat Technology Ltd.	Offers Best Micro-Organism System (BMS) turnkey wastewater treatment services, BMS and Aqua Mate product sales, and Build-Operate-Transfer (BOT)/Transfer-Operate-Transfer (TOT) water service fees.	- Shah Capital Management (13.78%) - Templeton Investment Counsel (4.95%) - Franklin Templeton Investments (4.81%)	BIOT:SP	59.607	147.9
Sino-Environment Technology Group Ltd.	Designs, assembles, installs, tests and commissions various equipment relating to industrial wastewater treatment.	- Stark Investments (4.80%) - Portia Investments (Netherland) (4.77%) - DnB NOR Asset Management (Asia) (2.26%)	SINE:SP	Suspended	349.1

Most institutional investors will find it difficult to invest in these companies due to lack of transparency on contracts, relatively low liquidity and market capitalisation and short track records. However Hyflux, with a market cap of over S$1.6bn, and Epure, with a market cap of $S750m, are theoretically investable for many funds. As of 13 November 2009, trading of Sino-Environment Tech and Asia Water Tech had been suspended. Figure 1 summarises the key water treatment businesses listed in Singapore.

Figure 1: Select water treatment firms listed in Singapore

Source: Company Websites, Reuters, Bloomberg.
Market capitalizations are based on the market close of 13 November 2009.
% Held: Percentage of all ordinary shares outstanding that the institution holds, as of the last reported filing.

FUNDS WITH WATER POLICY STATEMENTS

Fund	Based in	Water Policy Statement
Four Winds Capital Management	UK	Overtly sustainable mission statement, nothing specifically on water. Aqua Resources Fund
USS	UK	Maintains a policy of engagement with companies, if concerns are not understood and responded to, USS adopts a policy of open discourse and public participation
F & C	UK	Active engagement & proxy voting is practiced e.g. the company engaged with China Shenhua on biodiversity risk management. When F&C invests in property it claims to monitor and asks that company management set targets for water reduction. The group has a stated inclination towards investment in water infrastructure and management companies with strong ESG policies which resulted in an investment in Manila Water
Calstrs	USA	Calstrs considers over 20 risk factors before investing, environmental risks being one. Potential reduction of local water quality is one of the environmental factors considered
Newton Asst Management	UK	Newton has not stated public their policy regarding water, although it follows clear sustainability/responsibility policy. In the Japanese market it voted for the removal of 7 of East Japan Railway Co's board directors resulting directly from illegal river water diversion.[i] The group also holds the Asian supply chain company, Noble Group, and has been encouraged by attempts to offset carbon. The investor has, however, made specific mention the need for management to set targets for (among others) CO2 emissions and water use.
The Ethical Funds Company	Canada	Ethical Funds publishes an annual Focus List of themes and the respective companies to engage with. This year 'safeguarding water' was one of their themes.
General Board of United Methodist Church	USA	Given that only 8% of all water used annually is for domestic households, while 23% is for industry and 69% is for agriculture, the Church has pledged to 'encourage and commit to good water management by all entities, corporations, and communities' and 'shall push companies that pollute to provide funds and services to clean waters that they pollute' (Resolution 1029). The General Board has also challenged efforts by private companies to assume greater control of local water resources and has asked them to measure the impact of their operations on the local water table and to subsequently implement water conservation measures.[ii]
Norges Bank Investment Management	Norway	Norges Bank has a lengthy, detailed water management policy and expectations, including a section which expects 'companies to assess and monitor the social and environmental impact of the company's business operations in regard to water' and to 'implement appropriate sustainable water measures'[iii]
Henderson Global Investors	UK	'Only focuses on companies whose goods and services facilitate the good management and conservation of water… water distribution and management (providing water purification, distribution, wastewater treatment), water equipment and technologies (providing solutions enabling more efficient and better use of water)'. Henderson is known to have invested in Severn Trent (UK) and Veolia Environment (France)[iv] who both have projects in China.
Generation Investment Management	USA	Assesses impact of both direct and indirect use of water, lengthy consideration of all water based issues [v]
Standard Chartered	UK/Singapore	'Some of our markets are among those most affected by scarcity and poor quality of water and this situation is expected to worsen because of climate change and population growth. In 2008, we carried out a strategic review of investment opportunities to identify how best to support water-related projects. We already act as lead arranger in water sector project finance deals in the Middle East, and are developing a similar business in Asia. Principal finance is active in making investments through the recently established Asia Infrastructure Fund including a $71 million investment in Chinese water supply and waste-water treatment companies'[vi]
Lend Lease	Australia	Aims to be zero net water usage in its designs, construction and development. 'Aims to: avoid potable water consumption, improve efficiency of water use, foster increased access and sustainable use of water in the community and environments, develop solutions to enhance the built environment's mimicry of the earth's hydrological cycle'[vii]
China Environment Fund – Tsing Capital	China	Require investee companies to report on water pollution[viii]

Source: Company, Responsible Research.

FUNDS WITH A WATER THEME

Water ETFs
Claymore S&P Global Water Index ETF (CGW)
First Trust ISE Water (FIW)
Global Water Portfolio ETF (PIO)
Janney Global Water Indexes (JGI)
Lyxor ETF World Water
PowerShares Water Resources Fund (PHO)

Global water funds
CAAM Funds Aqua Global
Calvert Global Water Fund
KBC Eco-Water fund
Lyxor Alias Global Enhanced Water
Lyxor Dynamic Water Fund
Pictet Funds Water fund
S&P Global Water Index
SAM Sustainable Water Evolution Strategy (small and mid caps exposure)
Sarasin & Partners Sustainable Water Fund
Swisscanto Equity Water fund

Asian water funds
Allianz RCM Global Water Trends Fund
AmKonzen Asia Water Fund
CAAM Aqua Global Fund
CLSA Clean Water Asia Fund
CLSA Clean Water Asia Long Only Fund
Hanwha Global Water Fund
KBC Water Fund
KDB S&P Global Water Equity Fund
KITMC Korea World-wide Water Equity Fund
Nomura Aqua Investment (with hedge, administered by SAM)
Nomura Aqua Investment (without hedge, administered by SAM)
Samsung Global Water Fund

Source: Company, Responsible Research.

PRIVATE EQUITY INVESTMENT

The National Development Reform Commission recently reported that for the fourth quarter of 2008, investments in China's rural water resources and energy facilities topped US$3.2bn.[299] Ray Cheung, senior associate at the World Resources Institute's Markets and Enterprise Program commented that private investors seeking to take advantage of commercial opportunities should remain cautious: the country's green industries still face a variety of challenges, and investors will first have to carefully navigate these to be successful.[300]

Whilst many private equity investment opportunities related to water exist in China all, whether supply, technology, services or operations oriented, must be rigorously tested in terms of the underlying business model and take into consideration the following observations:

Whenever water is not fully priced, **water-saving technologies** often have limited materiality until there is a shortage. As water becomes scarcer and the quality deteriorates, many industrial facilities will be forced to react. Often businesses will not have received price signals, but it will be the absolute condition that will force them to buy new equipment and re-engineer processes. This will result in some sector-specific business opportunities for low-water usage technologies as companies play catch up.

Water-saving technologies often have limited materiality

Unfortunately, very few of the investor-accessible business models give private equity players the opportunity to invest in **watershed management**, which is still fully government-driven. Until this segment of the market opens up to investors, there is a feeling within the private equity industry that the China water story may largely be an end-of-pipe capital investment saga with high volatility, low margins, and lots of undifferentiated growth.

Private equity investors who have begun to incorporate an ESG overlay may also find that the sector is fraught with **governance risk** and may therefore decide, despite some of the innovative technologies delivering sustainability, the entities that own the intellectual property are not truly investable in the traditional sense of socially responsible investing.

Until the government establishes **clear policies** and **revenue sharing frameworks** around water as a commercial good, many private equity investors will stay away from traditional water services but may focus on low cost 'consumable' technologies such as membranes that will see growing demand as government spending increases. Any opportunity to transfer **high tech but low cost solutions** to China should be a major focus area of private investors into the emerging water market there.

The **water services** market is also a challenging environment for private equity investors in China. Operating terms are often imbalanced for long-term, sustainability-oriented investors. Most corporate investors prefer concessions where they can holistically manage the system and capture the upside from investments and efficiency gains. Ultimately, private investors in China are typically only offered the opportunity to invest in BOTs, which are essentially a cost-of-capital play in a market with no long-term debt market and plenty of tariff risk. In general, this works only for certain private equity players who believe that they can build a diversified portfolio of water holdings and sell it on to an investor with a lower cost of capital or better government relations to lower the risk of tariff surprises.

The water services market is often only a cost-of-capital play for private investors in China

Case Study: Robeco TEDA Sustainable Private Equity Fund to Launch in 2010

A joint venture between Dutch firm Robeco and the Tianjin Economic - Technological Development Area (TEDA) plans to launch a Sustainable Private Equity Fund by the first quarter of 2010. The TEDA (Tianjin) Investment Management Co. intends to raise RMB4bn (US$588m). Christiaan Kaptein, of Robeco, says, "This is the first renminbi-denominated cross-border private equity fund with a focus on sustainable investment."[301] The Agricultural Bank of China will be the custodian and the financial administrator of the upcoming Sustainable PE Fund. Domiciled in the Tianjin-Binhai Area (Northern China), the fund will invest in companies that improve energy, water and other resource productivity; lessen environmental impact of waste and emissions; and generate economic value by lowering costs with a focus on Chinese companies. (Source: Robeco, Reuters.)

ASSESSING WATER RISK IN YOUR PORTFOLIO

The following questions are adapted from '*Water Scarcity & Climate Change: Growing Risks for Businesses & Investors*', a Ceres/Pacific Institute report. They highlight initial issues that can promote a dialogue between company management and shareholders.

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?
	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?
Water Risk Assessment	**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?
	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?
Water and Business Strategy	**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?
	Does the company disclose water-related risks in its stock exchange filings?
Stakeholder Engagement	**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?

Source: Ceres/Pacific Institute



ACHIEVING A SUSTAINABLE WATER FUTURE



Drip irrigation, as shown in the image, is a powerful water-saving investment

This section highlights the trends that may have an impact on the water crisis in the next few years and reviews the solutions that are being adopted and suggested.

Issue	Opportunities and Solutions
Institutional	1. Government Responses 2. The ADB and public private partnerships 3. Integrated Water Resource Management (IWRM and the Global Water Partnership) 4. The UN backed CEO Water Mandate for improved disclosure
Regulatory	1. Evapotranspiration quotas 2. Water demand management 3. Green building codes
Technological	1. New water services 2. Desalination 3. Advanced wastewater treatment 4. Waste water recycling at power generation plants 5. Biodegradable beverage bottles and water use in recycling
Financial	1. Incentives and initiatives 2. Investment in sewage treatment and water purification
Management	1. Water basin management

SOLUTIONS

Institutional Solutions

1. Chinese Government Responses

At the recent World Water Forum, the Minster of Water Resources, Chen Lei, recognised the specific vulnerability of China to floods, droughts and typhoons and outlined the steps that the government thought necessary to prevent future loss of GDP (around 2.5% average p.a. since 1990) to the physical constraints of flooding and drought. He did not include the losses due to toxicity but did highlight the geographical disparity, as this report has done, of the domination of the South & East by industry and agriculture.[302]

He alluded to the effects of climate change, noting that seven typhoons normally hit Mainland China on average but, in 2008, 10 typhoons hit with unprecedented severity, landing onshore at an earlier point in their life cycle. Ice floods, which normally have a great impact on Northern Chinese rivers, are also increasing and in the 2007-2008 winter, the Yellow River Basin was hit by the most severe ice floods in the last 40 years. In fact, 2008 was a particularly taxing year on his Ministry as they also had to contend with the hydrological outcomes of the May 12th Earthquake which damaged around 2,500 reservoirs and 1,200 km of embankment and had an impact on over 800 hydropower stations. Over 100 reservoirs suffered from landslides that affected the supply of potable water.

The Minister described how the government was changing its emphasis from flood control to flood management and from drought relief to a process of integrated planning taking urban, rural and ecological needs into consideration. Measures to be taken at a government level include:

- Giving greater powers and budget to the State Flood Control and Drought Relief Headquarters. The General Commander is now a vice premier of the State Council. The priority is to build capacity at a river basin level for flood control and drought relief for the Yangtze River, Yellow River, Huai River, Hai River, Songhua River and Pearl River.
- Improving accountability of responsibility for flood defence at all levels within government
- Improving infrastructure by repairing defective reservoirs, improving drinking water supply in rural areas, improved irrigation and emphasising water conservation. The tasks ahead are substantial but, so far, they claim to have developed 280,000 km of flood embankments, 860,000 reservoirs, and 97 key flood retention areas. There is 660 billion m^3 of water supplied for all purposes, including irrigating 58m ha of farming land.
- Improving local level training on water basin management
- Improving Emergency Response Mechanisms - the National Flood Control and Drought Relief emergency planning system. All agencies have had to make flood and drought plans. Flood warning, regulating and forecasting systems have been strengthened with around 34,000 hydrological or precipitation stations and more than 8,600 flood reporting stations built all over the country.
- Increasing regulations – so far these have included the Water Law, Flood Control Law, Flood Control Regulations, Drought Relief Regulations and Temporary Regulations for Compensation in Flood Retention Areas. The Minister has referred to the need to ‘enhance the legal framework’ and to ‘coordinate the rights and interests of all parties’
- Using more technology and new scientific developments to support flood control and drought relief, especially advanced monitoring equipment and satellite remote-sensing data
- Collaborating through the UN networks on methods for disaster mitigation, evaluation of natural disasters
- Establishing effective international technical cooperation mechanism, encourage research and development, application and transfer of technologies in terms of climate change, extraordinary flood and risk management of water.

2. The Asian Development Bank promotes Public Private Partnerships (PPPs)
The Asian Development Bank (ADB) is actively reviewing investment options in China water PPPs. So far it has invested US$4m to buy 40% of a new company, Asia Infrastructure Project Development Company (AIPC) that will help promote Public Private Partnerships (PPPs) in water services in China. The initiative will help local governments develop projects to improve water supply, sanitation and wastewater treatment by providing feasibility assessments, planning, design and other services. Partnering ADB in this venture are three Singaporean companies with extensive experience in water and sanitation - United Engineers, Konzen Environment and Crest Spring.[303] ADB is also currently researching urban wastewater, sewage treatment, water supply, and water resource management projects to co-invest in China.

3. Integrated Water Resource Management (IWRM) and the Global Water Partnership
The 2002 Chinese Water Law strongly promotes 'Integrated Water Resource Management', a concept based on cooperation between all the sectors that depend on water resources including forestry, agriculture, public works and the private sector. The Millennium Development goals (MDG's) were the driving force behind the formulation of this new concept in 2000.[304]

The 2002 Water Law gave Integrated Water Resource Management its legal foundation

Global Water Partnership's (GWP) definition of IWRM is widely accepted. It describes it as 'a process that promotes the co-ordinated development and management of water, land and related resources, in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems'.[305] Indicators are based on milestones to achieve the MDG.

Water experts have strongly advocated IWRM to combat the water crisis. Liu Ning, chief engineer of the Ministry of Water Resources, has noted that 'without integrated water resources management (IWRM), China's total annual water supply will reach 800 to 900 billion cubic metres in the next 25 years or hit the limit of the country's total water supply'.[306] Another expert has commented: 'It is a must for China to use IWRM for its future sustainability as it can help all concerned authorities promote the co-ordinated development and management of water, land and related resource'.[307]

Global Water Partnership, founded in 1996 to safeguard water resources within the framework of sustainable development, has formalised mechanisms for sharing good practices via a global network of organisations that are committed to sustainable water resources management via IWRM, based in fourteen sub-regions and seventy countries. The short-term objective of the Global Water Partnership in China is to move from dissemination of information and discussing concepts to the promotion and implementation of IWRM.[308] [309]

Several partnerships exist to study and test good IWRM practices in China. For example, UK's Department for International Development (DFID) has invested more than US$15m in a Water Resource Demand Management Assistance Project (WRDMAP). In the Northwest province of Gansu, headquarters of high-tech agricultural producer Yasheng Group <600108:CH>, and Northeast province of Liaoning, a key industrial base. The consultancy Mott McDonald Group Ltd. is advising on the project.[310]



GWP China
Training in Beijing

Source: GWP China

4. The CEO Water Mandate promotes better reporting on water issues
The CEO Water Mandate is a global initiative devised to give companies a collaborative platform to engage and address the global challenges posed by water, and to contribute towards the vision of Millennium Development Goals. It is a voluntary commitment by companies to address the problems associated with the use of and access to water. The initiative focuses on comprehensive approaches to water management:

Direct Operations
Supply Chain and Watershed Management
Collective Action
Public Policy
Community Engagement
Transparency

Companies in China are encouraged to endorse the CEO Water Mandate. They would then be required to publish and share water strategies in sustainability or annual reports, using, where applicable, the GRI Guidelines for reporting. They would also be expected to engage with and support local communities and be advocates for water sustainability in local and international public policy forums. The Initiative believes that collaborative action is essential for progress in water efficiency. Collectively, firms can produce greater pressure and superior results, whether in association with each other, NGOs or intergovernmental organisations.

Two Chinese firms are CEO Water Mandate signatories

We understand that two Chinese firms have so far become signatories – the Aluminum Corp. of China Ltd <2600:HK>and Hong Kong Beijing Air Catering.

Regulatory Solutions

1. Evapotranspiration quotas to drive agricultural water efficiency
We have emphasised throughout our report that agriculture still uses the vast majority of water in China. Investment in 'sustainability innovations' in this critical sector will be crucial to solving the water crisis. One such promising innovation is the 'evapotranspiration quota' system that could be used, particularly in the arid Northern regions to alleviate local shortages. Agriculture in the northern river basins uses upwards of 70% of the total water in the system versus around 50% in the south. It is estimated that wasteful irrigation techniques mean that only around 45% of that withdrawn is actually used for crop irrigation,[311] with the balance being lost through poor piping infrastructure or run-off. This is a significant cause of water inefficiency in China.

Water experts now recommend gauging water efficiency based on calculations of evapotranspiration (ET), a combination of general evaporation and plant transpiration, rather than looking at total water withdrawals from surface and groundwater. ET monitoring systems, aided by remote satellite sensing, can reflect more accurately how crops and trees actually use water. An ET quota system provides incentives to agricultural producers to lower overall ET not directly related to plant growth. Evapotranspiration can be substantially reduced through the use of dry-seeded species instead of traditional paddy rice, night irrigation (when evaporation is lowest), mulches that trap moisture and using covered pipes instead of open ditches. Diligent weeding can also reduce total water usage.[312]

Water experts recommend measuring water efficiency based on evapo-transpiration

The US$33m Hai Basin Integrated Water and Environment Management Project is piloting the ET quota system, as part of a larger water resource management effort, to control pollution discharge into the Bohai Sea, an important fishery.[313]

2. Water demand management - higher water prices and metering
Stakeholders and government officials have recognised that managing water demand is far more effective than managing supply, where the emphasis has previously been. Encouraging water conservation and efficiency are key components of integrated water

resource management (IWRM), and this is slowly being adopted. Higher water prices and regulating the metering of water provision are two ways to manage water demand and foster households and industries to be more water conscious.

3. Green buildings to drive water efficiecy

Water efficiency in buildings has long-term social and environmental implications

Another main area of interest in China is to improve national water efficiency by introducing more stringent building codes. Buildings consume about 20% of the world's available water[314] and, as home to around half of the world's new building construction, China's incorporation of energy and water efficiency into building design, operations, and management has long-term implications on society and the environment.

So far China has constructed almost 3 billion m^2 of 'energy-saving' buildings, accounting for over 16% of existing construction space. From 2010, all new urban buildings will have to meet new design criteria for reducing energy use by 50% to 65%, depending on the location.[315]

In order to improve building standards on water and energy efficiency the Ministry of Housing, Urban and Rural Development (MOHURD) has developed a 'Green Building Label' and a 'Three Star' scheme. The scheme has two components: the Green Building Label (GBL) and the Green Building Design Label (GBDL). The former is only awarded to buildings that have been occupied for at least one year. The NRDC, an environmental NGO, notes that only ten designs have been awarded the GBDL in two years of operation, whilst no building has yet received the GBL certification.[316] Chinese property developers and project managers have tended to favour the international certification 'Leadership in Energy and Environmental Design' (LEED) and more than 100 buildings have sought certification.[316] The 3-star building certification, the most environmentally friendly under the scheme, must be approved by MOHURD's Beijing office. Buildings with 3-star certification include the offices of the Shanghai Research Institute of Building Sciences, the Shanghai 2010 World Expo Center and Vanke City in Shenzhen.[317]

It is likely that the government will set more aggressive green building codes with specific water targets in the 12th Five Year Plan (2011-2015), which is already being drafted. The government's plans have so far focused more on energy, and water use has been somewhat neglected. The draft of the Water Efficiency Code for New Residential Building is currently open for comment.

Technological Solutions

1. New water services

There are a huge number of new technologies servicing the water industry in Asia. GE Water, for example, is working with Chinese corporations such as Baosteel Group to increase its water efficiency and is using its new membrane bioreactor (MBR) technology at Taihu, China's third largest lake. There are also several next-generation desalination technologies being adopted and adapted for use in China. One interesting company to watch is the US based Energy Recovery, Inc. <ERII:US>, which had a US$69m IPO in 2008. The company produces energy recovery devices for salt-water reverse osmosis (SWRO) desalination systems by forcing seawater through filtering membranes under high-pressure conditions to produce freshwater. Other solutions are more service oriented, focusing on operational and management experience rather than cutting-edge technologies or products. Veolia <VIE.FP>, Sembcorp <SCI:SP> and Hyflux <HYF:SP> have all established a strong presence in China and provide utilities services, seeking to finance, build, own and/or operate water treatment, recycling or distribution infrastructure throughout China.[319]

The use of new technologies in China's water and wastewater treatment

Most Chinese water and wastewater treatment technologies have been poor financial performers. However, the processing of the wastewater from industry, agriculture and domestic use will become more important as the quality of water in the Chinese water system deteriorates. Research by the Israeli Chamber of Commerce in Beijing has highlighted the poor quality and performance of most Chinese water and wastewater treatment technologies, giving more advanced foreign solutions a competitive edge. Companies which sell robust technologies and technologies have, they found, achieved excellent sales in China, particularly when imported technologies and equipment are used.[320]

Most Chinese water technologies exhibit poor quality and performance

2. Desalination – an energy intensive 'solution'

To lower its carbon footprint, a desalination plant can use wind energy facilities

The 12 largest desalination plants in China have a combined throughput capacity of almost 2 million m3 of water per day, as Figure 1 describes (next page). In July 2009, Befesa <BMA.SM> announced that it had completed financing of the €135m Design-Build-Finance-Operate 100,000 m3 water/day project in Qingdao, a major seaport on the Yellow Sea. The plant uses reverse osmosis processing. Befesa claims that it is the first desalination project to use a project finance structure and be 100% financed through local banks. Agricultural Bank of China is the lead bank, with China Export-Import Bank, China Construction Bank and China Merchants Banks also involved. The syndication is providing non-recourse financing to shareholders for 70% of the investment.[322]

In an interview with Global Water Intelligence, Carlos Cosín, Befesa's international director, explains, 'Many municipalities are now trying to understand exactly what we have done, and we have, a lot of proposals to develop more projects in the same province, and even outside. [323]

A major drawback to the technology is that desalination plants are highly energy intensive. The two main desalination processes, reverse osmosis (RO) and multi-stage flash distillation (MSF), require about 4-6 kWh per m^3 water and 23-27 kWh per m^3, respectively.

Technological improvements and economies of scale can improve those figures to approach a theoretical limit of 0.86 kWh per m^3 of water.[324] One solution being developed around the world, notably in Sydney, Australia, is to position the plants next to renewable power facilities to provide the energy.[325]

China has the potential to use its rapidly growing wind power industry to fuel future desalination plants. Shandong Province, where Befesa's Qingdao Desalination Project will be constructed, has substantial on and off-shore wind resources. Qingdao Huawei Windpower Co. Ltd's 16.35MW-capacity wind farm, for example, produces about 30,000 MWh per year.[326]

3. Waste Water recycling at power generation plants

Regulations push power plants to use brackish water reverse osmosis solutions

Facing increased environmental regulations from Chinese government, power plants have begun to use brackish water reverse osmosis solutions for reusing the blow down from their cooling towers as boiler feed water. Recycling systems for cooling tower blow down are common in fossil fuel power plants in the West because of the large volume of wastewater needed.

Levels of contaminants in this water following recycling vary substantially with location, technology and seasonal but all wastewater has to be then treated for hardness, alkalinity, silicon dioxide and sulphate presence following re-use in the cooling towers. However, this new, integrated technology will reduce the need for thermal power plants to take water directly from the surface and ground supplies.

Case Study: EcoTech International (ETI)

This company, started by Robert Watson, founder of the LEED green building rating system in the USA, aims to bring green building expertise, innovation and key clean-tech technology solutions to China. ETI estimates that the potential market for energy-efficient green buildings in China alone will be over US$55bn within five years.[318]



Source: Chyau FWU Properties Co Ltd

Case Study: Parkview Green, Beijing may earn China's first LEED Platinum Award

At the time of writing Parkview Green, a development of Hong Kong Parkview Group Ltd <207:HK>, is reportedly in line to recieve a platinum award from the US LEED green building rating system. The rating system offers four certification levels for new buildings – certified, silver, gold and platinum. Credits are accrued in five design categories – sustainable sites, water efficiency, energy and atmosphere, materials and resources and indoor environmental quality. Currently about 150 buildings in China have received LEED certification but none has reached platinum standard. Parkview Green's air conditioning is extremely energy efficient and there is a "grey water" recycling system.

Case Study: Meicun uses ultra-filtration technology

Meicun Wastewater Treatment Plant on Lake Tai, the winner of the Global Water Intelligence's Industrial Water Project of the Year, uses GE Water's 'Zenon ZeeWeed' ultra filtration technology to treat the nitrate-rich water that gives rise to the infamous algae blooms. The first 30,000m3/day module was completed within six months of the contract signing and is now the only large-scale application of GE's membrane bioreactor (MBR) technology. The project cost around US$10m and has a capacity of up to 100,000m3/day.[321]

Figure 13: Map of desalination plants in Eastern China



Largest planned and existing desal plants

Xilinhaote Water Works (Desal), o, 50,000 m3/d

Shougang Jingtang Steel company (Desal), MED, 40,000 m3/d

Tianjin Sdic (Desal), MED, 100,000 m3/d

Lubei, Wudi County, Binzhou City, Shangdong Province (Desal), RO, 40,000 m3/d

Caofeidian Desalination Plant (Power/Desal), RO, 950,000 m3/d

Wenling City, Zhejiang Province (Nuclear Power/Desal), MSF, 100,000 m3/d

Zhoushan City Liuheng Islandi in Zhejiang Province (Desal), RO, 100,000 m3/d

Xiangshan county, Ningbo city, Zhejiang province (Desal), HYB, 1000,000 m3/d

Fujian Coal Group (Power/Desal)

Guohua Cangdong Power Company (Desal), MED, 50,000 m3/d

Zhanjiang Project of Baoshan Iron & Steel Co., Ltd (Desal), 150,000 m3/d

Zhejiang Zhoushan and Guangdong Nanao (Desal), RO, 100,000 m3/d

Hebei Province- A total of eight desalination projects is planned

Cangzhou Coastal Port Chemical Industry- The ongoing extension of the Guohua Cangdong Power is underway

Qingdao Soda Ash (Formerly Qingdao City Shangdon)- Construction has now commenced on phase two

Befesa completes financing of US $194 million Design-Build-Finance-Operate project in Qingdao. Planned capacity 100,000 m3/s, RO

Source: desaldata.com, Befesa. Note on abreviations: RO= reverse osmosis, MED= Multiple Effect Desalination plant, MSF = Multi-stage flash distillation process, HYB = Hybrid plant.

Case Study: The Gaojing Power Plant reduces groundwater use

For more than 40 years, the Gaojing Power Plant, one of the earliest power plants built by Datang Corporation in Beijing, has supplied heat and electricity to the city of Mengtougou. Since 2007 the plant has changed from using surface water to using secondary effluent from the Gaobeidian Municipal Wastewater Treatment Plant. In August 2009 Dow Water and Process Solutions announced that its partnership with plant management helped the plant achieve over 70% reuse of the cooling tower blow down after five years of operation. [327]

4. Advanced wastewater treatment technologies

Several new technologies are hoped to improve water quality in China in the coming years. Below is a selection of the most promising:

Municipal Wastewater	Standardized water and wastewater treatment equipment
	Energy-efficient technologies and phosphorus-removal technology
	Anaerobic biological reactors anaerobic filters, anaerobic attached film expanded beds
	Immobilized microbe technology
	Membrane technology
	Variable-speed multi-pole centrifugal blowers
	Sludge treatment and disposal equipment
	Packaged thickening and dewater belt presses
	Horizontal screw centrifugal dewatering
	Automatic control equipment
Industrial Wastewater	High-concentration organic wastewatertreatment technology and equipment
	Membrane separation technologies, such as reverse osmosis, nano-filtration, ultra-filtration, micro-filtration and ion exchange
	Wastewater deep treatment and reuse technology and equipment in industry sectors, such as surface treatment, coal and mining, pulp and paper, metallurgy, petroleum exploitation, electronics, machining, and chemical sectors
	High-efficiency ultraviolet and disinfection devices
Bio-treatment agents	Water treatment biological and enzyme agents
	High-efficiency flocculation and coagulation agents
	Pollution-free bactericide
	Biological de-nitrification
	Anaerobic fluidized bed reactors

5. Waterless recycling of plastic bottles – development of biodegradable bottles

As discussed previously in this report (*See Intensive Water Users*), plastic bottled water sales have grown rapidly in China, bringing a new problem for the bottled beverage industry - the recycling and disposing of the polyethylene terephthalate (PET) bottles. The plastic recycling industry is, ironically, an extremely high water intensity industry. Plants can use over 350,000 litres of water per day.

Plastic recycling is a very high water intensive activity

ENSO Bottles, a U.S.-based firm, has developed a technology to manufacture biodegradable PET bottles. On 3 June 2009 the company announced that third party laboratory testing validated the biodegradability claim.[328] ECO_2Plastics <OTC:EOPI>, has also developed a waterless cleaning and recycling process with Honeywell <HON:US>[329] which, it is hoped, will, one day, reduce the water footprint of the beverage industry.

Financial Solutions

1. Government incentives and initiatives
The government's new focus is on replacing high-polluting industry with environment friendly ones. Amongst many other incentives planned for the sector, in October 2008, the Beijing government announced that it would provide companies who stop highly polluting behaviour with incentives up to RMB2.3m (US$338,000) per company. One official was quoted as saying: "The amount of money handed out would depend on how much pollution was cut, or how much water and energy were saved'.[330]

In February 2009 the Chinese Ministry of Water Resources promised to introduce the strictest levels of water resource management, paving the way for a sustainable economy. A top official was quoted as saying 'from now on, water authorities would prioritise the management of water resources to intensify administration and supervision of reasonable exploitation, efficient utilisation, overall distribution and protection'.

The following initiatives were discussed:

- Water authorities to collaborate and set up 'security systems' for water management by strictly enforcing water-related laws and monitoring overuse of water.
- Reducing development support for high water consuming sectors such as steel
- Setting water quotas for all users with progressively higher pricing when user exceeds its quota.
- Promotion of water-saving irrigation methods
- Re-allocating water resources towards local environmental improvements and ecosystem rehabilitation

2. Crucial investment in sewage treatment and water purification
According to research on sustainable utilisation of Chinese urban water resources, China's total investment in the sewage treatment industry is expected to reach RMB200bn (US$29.4bn) for the 3 years 2008-2010. This indicates that China's sewage treatment industry has substantial market potential for rapid and sustainable development. Top government priorities are the prevention and control of pollution from agriculture and rural areas, as well as the evaluation and analysis of clean water policies, and the assessment and promotion of clean water technology. Water experts have highlighted the need to implement new technologies such as Ultra Violet light and ozonization to purify enough drinking water to supply the growing population.[331]

Management Solutions

1. Water basin management – complicated by regulatory fragmentation
As highlighted in the January 2009 World Bank report *Addressing China's Water Scarcity*, China must provide better legal protection and more open competition by overhauling its water management systems. Suggested measures included greater use of market-based instruments such as water rights, pricing and eco-compensation mechanisms.[332]

While the 2002 Water Law recognises the need for stakeholder consultation and the integrated management of surface and groundwater resources, many of the requirements have yet to be implemented at a local level. Despite the recent trend of combining various water-related agencies into a more unified water bureau in some city governments and converting government-owned water utilities into corporations, China's water resource management system is characterised by extensive vertical and horizontal fragmentation.[333]

ADDITIONAL CASE STUDIES

Case Study: China Water Industry Group invests US$90m in sewage treatment and water supply

China Water Industry Group, Ltd. announced in August 2008 that its wholly owned subsidiary was acquiring 100% of the issued share capital in Affluent Boom Enterprises Ltd. for around US$90m. Affluent is an investment holding company whose subsidiaries are involved in sewage treatment and water supply businesses in China. One of the subsidiaries is currently operating sewage treatment plants in Huizhou City, Sihui City, Huidong County, Boluo County (Guangdong Province) and Baoji City (Shaanxi Province), and one water supply plant in Tangshan City of Hebei Province, which is partially under construction and will commence operation in 2010. The total sewage water treatment capacity is around 480,000 tons/day, and the water supply capacity is around 180,000 tons/day.[334]

Case Study: World Bank entity invests in solid waste management in China

In July 2007 it was announced that the Multilateral Investment Guarantee Agency (MIGA), a World Bank Group member, issued over US$34m in loan guarantees for three water infrastructure projects in China. The guarantees insure investments in China's urban solid waste treatment and water supply sectors against non-commercial risks. One of the projects involves an almost US$28m investment by Golden State Waste Management Corporation involved in the restructuring and expansion of a solid waste treatment and power generation facility in Chaoyang, Beijing. MIGA also provided a $7m guarantee to Golden State Waste Management for a comprehensive solid waste treatment and transfer centre in Fengtai, Beijing.

Case Study: Earth Tech aims to double its investment in Chinese water supply to promote DAF

Dissolved air flotation technology is reducing chemical use in water treatment

In June 2007 it was reported that Earth Tech, a Tyco International company, plans to double its investment in China from the current RMB1.3bn (US$ 191m) to meet rising demand for urban water supply and wastewater treatment. The California-based company has identified 12 locations in China for its future expansion. The company recently renovated a water factory that is now the largest urban water facility in China to use Dissolved Air Flotation (DAF) technology. Using the technology, air is injected into the bottom of a water tank where tiny bubbles are formed and attach themselves to solids in the water. The bubbles, with the solids, float to the surface and are removed using mechanical scrapers. The process removes algae and other low-density particles and organisms. It could help reduce use of chemicals in water treatment by as much as 30%.[335]

CONCLUSIONS

Throughout this report we see how China has effectively harnessed its powerful rivers and tapped into ever-deeper aquifers to enable its incredible growth in industrial and agricultural production, domestic consumption and in the relocation of populations to previously uninhabitable areas. The pace of change has been stunning; in many areas, where farmers 20 years ago used shovels to access fresh water for irrigation, heavy machinery is now used to drill wells up to half a mile deep to hit underground reservoirs.

These final supplies of clean freshwater, however, are not being regenerated and the whole hydrological system is now under threat, despite recent announcements of mega-reserves being discovered in remote areas. Farmers in northern China already have to address the immediate challenge of meeting rapidly growing demand for fresh food from less land, with less water. Worryingly, tradeoffs are starting to be made between water for energy, food, industry and basic health and sanitation.

Simultaneously global warming is resulting in volatile rainfall patterns, more frequent monsoons and cyclonic activity in the South, increased run off from glaciers in the West, rising sea levels in the East and a greater likelihood of drought in the arid North. These factors combined mean that China will be one of the most affected nations on earth in terms of its water supply.

This 'perfect storm' is further complicated by the fact that producing a clean water supply for 1.4bn people, with currently available technology, results in huge increases in carbon emissions and energy usage. Vast amounts of electricity are required to process and deliver clean water, pump ground water from falling aquifers, transfer raw water from one river basin to another and bottle drinking water. Conversely, access to water is a vital consideration in the provision of energy; cooling thermal generators, exploiting oil sands, growing bio-fuel crops and producing ethanol are all energy intensive.

The government in Beijing is beginning to realise the cost of the clean-up after years of neglect of its waterways and underground reservoirs and the stage is set for the establishment of a new water industry where costs are internalised and end-users are encouraged to be more efficient and sustainable. Even though frameworks for managing natural resources in China are still under-developed in terms of personnel, effective internal management and accountability, more funding is being directed to the sector and the pronouncements of hydrologists and sustainability experts are being taken more seriously.

Obstacles to achieving water sustainability in China are still apparent in the inherent conflicts of interest and differing time horizons for investment returns for local governments versus national government bodies and resource agencies. At a local level change is coming fast. The new 'veto system' allows promotion of key local officials on criteria other than short-term financial performance, thus allowing critical environmental needs to be taken into consideration in decision-making and planning. Over the next few years, however, we see reporting lines becoming less confused, more accountability at senior levels, better enforcement of environmental legislation and more external review systems being introduced.

Importantly, we also expect the Chinese government and its agents to act quickly to address the inefficiencies in the current system and rapidly redirect its investment focus from water intensive heavy industries to 'greener' industries. Although tempting to believe that recent talk of environmental impact assessments and 'green' funding is pure political posturing, there does seem to have been a sea change in the importance placed on long-term environmental initiatives in China. None of the funding allocated in the current fiscal stimulus package is due to go to high polluting or energy and resource-intensive industries.

The Ministry of Environmental Protection is also keenly monitoring energy-intensive and heavy-polluting firms during the stimulus period, which should result in more transparency on best and worst practices. Additionally, the move towards creating controversial 'environmental watch lists' of high impact local and foreign firms will go a long way to ensuring companies become more responsible for their own downstream impacts and become more carefully scrutinised for their water usage.

In terms of market solutions, the support of government and regulators in the development of public-private partnerships and private equity investment in basic water services is vital. This, however, will require much higher levels of transparency and more stringent management controls but should deliver promising returns to well-governed companies with good connections, robust systems and world-class technologies. This, plus increased focus on achieving appropriate localised pricing, will act as an incentive to drive efficiencies and new water service technologies.

The opening up of the Chinese water markets will be made somewhat easier than in other countries due to the existence of virtual regional monopolies, with vertically integrated single operators dominating particular cities. This will increase the viability of large-scale supply projects in more populated areas but could also be a complicating factor in delivering solutions to water shortages in rural areas where the government may find it has to fund and manage much of the water infrastructure development itself.

Companies have an important part to play in the management of the impending water crisis in China and should be seen as part of the solution and not the problem. As much as 95% of the water footprint of a product comes from its raw material supply chain and packaging. Companies should be encouraged to measure and then manage their exposure to both water scarcity and pollution. Polluting companies, both local and multi-nationals, are likely to see increased monitoring and fines or run the risk of having their license to operate withdrawn. Management, therefore, needs to understand where risks to earnings lie and then develop policies and reporting procedures accordingly. The best-managed companies will endeavour to extract this information at the level of individual business units, or even by river basin, and to make much of the information publicly available.

Solutions will be derived from the development of collaborative partnerships with other businesses within a sector, region or municipality in order to begin stakeholder dialogue with government agencies on price reform and ensuring long term supplies of clean water. To ensure continuity and momentum, each company should appoint a representative who has responsibility for water efficiency and reporting and allow them to share information with their peers on tackling systemic water inefficiencies.

Companies in China wishing to embrace the challenges of this water-strapped future can join the CEO Water Mandate and support other global water initiatives such as the Water Disclosure Project and the Asian Water Project. Management should consider funding academic research on a local level to understand where the critical shortages exist and assist in the development of improved predicting mechanisms and large-scale integrated watershed management exercises such as tree planting and flood-flow measurements. On a local level, water issues should be woven into corporate social responsibility missions, such as ground-water pollution control and river clean up projects.

The key for executives in China is to know what is material to the success of their business in terms of water impacts and concentrate on internally delivering efficiencies in this area and following global best practices. If successive quarters of data demonstrate revenue enhancement from water efficiency measures, management could consider sharing that information with the market place in order to encourage other companies to begin taking steps towards water sustainability. We believe that leadership in this area will be rewarded.

Responsible investors, of course, have an important part to play in preventing a worsening situation by closely considering the direct and indirect use of water along the value chains of their portfolio companies. Although highly challenging, it is necessary to attempt to internalise long-term ecological impacts in forecasting potential portfolio returns. Asset managers will need to recognise and manage impending risks from higher water prices, a more litigious China, more public opposition to environmental abuses and a highly concerned and cynical consumer base. Analysts will need to also consider the lack of financial transparency of the 'ecological services' that provide the clean water that fuels economic growth (air, rivers, aquifers, forests, mangroves and wetlands).

Active investors with experience in other markets can engage with management in China and share best practices from other locations, which have been shown to drive shareholder value. Investors should collaborate and share these practices, engage with regulators on reporting standards and with government on creative ways to deliver water efficiencies and lessen systemic stresses. Funding is always an issue in emerging markets and investors who can allocate budgets to support water disclosure and efficiency research initiatives will benefit from increased knowledge

Private investment opportunities in the Chinese water and sewerage industry will probably continue to lag those in the telecom, transport and energy sectors but diligent investors will still find companies and models with good business fundamentals, especially in sectors which do not rely heavily on long term build-operate-transfer models. Most equity investors are likely to prefer to play the sector through the new water technologies and pollution mitigation equipment providers. However, until disclosure and reporting on financial, environment, social and governance risks improves, investors will need to tread carefully and will continue to be challenged by the lack transparency on tariffs and concessions, off-take agreements, water policies and water usage.

Whilst the current funding availability for low water intensity industries is promising, some have commented that Beijing could possibly deliver greater short-term results by developing more stringent and consistent "green" criteria on new bank lending and private investment, and by creating incentives that would prompt the retrofitting of older plants and factories. It seems likely, therefore, that the fastest early growth sub-sectors of the development of a water industry in China will be the provision of metering, testing and monitoring equipment along with industry specific consulting and auditing services. We also expect to see a significant new focus on water re-purposing, recycling and wastewater treatment to develop an integrated demand and supply monitoring system that together can bring about more sustainable water management.

In all continents and periods, history has shown that systemic neglect of natural resource management can lead to societal collapse. It seems now that there are only two solutions left for China to prevent wide-scale social conflict and faltering economic growth: to quickly decrease water demand and rapidly increase efficiency of water usage. We see swift action in both areas as being vital to the health and well being of the Chinese people and the stability of the global economy.

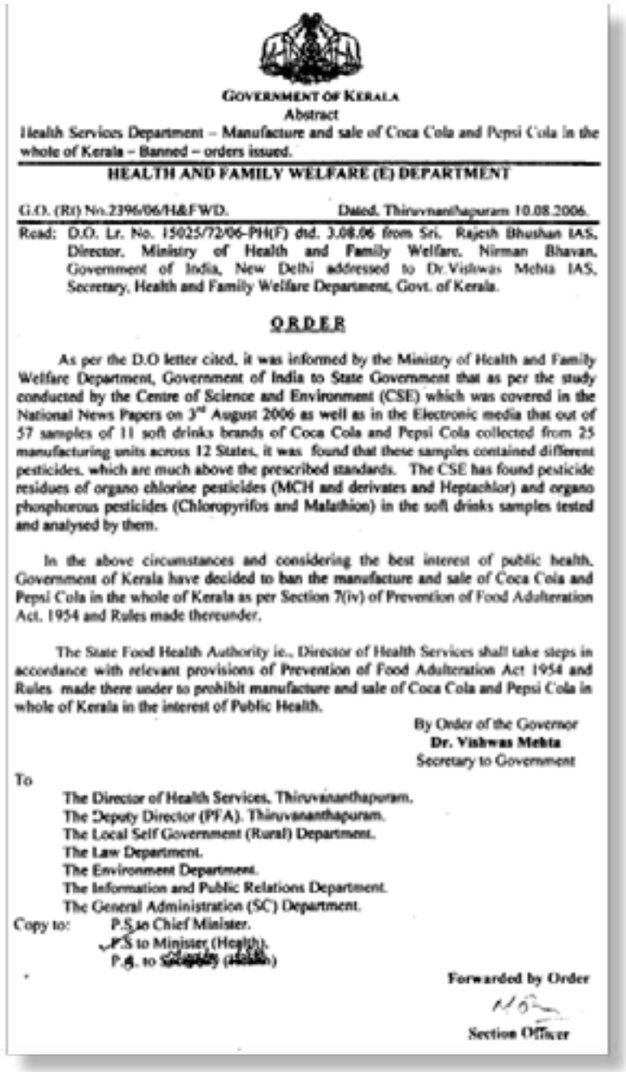
APPENDIX

A Beijing Water Utility Bill.



Utility Bill			
Name:			Means of Payment:
Address:			XXX BANK
Water use: m³	Time:		XXX BANK
Charge item	unit price (RMB/m³)	Amount	XXX BANK
Water fees:			XXX BANK
Water resources fees:			XXX BANK
Sewage treatment charge:			XXX BANK
Amount:			Water company

Order from the Government of Kerala to Coca Cola and Pepsi Cola



GOVERNMENT OF KERALA

Abstract

Health Services Department – Manufacture and sale of Coca Cola and Pepsi Cola in the whole of Kerala – Banned – orders issued.

HEALTH AND FAMILY WELFARE (E) DEPARTMENT

G.O. (Rt) No.2396/06/H&FWD. Dated, Thiruvnanthapuram 10.08.2006.

Read: D.O. Lr. No. 15025/72/06-PH(F) dtd. 3.08.06 from Sri. Rajesh Bhushan IAS, Director, Ministry of Health and Family Welfare, Nirman Bhavan, Government of India, New Delhi addressed to Dr.Vishwas Mehta IAS, Secretary, Health and Family Welfare Department, Govt. of Kerala.

ORDER

As per the D.O letter cited, it was informed by the Ministry of Health and Family Welfare Department, Government of India to State Government that as per the study conducted by the Centre of Science and Environment (CSE) which was covered in the National News Papers on 3rd August 2006 as well as in the Electronic media that out of 57 samples of 11 soft drinks brands of Coca Cola and Pepsi Cola collected from 25 manufacturing units across 12 States, it was found that these samples contained different pesticides, which are much above the prescribed standards. The CSE has found pesticide residues of organo chlorine pesticides (MCH and derivates and Heptachlor) and organo phosphorous pesticides (Chloropyrifos and Malathion) in the soft drinks samples tested and analysed by them.

In the above circumstances and considering the best interest of public health, Government of Kerala have decided to ban the manufacture and sale of Coca Cola and Pepsi Cola in the whole of Kerala as per Section 7(iv) of Prevention of Food Adulteration Act, 1954 and Rules made thereunder.

The State Food Health Authority ie., Director of Health Services shall take steps in accordance with relevant provisions of Prevention of Food Adulteration Act 1954 and Rules made there under to prohibit manufacture and sale of Coca Cola and Pepsi Cola in whole of Kerala in the interest of Public Health.

By Order of the Governor
Dr. Vishwas Mehta
Secretary to Government

To
The Director of Health Services, Thiruvananthapuram.
The Deputy Director (PFA), Thiruvananthapuram.
The Local Self Government (Rural) Department.
The Law Department.
The Environment Department.
The Information and Public Relations Department.
The General Administration (SC) Department.

Copy to: P.S.to Chief Minister.
P.S to Minister (Health).
P.S. to Secretary (Health)

Forwarded by Order

Section Officer

Useful Resources for Further Study and Engagement

Resource	Contact	Telephone	Email	Website
International				
CEO Water Mandate	Gavin Power, Deputy Director UNGC	N/A	powerg@un.org	www.unglobalcompact.org
Global Reporting Initiative	N/A	+31(0) 20 531 00 00	info@globalreporting.org	www.globalreporting.org
WBCSD	James Griffiths, Managing Director	+41 (22) 839 3114	griffiths@wbcsd.org	www.wbcsd.org
UN Environmental Programme Finance Initiative	Remco Fischer, Water Work Stream	+41 (0) 22 917 8178	water@unepfi.org	www.unepfi.org
Universities				
Department of Environmental Science and Engineering, Tsinghua University	Office of International Affairs	+86 (10) 6278 9313	douww@tsinghua.edu.cn desewx@tsinghua.edu.cn	http://env.tsinghua.edu.cn/Eng
College of Environmental Science and Engineering, Tongji University	Tongji University-wide office	+86 (21) 6598 2200	N/A	http://sese.tongji.edu.cn/College/english
Jiangxi Normal University	Jingyun L., Associate Professor	+86 (791) 1812 0166	N/A	www.jxnu.edu.cn [Chinese only]
Government Think-Tanks				
Chinese Hydraulic Engineering Society (CHES)	Variety of hydrology experts	+86 (10) 6320 2163	ches@ches.org.cn	www.ches.org.cn/jianj/english.asp
Chinese Research Academy of Environmental Sciences	Variety of water experts	+86 (10) 8491 5193	office@craes.org.cn	www.craes.cn/cn/english/welcome.html
Civil Society Think-Tanks				
Institute of Public & Environmental Affairs	Ma Jun	+86 (10) 6718 9470	N/A	www.ipe.org.cn
Green Watershed	Yu Xiaogang	+86 (871) 4182395	N/A	www.greenwatershed.org/ziye/xinzhuye11.htm
International Rivers	Nicole Brewer, China Global Program Associate	+1 (510) 848 1155	nicole@internationalrivers.org	www.internationalrivers.org
Water Industry Associations				
China Water Net	Zhang Lizhen	+86 (10) 6213 8240	zlz@h2o-china.com	www.h2o-china.com
Center for Water Research and China Training Institute	Weidong Zhou, BSR China Director	+86 (20) 3891 0690	N/A	www.ctichina.org

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An alternative view is that "green insurance" does not have to be fixated on pollution control. "Green insurance products include new policies that pay to rebuild a home [or factory] using environmentally friendly materials if destroyed by fire or other disasters. Discounts will be offered if a contractor purchases a policy involved in eco-friendly activities."The program is not scheduled to be implemented nationally until 2015. Source: China Water Working Group and
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