

Investing in Asia's Water Sector

A Turbulent Rush through Opening Floodgates

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Editorial team: This report was authored by Colin McKee with editing and review by Melissa Brown, David St Maur Sheil, Sophie le Clue and Sweeta Motwani. The layout and design of the report was managed by Sky Koon-chow Ng.

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"Of all the social and natural crises we humans face, the water crisis is the one that lies at the heart of our survival and that of our planet Earth. No region will be spared from the impact of this crisis which touches every facet of life, from the health of children to the ability of nations to secure food for their citizens. Water supplies are falling while the demand is dramatically growing at an unsustainable rate. Over the next 20 years, the average supply of water worldwide is expected to drop by a third."

- UNESCO Director-General Koichiro Matsuura

INTRODUCTION

Few issues can be as contentious in developing countries as the privatization of water resources and Asia is no exception. Lessons from Latin America have demonstrated the degree of social protest and political fallout that can result when water, commonly considered a public good, is transferred in part or in full from the public to private sectors.¹ While the role of private enterprise in the production, distribution and management of water and wastewater services can be fiercely debated, the extent of a looming water crisis is broadly recognized. Globally, 1.2 billion people lack access to clean drinking water and the United Nations has indicated that by 2025 water scarcity could affect close to 40% of the world's population, a high proportion of whom will live in Asia. Despite broad political motivation from national governments and inter-governmental bodies to address these issues, poor governance and historically low water tariffs are largely to blame and continue to hamper efforts to attend to the crisis.

While government has traditionally been the dominant actor in water supply and wastewater treatment, a number of Asian countries have increasingly experimented with water privatization. Two imperatives are driving this change in approach: Asia has become increasingly affected by growing water scarcity and water pollution, and the pace of economic and population growth in parts of the region suggests that these problems will become far worse sooner rather than later. In China, a country where the need appears greatest, government estimates suggest that water pollution accounted for between US\$23-90 billion in lost GDP in 2005. Furthermore, the Ministry of Water Resources predicts that by 2030, per capita water resources among China's projected 1.6 billion inhabitants could fall by 20% from today's level to 1,760 cubic meters (m³) per capita. Nearing the water stress benchmark of 1,700 m³ per capita, the United Nations has labeled this a "threshold of concern".

There are cautious though increasing attempts to broaden private sector participation to address Asia's water-related problems

In light of the situation's growing severity, there are cautious though increasing attempts to broaden private sector participation to address Asia's water-related problems. Those in favor of privatization commonly argue that private companies have greater ability to finance water projects, and ultimately optimize efficiency and expand services in pursuit of profit. In addition, the process can divert costly government subsidies to other social service priorities. The counter argument to water privatization, often voiced by political parties and civil society groups, is that water is a natural monopoly and that competition in the sector will not yield economic benefits. Opponents argue that this has been borne out in situations where privatization has caused substantial price hikes without any guarantee of service expansion or quality improvement.

A key debate therefore revolves around the politically sensitive issue of tariff rises. In particular, whether tariff rises from current historic low levels across the region will encourage the needed investment in efficiency and curb inefficient water usage, or whether such tariff rises would fail to yield enough improved efficiencies or improvements in service quickly enough to prevent consumer unrest, political fall-out and economic dislocation.

A huge new infrastructure and services market is emerging in Asia, which will be a focal point for a range of traditional and innovative water sector investment strategies

Regardless of the political debate, it is obvious that a huge new infrastructure and services market is emerging in Asia, which will be a focal point for a range of traditional and innovative water sector investment strategies. Indeed, a number of global multinationals have been active in aspects of the Asian water sector for some time, and an increasing number of small and mid-capitalization listed Asian water companies have begun to identify opportunities stemming from the region's growing water and wastewater treatment crisis.

In this report, we assess these issues in the context of Asia's most broadly held companies in the water sector with a particular focus on the emerging market in China. For the purposes of this report, we define the sector to include three types of companies:

- 1 **water-supply and wastewater service operators** including multinationals like Suez and Veolia in addition to comparable regional actors,
- 2 **environmental services and system integrators** with engineering and some operations expertise, and
- 3 **component manufacturers and solution providers**

We believe that the most important investment themes in this sector are as follows:

- **Dynamic growth requires new funding strategies** The need for investment in the Asian water sector is undeniable, but investors are just beginning to see the capital market structures which will be critical to funding the sector and defining long-term returns
- **Diverse business models** There are a broad range of opportunities for investors, but developed market business models may not translate to accustomed returns
- **Pricing risk dominates** While industrial users are increasingly being asked to pay for water or for treatment, reaching consensus about water tariffs for consumers and the rural sector may slow implementation of a forward-looking user pays model
- **A look ahead: trading, funds, and new technologies** The potential for innovation in the Asian water sector is high once governments and financial markets define fundable strategies.

What the sector looks like today

Asia's water sector can be characterized by its early stage of commercial development relative to common patterns of public-private ownership found in regions such as Europe. Not only has privatization of urban or regional systems been quite limited in Asia, but it is notable that the management expertise required for Asia's larger privatizations has tended to come from the well established European market. Although there will ultimately be significant and potentially attractive investment opportunities in the "solutions" end of the engineering and component markets, most of the current listed equity players are at the early stage of development.

Most of the current listed equity players are at the early stage of development

Governments across Asia have involved private companies in water provision and wastewater treatment in different ways and for varying reasons. Much of the driving force behind greater private sector participation in Asia's water sector has come from international financial institutions, including the World Bank and International Finance Corporation (IFC), the International Monetary Fund (IMF), and Asian Development Bank (ADB). In support of commonly cited reasons for private rather than public operation of the water sector, development banks made many of their country loans conditional on greater private sector participation. While this position has tempered recently, interest in improving service and quality has not. Through the UN's Millennium Development Goals, governments have committed to the ambitious target of cutting in half the proportion of people without access to safe drinking water and sanitation by 2015, be it provided by a public or private water sector utility. Nonetheless, country-specific evidence across Asia indicates that the involvement of the private sector in the operation of national water utilities has not always met with success.

The Philippines was among the first countries to partially privatize its water sector, and in 1997 undertook the largest water privatization project in the world with support from the World Bank and Asian Development Bank. Manila's Metropolitan Waterworks and Sewage System was partially transferred under a joint venture concession to a consortium including Suez in the west of the city and to Manila Water in the east. By 2001, tariff levels had increased by at least 300% in both parts of the city from very low levels and substantial tariff increases were planned to continue in a 2003 review. Much of the government's share of revenue increases from these concessions was used to pay down outstanding sovereign debt. As a result of public protest over tariff hikes and poor service quality, the government ended its contract with Suez. Although the Suez concession faced serious problems, the east zone concession operator, Manila Water, has had more success, listing on the Philippines Stock Exchange in 2005.

By contrast, Malaysia has had a slightly more positive privatization experience, having transferred 57 water treatment plants to private operators with a total capacity of 3.8 million m³ per day by 1996. Unique to Malaysia's case is that it has involved a large degree of domestic ownership. Non-revenue water losses due to either system leaks or illegal connections continues to hamper the private sector's overall success, however, amounting to an average 37% of volume in 2003.

Figure 1 Larger mid- and small-capitalization Asian water sector companies

Industry Segment	Company	Country	MCAP USD millions
Service Operators	Guangdong Investment Ltd. ⁱ	China (listed in Hong Kong)	3,470.74
	Beijing Capital Company Ltd. ⁱ	China	1,972.31
	Shanghai Municipal Raw Water Co. Ltd. ⁱⁱⁱ	China	1,677.23
	Tianjin Capital Environmental Protection Company Ltd. ⁱ	China (listed in Hong Kong)	774.50
	Puncak Niaga Holdings Ltd. ⁱ	Malaysia	556.30
	China Water Affairs Group Ltd. ⁱ	China (listed in Hong Kong)	523.16
	Manila Water Company ⁱⁱⁱ	Philippines	401.28
	Taliworks Holdings Ltd. ⁱⁱⁱ	Malaysia	179.52
System Integrators and Solution Providers	Bio-Treat Technology Ltd. ⁱⁱ	Singapore	109.72
	Hyflux Ltd. ⁱⁱ	Singapore	69.73
	Sinomem Technology Ltd. ⁱⁱ	Singapore	58.99
	Asia Environment Holdings Ltd. ⁱⁱ	Singapore	20,.39
	United Envirotech Ltd. ⁱⁱ	Singapore	13.52
European Service Operators	Suez SA ⁱ	France	65,182.27
	Veolia Environnement SA ⁱ	France	30,204.47

NOTE:

i. Market Cap. figures sourced from Bloomberg 15/2/2007

ii. Market Cap. figures sourced from Singapore Exchange 14/2/2007

iii. Market Cap. figures sourced from corporateinformation.com 15/2/2007

Suez, Veolia and Thames have been the dominant multinational players in Asia's water market. Their business model has been based on public-private partnerships (PPP), preferring so-called Build-Operate-Transfer (BOT) contracts over riskier full concession contracts². Under BOT arrangements, the company invests the full costs required in the construction of the reservoir or treatment plant. The local water authority pays the company a set price per cubic meter of water for the duration of the 15-30 year contract. In ensuring that the company is able to recoup the costs of this investment, the set price must provide sufficient revenue for the company to cover its capital costs and operations while equally remaining affordable to the government over the long-term. This latter challenge has been the source of broken contracts in the past. In 2003, Suez broke its \$154 million BOT treatment plant contract with local authorities in Ho Chin Minh City, Vietnam, and in 2004 Thames Water abandoned its Da Chang plant in Shanghai, the first BOT arrangement in China, following the municipal government's re-negotiation of the guaranteed 16% return.

While private sector interest in large scale water sector privatization in parts of Asia has largely tempered over the past decade due to contractual disputes, social protest, and increasing questions surrounding the quality of the private sector service, China has proved to be the one exception. This is due to an increasing awareness and understanding by the central government of the scale of China's current and future water problems and to changes in laws that better facilitate and protect private investment in the water sector. It is also supported by growing sophistication and confidence in China, as well as other financial markets, to underwrite water-related investments. It is for these reasons that we have focused the bulk of our research on the development of the water market in China and on publicly traded Asian companies from emerging markets that are targeting China's water market.³

Cross-cutting issues

Despite varying degrees of privatization across the region, with equally diverse results, there are two dominant issues that continue to characterize the sector:

- **Government Control** Governments remain the dominant water utility players while wastewater treatment clients are both industry and municipalities. The developed market norm is that government assets and operations are privatized and that an independent regulator steps in to provide transparent market guidelines on the terms and conditions of service. This model, while understood in Asia, has proven challenging to implement as the concept of an independent market regulator is new and requires a high standard of transparency for successful operations.
- **Tradition of Low/No Tariffs** In addition, governments are facing two challenges linked to the successful implementation of new tariff and service regimes - many Asian water consumers are not accustomed to paying for service and it will inevitably prove challenging for some governments to manage complex social impacts. In addition, by raising the cost of water, governments will have to face often difficult regional problems as water and other resource differences become politicized.

DYNAMIC GROWTH REQUIRES NEW FUNDING STRATEGIES

The severity of China's water problem is striking and presents a picture of severe supply constraints which are applicable in part to other Asian countries. China accounts for 22% of the world's population, but it is endowed with only 7% of the world's fresh water. This situation has led the United Nations to designate the country as one of 13 countries with the lowest water per capita in the world, and a region of significant future risk. Adding to the challenges of insufficient water supply are problems of pollution. Estimates from 2005 indicate that 70% of industrial wastewater and 20% of residential wastewater are discharged without any prior treatment.

It is against this backdrop that investors, government authorities, and development organizations alike are turning a keen eye to water supply and treatment solutions. The various sub-segments in China's water market cover the spectrum from service operation to system integration and component manufacturers. Drawing the line between these different market segments is difficult, as many companies can be involved in several of these sub-sectors. While opportunity abounds and market forecasts project scenarios of broad water demand, there is a less clear understanding of the financing and investor risks involved.

A bet on growth dynamics - water scarcity and pollution

*Water in China
could become as
crucial a global
commodity as oil*

A variety of factors contribute to the perception that water in China could become as crucial a global commodity as oil. To place it in perspective, when the Communist Party took power in 1949, water consumed was roughly one fifth of what it is today. Current demand is driven foremost by industrial growth, demographic pressures, and agricultural production. Together, these exert substantial pressure on China's limited water supply. A looming crisis in supply and demand therefore provide a growing opportunity for investors.

As Figure 2 shows, official estimates project that China's water consumption may well increase by more than two times from 1995 levels, reaching 1068 billion tons consumed by 2030. This will be led by strong industrial demand growth, given forecast economic growth of 8% through 2010. However, as in most developing countries, China's agricultural sector is the dominant water consumer, accounting for roughly two-thirds of total volume use. Without increased water efficiency in the agriculture sector, food security may become an issue of concern given demands on greater food production. Adding to this level of demand is increasing use by residential consumers, due to the country's rising middle class as well as rural migration patterns into urban centers. By 2015, China is expected to have over 109 cities with population of more than one million⁴, placing enormous demands on the level of urban services, water included, needed to sustain these populations. The Ministry of Water Resources has indicated that 400 of China's 660 cities already have insufficient water supply and 100 of these face extreme water shortages.

Figure 2 Water demand in China (billion tons of water)

	1995	Sector Use	2030	Sector Use
Residential	31	6%	134	13%
Industrial	52	11%	269	25%
Agricultural	400	83%	665	62%
TOTAL	483	100%	1068	100%

Source: Ministry of Water Resources, People's Republic of China (PRC), quoted from GK Water Sector Report, 2005, p. 8.

In stark contrast to the rapidly growing demand scenario is the question of dwindling freshwater supply, which is already increasingly constrained in meeting current needs, not to mention future demand. Official data for 2000-2002 indicated that China's supply of water resources, including both surface water and groundwater, amounted to between 2.7 trillion and 2.8 trillion m³. Water consumption during this period was roughly 550 billion m³. Due to the challenge of accessing the bulk of this water, combined with very serious levels of pollution in some regions, China faced a supply shortage in 2000 of approximately 40 billion m³. A graphic illustration of the severity of the situation is provided by China's Yellow River, the world's seventh longest, which first failed to reach the Bohai Sea in 1972 and has run dry almost every year since 1985⁵.

Furthermore, evidence indicates that China has become over-reliant on groundwater, threatening normal groundwater replenishment rates. In 1965, only some 150,000 wells had been dug across China and groundwater contributed a relatively small amount to the country's water supply needs. Today, by contrast, China has an estimated 7.6 million wells and groundwater accounts for 19.5% of the country's water consumed. Heavy groundwater demand around Beijing, China's second largest city and one of its most water scarce, has caused water tables to fall an average of nearly two meters annually in recent years⁶. Experts indicate that with each meter decline in water tables, drilling costs increase by a factor of five and pumping costs increase by 2%⁷.

Supply issues are heightened by China's severe dislocation in water resources. This divide is most pronounced between the country's comparatively water-rich South and its more arid North. It should be noted that China's Northern region is an important agricultural area and accounts for the majority of the country's heavy industrial production. As Table 3 illustrates, despite the country's almost equal population distribution, Southern China is endowed with over 80% of the country's water resources.

Figure 3: Water distribution across Northern and Southern China

National Values	Northern Five Major Watersheds	Southern Four Major Watersheds
Water Resources (Percent)	19	81
Population (Percent)	46.5	53.5
Per capital water resources (m ³)	1,127	3,381
Gross domestic product (percent)	45.2	54.8
Cultivated land (percent)	65.3	34.7

Source: Table reproduced from US Department of Commerce, International Trade Administration, 'Water Supply and Wastewater Treatment Market in China', 2005, p. 2 www.export.gov/china/industry_information/ChinaWater.pdf

In addition to more limited resources, the North also requires more careful water management as the region receives 70-80 percent of its annual precipitation concentrated in July through September. This North-South disparity is what has led the Chinese government to implement the South-to-North Water Diversion Project.

China's South-to-North Water Diversion Project

First proposed in the 1950s, China's water diversion project became reality in 2002. With routes in the east, center and west of the country, the project will ultimately move 44.8 billion m³ of water annually from the Yangtze, Yellow, Huaihe and Haihe Rivers. Construction will be carried out in three phases and is expected to end in 2050. The estimated investment of US\$60 billion is twice the cost of China's recently completed Three Gorges Dam.

Certain critics oppose its environmental impact as well as required relocation of roughly 400,000 people, while others argue that its cost far outweighs any stated economic gain. The South-to-North Water diversion project is illustrative of a range of central government designed and funding projects that appear to exist in a policy realm separate from the privatization process that is driving commercial opportunities.

Water pollution clean up is the second dynamic bet for investors in China's water market

In addition to water demand growth and supply shortages, water pollution clean up is the second dynamic bet for investors in China's water market. Historically, the lack of stringent regulation and limited enforcement has been a feature of the economy's rapid growth. This scenario has, however, changed over the past years as environmental regulation is being taken more seriously. This is certain to hold true in the immediate future following the chemical explosion and spill in November 2005 along the Songhua River near the downstream city of Harbin.

Occuring at a petrochemical plant, the event caused 100 tons of benzene, a known carcinogen, to flow down the river, forcing the government to shut off water taps for nine million people. According to a Provincial Environmental Protection Bureau spokesman, the event has made the safety of drinking water a key priority over the next five years⁸.

The costs of water pollution are not inconsequential. Official estimates suggest that water pollution costs the Chinese government roughly 3-12% in lost GDP per year. This is roughly in line with World Bank estimates that suggest overall pollution costs China 8-12% of its GDP. The social costs are also clear. For instance, with some 320 million people across China drinking polluted water every day, China now has the highest liver and stomach cancer death rates in the world and a growing phenomenon of so-called 'cancer villages'. In Beijing, the cost of adequately supplying and treating water resources has led to some of the government's toughest environmental responses. Residential water tariffs in the capital have increased nine times between 1991 and 2004 and are the highest within the country⁹. Furthermore, Beijing authorities have begun limiting the development of new water-intensive industries, including textile, leather, and chemical plants around the capital¹⁰. As discussed later, these are some of the clearest signs that economic growth in certain areas may no longer trump environmental regulation and enforcement as they have in the past. Figure 4 shows the difference in tariff prices across major Chinese cities, illustrating how different cities have begun to address scarcity and pollution through pricing.

Figure 4: China's Urban Water Tariff Prices

City	Province	Water Price (\$/m ³)		
		Water Supply	Wastewater Treatment	Total
Beijing		0.28	0.07	0.35
Jinnan	Shandong			0.31
Tianjin				0.31
Changchun	Jilin			0.30
Chongqing		0.24	0.05	0.29
Shijiazhuang	Hebei	0.18	0.06	0.24
Nanjing	Jiangsu	0.11	0.12	0.23
Guangzhou	Guangdong	0.11	0.08	0.19
Shenyang	Liaoning	0.17	0.02	0.19
Wuhan	Hubei	0.13	0.05	0.18
Wulumuqi	Xinjiang	0.15	0.04	0.18
Yinchuan	Gansu			0.14
Nanning	Guangxi			0.13

Source: Table reproduced from US Department of Commerce, International Trade Administration, 'Water Supply and Wastewater Treatment Market in China', 2005, p. 15.

www.export.gov/china/industry_information/ChinaWater.pdf

Note: Prices have increased in various cities since this table's first publication

Securitization of Asia's water sector - new financing opportunities

Interest in investment opportunities in China's water sector has been growing for the past ten years. Initially, this was a reflection of the same process which brought global players into the Chinese power sector and new investment flows into Chinese infrastructure assets. In the past year, new interest has been spurred by thematic investors pursuing both infrastructure and water-linked assets and a surge in business opportunities for primarily local players. A critical driver for this process has been the implementation of the Water Resource Law in 2002, which established new oversight and management structures that have facilitated the move to a user-pay system.

Investor confidence in China's water market is increasing and water is emerging as a target market for investors

Investor confidence has also grown with the increasing sophistication of China's debt and equity markets. Credit constraints previously hindered the ability of both local and foreign water companies to rely on China's banks and financial markets. In the early phase of water sector investment in China, foreign consortia were often using US dollar denominated loans, with credit terms reflecting assurances about future tariff increases and target returns. This proved risky as tariff adjustments often lagged expectations and the borrowers lacked access to concessionary RMB financing from domestic Chinese banks. In addition, although US dollar denominated lending can make sense if foreign equipment is being imported, much of the capital spending now required in the Chinese water sector is focused on RMB denominated costs.

Today, the investment community has found the level of risk in China's water market far more favorable. This is in part due to the nature of the industry itself. Similar to other infrastructure investments, like roads or utilities, water supply and wastewater treatment installations can offer reliable returns for long-term investors as water utilities typically enjoy steady demand and a fairly predictable future. As evidence of increasing investor confidence in the sector, in July 2006, Merrill Lynch provided pre-IPO financing to Golden State Environment, a relatively young Chinese water utility, with a USD \$150 million bond, which will be convertible into new equity upon IPO or equity from current controlling shareholders if the IPO is delayed. This private equity investment is presumably a reflection of Merrill's confidence both in the underlying business fundamentals of the project and the equity market's eventual interest in a Golden State Environment IPO.

While China's water sector is sure to attract considerable interest from long-term equity investors, it is important to take a broader look at the ability of new funding vehicles and the debt market to provide funding solutions appropriate to the risk-reward profile of the sector. Water is clearly emerging as a target sector for a range of investors interested in sustainable finance. As a result, we expect to see a convergence of interest from various directions, all of which could create a more dynamic funding environment as the Chinese government accelerates its efforts to address the country's looming water problems.

From a funding standpoint, the following key trends will be critical to monitor as they will doubtless influence the scope of opportunities for foreign and local investors and funders:

- **New listings** - Merrill's Golden State Environment private equity investment is a clear signal of the growing interest in equity funding for the Chinese water sector. Although experienced water sector investors often have a preference for smaller, potentially high growth "solutions" providers with proprietary technology which can be sold to industrial users or utilities, it is likely that the larger initial opportunities will go to domestic Chinese operators of newly privatized water utilities. Indeed, there are a number of indications that a range of new players from property developers to industrial companies are entering the water sector, often through existing listed companies. This could ultimately result in a spate of new listing or repackaging of existing companies as water plays.
- **Specialized infrastructure and water funds** - A second critical trend is the mobilization of targeted investment funds. These funds typically appeal to thematic investors or long-term pension investors who favor the low volatility and return profile of infrastructure assets. Sustainable Asset Management's EUR 586 million Sustainable Water Fund focuses on all aspects of the water value chain, including service, technology and products. Firms like Australia's Macquarie have been particularly active in funding and "packaging" these types of infrastructure opportunities in Asia.
- **More tailored local currency lending strategies** - In the past, Chinese companies have often sought traditional balance sheet funding for investments in the water sector. While this will continue to be the norm for many new entrants, the gradual reform of the Chinese banking system will doubtless stimulate the introduction of more asset-based lending strategies with a project finance flavor. In particular, as the government begins to adopt strategies for the development of a sub-sovereign debt market, it is possible that government-backed infrastructure projects could attract new, lower cost forms of debt funding which would benefit private sector investors as well.
- **Securitization and second market trading** - If innovation in China's debt markets progresses, it is also possible to expect that banks which lend to the water sector may eventually find that these loans can be packaged and securitized as domestic debt capital markets develop. This will provide the banks with greater liquidity and provide new tools for risk-adjusted pricing of water assets - a tool which can be critical to mobilizing more capital for the sector.

From a debt perspective, Chinese bank loans and RMB denominated debt is increasingly the financing mechanism of choice. As a result, it is unsurprising that Chinese banks are now offering long-term funding and preferential terms for investments. It is for this reason that Suez and Veolia, the two most dominant foreign water utilities in China, have financed the bulk of their recent investments from Chinese banks.

Added to this remains strong interest from the region's development banks. The Asian Development Bank had committed to lend China USD \$4.5 billion in 2006 to assist in the development of infrastructure, and water has been defined as a clear priority. The World Bank's International Finance Corporation has also begun to play a more dominant role, recently providing US\$20 million in equity financing to support Hyflux, a Singapore-based water company.

DEFINING THE BUSINESS MODEL

The short history of water as a commercial sector in China has a number of fundamental implications for investors. There is every reason to expect that the evolution of the Chinese water sector will feature a potentially high stakes sorting process as regulatory and commercial models are tested and rejected. As a result, it will be crucial to evaluate the business models which have developed in other markets and to consider how they may develop in a Chinese context. This is particularly important because the investment and funding dynamic in China's water sector will be defined by at least three interlocking forces:

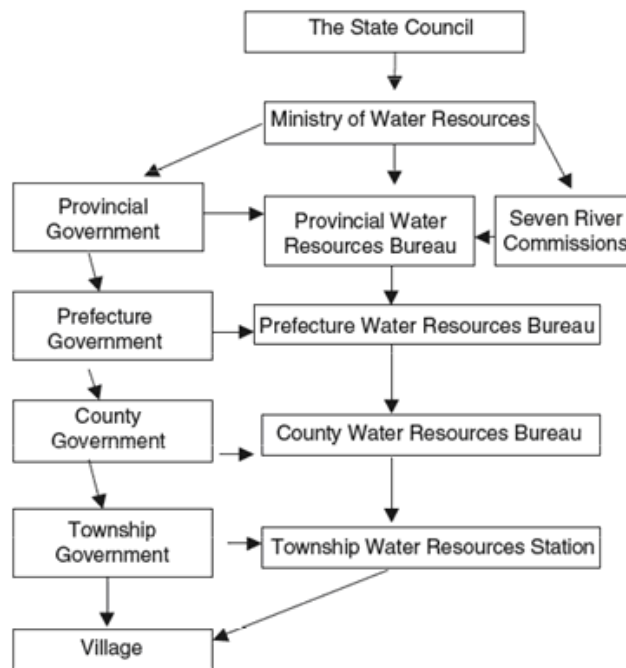
- **Regulation** Government legislation will set the terms for asset transfers, ownership, regulation, and implicitly for reform.
- **Local diversity** There will inevitably be differences in interpretation and enforcement at the regional, provincial, and municipal levels in China as the various arms of the government work with local conditions.
- **Competition** The commercial response to new sector drivers will also reflect the interplay between state- and locally-owned enterprises, new entrepreneurial enterprises, and foreign owners, operators, and investors.

New government policies clarify mandates and opportunities

China's legal and regulatory framework for the water sector is steadily taking shape. The 2002 Water Resource Law provides the clearest mandate to-date to facilitate private sector investment in China's water sector by moving towards a market-based system. Most significantly, the law establishes a user-pay system whereby "water consumption will be charged based on the actual amount of water consumption."¹¹ This law superseded China's first comprehensive Water Law enacted in 1988 and gives increasing priority to improving water efficiency and water management. Previously these issues were given scant attention, as water management related principally to designing an infrastructural system that could prevent flood damage and ensure adequate supply for the country's dominant users, industry and agriculture.

Greater centralization of water management has offered improved regulatory clarity, giving investors greater confidence surrounding contractual enforcement. Specifically, water resources are now under the unified management of the Ministry of Water Resources' State Council (See Figure 5), which now oversees water resource, water supply, and wastewater treatment activities. Significant authority also resides with Water Resource Bureaus (WRB) at the local level, as they are capable of setting prices, establishing policy, and factoring in other economic or political considerations into their decisions. As of 2005, there were an estimated 1,200 water bureaus established throughout the country with Beijing creating its own in 2004¹².

Figure 5: China's water management structure under the Ministry of Water Resources



Source: US Department of Agriculture, *China's Agricultural Water Policy Reforms: Increasing Investment, Resolving Conflicts and Revising Incentives*, 2003, p. 5.

Adding clarity to the investment climate are regulatory changes related to foreign direct investment and ownership of state resources also made in 2002. Under the "Notice on Accelerating the Industrialization of Municipal Wastewater and Wastes Treatment", the government proposed that market mechanisms be incorporated in building new wastewater treatment facilities, and that build-operate-transfer (BOT) contracts be the preferred contractual arrangement. Additionally, the "Decisions on Accelerating the Market Conversion of Public Utilities" permitted the use of foreign capital in construction of new water utilities and the authorization for private operation of these facilities.

The Chinese authorities appear increasingly committed to addressing certain sustainability issues in the course of its economic development. This is a strong message reinforced by the government's two most recent five-year development plans.

Of the budgeted US\$90 billion committed to environmental protection in the Tenth Five-year Plan (2001-2005), roughly 39% was earmarked for water pollution prevention. The aim of the current eleventh 5 Year Plan (2006-2010) is that by 2010, all cities and seats of county governments will have wastewater treatment facilities with a treatment rate of not less than 70%¹³.

In certain regions, the government has also mandated that all future industrial expansion can only occur if it uses the same amount of water in its operations that was used prior to expansion. This has required companies to either invest in highly advanced water recycling equipment or to streamline the efficiency of their industrial processes.

It appears that the age-old slogan of “more, faster, better, cheaper” is being re-assessed as the Chinese authorities are increasingly coming to recognise that economic growth can no longer come at any cost, especially environmental. The Chinese government has increasingly acted to close or fine factories responsible for major water pollution. In a recent headline grabbing case, Fountainset, a major listed textile firm based in Dongguan in China’s Guangdong Province, was ordered to pay a record fine of 11.55 million yuan (US\$1.4 million) for the illicit dumping of more than 10 million tons of wastewater over the previous two years via a hidden underground pipe¹⁴.

Enforcement of regulation to a large degree, is at the discretion of the local authorities

It should, however, be highlighted that the enforcement of regulation is far from uniform and to a large degree remains at the discretion of local authorities. In a majority of areas, local budgets are too small to carry out any level of enforcement greater than reviewing a company’s water use and treatment plans at the investment stage, or establishing penalties that would apply should companies be caught exceeding mandated pollution levels. For many companies, this lack of enforcement creates a situation where paying the occasional penalty is more cost-effective than curbing pollution discharge with expensive end-of-pipe treatment.

In addition to domestic pressures, international influence is affecting China’s operation and oversight of the water industry. The accession of China into the World Trade Organization opened China’s market to international competition for environmental services and environmental protection. As discussed in the next section, the Chinese government has detailed what types of partnerships and business models foreign and domestic private water companies can use in water supply and wastewater provision. For the most part, however, the government has preferred to remain in control of piping and distribution of water services. With Beijing to host the 2008 Olympic Games, the government is also working hard to ensure that the city’s water services are at peak performance.

Different segments define risk and returns

There is far more clarity surrounding China's water market today than there was just five years ago, as the government has defined various forms of private and public partnerships that are acceptable for private sector investment. Determining an appropriate partnership with fair returns has at times been a process of trial and error. In 2003, for example, the government declared that double digit returns to private operators were illegal and unenforceable, and required municipalities to renegotiate contracts basing some part of the guaranteed return also on performance. It was this change that resulted in Thames Water's exit from its Da Chang Shanghai wastewater treatment plant concession.¹⁵ This should not overshadow, however, the fact that the government has become more trusted, adding to the confidence of both investors and operators to work with local partners

In light of the relative immaturity of the Asian water sector, there is not yet a defined sector or sub-sector taxonomy. Based on our review of listed companies, we have defined three dominant segments for private sector investment in China's water sector:

Water Supply and Wastewater Service Operators - these are generally large-scale companies with significant engineering and service operation expertise.

Environmental Services and System Integrators - these are companies that provide water supply and wastewater treatment services though on a smaller scale. Their expertise is in engineering and constructing facilities that incorporate company-specific or generic treatment technology. However system integrators may achieve significant scale by being engaged as partners in multiple projects globally or across the Asian region. Hyflux, for instance, one of the leading Singapore based service operators, has been engaged in numerous projects in China, with over 500 clients in 25 out of 31 Chinese provinces¹⁶.

Component Manufacturers and Solution Providers - these are companies that sell a product or technology used in the operation of a water or wastewater facility, or water delivery.

We focus our review on the first two sub-sectors as companies operating in these areas tend to be larger in size, servicing both residential and industrial users, and offer a better market pulse as to the investment climate in the sector as a whole. In addition, while there is considerable equity investment interest in companies that describe themselves as solutions providers, it remains unclear how many listed Asian water companies currently have genuinely proprietary product or process technology in this sector.

Water Supply and Wastewater Service Operators

Various aspects define how companies and the government choose to operate in China's water and wastewater treatment markets. The majority of contracts are defined as joint-venture arrangements whereby the private company typically operates in a 50:50 partnership with a local municipality or industrial park developer. Historically, the contract of choice has been a Build-Operate-Transfer (BOT) arrangement, whereby developers take on full financing risks and are only guaranteed their return over the long-term course of the contract, ranging on average 10-30 years. Design-Build-Operate (DBO) contracts have been used as well, providing a slightly lower level of investor risk. With water still largely viewed as a social good, both types of contracts give limited pricing power to the developer, allowing the government to regulate the company's total profits. Depending on the severity of the water supply or treatment problem, local authorities can also attract companies with lucrative contracts.

Increasingly, there is a move toward greater privatization with full concession contracts on a DBO basis

Increasingly, there is a move toward greater privatization with full concession contracts on a DBO basis, which have been negotiated by several of the major service companies. Under this arrangement, in addition to the water production, the company is responsible for delivery, maintenance, billing and collection. While adding an element of end-user risk, the company also has in some instances added influence over tariff pricing. By contrast, bulk water pricing under BOT contracts, which can increase over a staged period, are negotiated at the outset and rarely amended thereafter.

Scale of operations is a distinguishing characteristic between private sector actors in China's water supply and wastewater treatment markets. Global market leaders, including Suez, Veolia, and Thames Water have been active in the Asia market for 20 to 30 years and have in many ways defined the terms by which private companies can operate in China's market. By contrast, recent Chinese and other Asian entrants have yet to become seriously competitive with these European players.

While it is believed that of the three major foreign water company operators only Suez has begun operating at a profit, various factors have allowed these companies to position themselves for profitable operations over the longer term. First-mover advantages have been a clear benefit allowing certain companies to become established in the country's major residential and industrial demand areas. Over the long run, these locations will allow them to more quickly profit when tariff levels do increase to or near full-cost pricing.

As of 2005, Suez, via its 50-50 joint venture with the New World group in Hong Kong, operates the drinking water services of 16 Chinese municipal authorities (Chongqing, Qingdao, Sanya, Tanggu, Shanghai, etc), representing the supply of 12 million inhabitants.¹⁷ Veolia, by contrast, had a project portfolio of 21, which is roughly two times larger than Suez in value, and chooses to operate with local partners based on geographic location. The company now operates in 19 out of 34 provinces in China, in different municipalities, autonomous areas and special administrative regions, serving the water needs of 20.59 million inhabitants.¹⁸

An important element of the operating model can be the choice to focus on industrial customers based in specialized industrial parks with common utilities. Both Suez and Veolia prefer lower levels of risk relative to their Asian competitors, and compete for projects largely on quality rather than price. It is often their technical expertise in both engineering and operations that give these companies a competitive advantage.

Figure 6: China's Most Active Water Service Companies

Company	Company Description	Number of China Projects	Project Portfolio (USD m)
Suez	Through Sino-French Water Development, Suez has been active in China's water market since the mid-1980s. The company operates drinking water and wastewater services for municipal governments and industrial park developers in over 16 cities.	18(i)	857
Veolia	Veolia water specialized in the outsourced management of water services for municipal or industrial customers, while also providing technological solutions. The company is currently present in 19 provinces. It is the largest and most aggressive international water operator in China.	21	1,900
Beijing Capital	Beijing Capital Co. Ltd. is a municipal company engaged primarily in water sector infrastructure development. Its water investment assets include supply, distribution and sewage treatment facilities. The company was founded in 1999 and listed on the Shanghai Stock Exchange in April 2000. It is also invested in toll roads, hotels, and construction.	12(ii)	755
Tianjin Capital	Tianjin Capital Environmental Protection Company Limited, through its subsidiaries, processes sewage water and constructs sewage water processing plants. The company also operates road and toll stations in Tianjin. The company was founded in 1993 and had its first listing in 1994 on the Hong Kong Stock Exchange.	3	342

Source: corporate public documents &
 i. China Daily 10/25/2006: SUEZ, major player in water solution
 ii. China Daily 14/09/2006: Water Firm Plans First Industry Fund

Nipping at the heels of these European players are an increasing number of local Chinese entrants, including Beijing Capital, Tianjin Capital, and Guangdong Investments. As Figure 6 shows, their market capitalization places these companies at a different scale than the European operators, though the aggressiveness with which they have entered the market is illustrative of the level of risk they are willing to assume. This is a distinguishing characteristic among new Asian entrants. Risk in the water sector is defined by how low a company is willing to bid a contract in terms of negotiated bulk water sale price as well as the number of total years required to recoup the capital investment. This largely comes down to forecast demand for bulk water sales or processing year on year. Stiff competition from Chinese entrants has contributed to falling margins for the dominant players. According to Chan Kam-ling, chief executive of New World Holdings (NWH), the internal rate of return for the Suez-NWH consortium has been driven down below 12% from a high of 15%¹⁹.

Environmental Services and System Integrators

The next tier of operators, the environmental service providers and system integrators, typically offer wastewater treatment services associated with some form of company-specific treatment technology, though at a much smaller scale and without the same level of operations expertise as the companies discussed above. In addition to providing the engineering and design of wastewater treatment facilities that can accommodate their treatment technology, these firms will also operate BOT contracts either at the municipal, industrial park, or company level. Dominant players in this market include Hyflux, Bio-treat, United Envirotech and Sinomem, all of which are Singapore-listed.

Figure 7 Hyflux: An Asian Water Sector Pioneer

Established in 1989 in Singapore, Hyflux Ltd has quickly grown into a regional leader with the bulk of its revenue in 2005 coming from China (41%) and the Middle East (35%). In March 2006, the World Bank's International Finance Corporation (IFC) agreed to invest in Hyflux's 50% ownership of SinoSpring, which has eight water projects in China. As the IFC describes, Hyflux "is Asia's leading water and fluid treatment company, specializing in the application of membrane-based technology. The company is headquartered in Singapore and listed on the Singapore Stock Exchange, with a market capitalization of approximately US\$768 million as of April 14, 2006. It is an integrated solutions provider, offering customized services including: process design and optimization; engineering, procurement and construction; pilot testing; fabrication; installation; commissioning; operation and maintenance, on a turnkey, BOO or BOT basis, with an impressive record of accomplishments. As of the 2004 Annual Report, approximately 53% of the Company's shares were publicly-held, and Olivia Lum (Founder, CEO and President of Hyflux) owned approximately 38%."

Source: Text summarized from International Finance Corporation, World Bank
<http://ifcln1.ifc.org/ifcext/eastasia.nsf/Content/SelectedProject?OpenDocument&UNID=E656361802A09F50852571530051BFCE>

Within this sub-sector, companies can be differentiated by the type of sewage treatment processing that they offer. The more basic sewage treatment process is to prepare wastewater for the required level of discharge through both physical and biological removal of solids. Companies such as Bio-treat and Asia Environment are active in this segment, offering biological additives, some of which are company patented, as is the case with Bio-treat, and can speed the treatment process. The more advanced treatment process relates to water reclamation, which treats water such that it can be re-used or recycled. This has most application in areas where regulation is sufficiently stringent to cap the total amount of a company's water use or where water resources are sufficiently scarce. Often using membrane technology, this process can re-cover 70-80% of the initial wastewater discharged. Included within the reclamation sub-sector is also desalination technology. Dominant listed leaders in this field include Hyflux and Sinomem.

Project partners help too

Critical to any business activity in China is the value of local partners. This is certainly the case in China's water sector where the market's rapid development creates a situation where business relationships and models are still being defined. The value of local connections holds especially true for companies that establish themselves in China with local staff. With the pace of China's economic growth, water companies such as Suez have strategically partnered with property developers to capitalize on these actors' role in the construction of new industrial parks and residential areas by offering the required water utility services.

Business sales and R&D efforts can also be bolstered when you have a national government's support. This has been the case for several of the Singapore-based companies which have benefited from the government's commitment to developing an advanced water industry (see Figure 8). Singapore's lead in this respect is largely driven by its lack of domestic resources and dependence on Malaysian water supply contracts, which currently run through 2061. In order to increase water self-sufficiency, the Singapore government has subsidized leading companies' research and development efforts in the desalination and advanced membrane markets.

Figure 8 Singapore's commitment to water technology

The Singapore government has taken strategic steps to develop leading expertise in specific economic sectors, including water, which it believes will provide high growth opportunities. In July 2006, Singapore inaugurated the Research, Innovation and Enterprise Council (RIEC), which will support the R&D activities of foreign and domestic companies based in Singapore that work in biomedical sciences, environmental and water technology, and interactive and digital media. Chaired directly by Singapore's Prime Minister Lee Hsien, RIEC plans to commit roughly USD \$887 million between 2006-2010, of which USD\$ 207 million will support environmental and water technologies.

The government's commitment to making Singapore a water technology hub extends beyond national interests in water security to developing a strong regional export market. According to the Minister for Environment and Water Resources, Dr Yaacob Ibrahim, "[the] Ministry has been helping to build up the companies' experience and track record to expand overseas. Through public-private partnerships... companies have built up planning, operation and maintenance experience and can now offer their services as a more complete package to potential clients."²⁰ China, the Middle East and India are prime markets that companies and the government alike are targeting.

Developing the country's water market has been a longstanding policy objective. The government's Public Utilities Board has been an active partner with local companies in promoting public private partnerships (PPP) with the aim to help water companies undertake large-scale projects. The government's first PPP project was with Hyflux in the 2005 opening of the country's first desalination plant, which the company was contracted to design, build, own and operate. Hyflux has since been awarded a contract for the high-profile Dagang desalination plant in Tianjin, China due for completion in 2008. The Singapore Government has also been active in underwriting water technology research by providing companies access to government facilities to test new technologies as well as R&D support from leading Singapore and foreign universities. The latest in such partnerships is the Singapore-Massachusetts Institute of Technology (MIT) Alliance for Research and Technology (SMART) Center, falling under the RIEC initiative.

Source: Text extracted from International Finance Corporation, World Bank
[http://ifcIn1.ifc.org/ifcext/eastasia.nsf/Content/
SelectedProject?OpenDocument&UNID=E656361802A09F50852571530051BFCE](http://ifcIn1.ifc.org/ifcext/eastasia.nsf/Content/SelectedProject?OpenDocument&UNID=E656361802A09F50852571530051BFCE)

BUSINESS BASICS - RISK COMES DOWN TO PRICING

Far and away, the critical risk for any utility sector in transition is pricing risk. While the need for aggressive measures to address China's water problems is immense, China is nonetheless facing a challenging period of government and community adjustment as the implications of private sector involvement in the water sector are explored. Unfortunately for investors and funders, this will bring with it a period of sustained price risk. Here again, equity investors will reference the experience of the investment community in the Chinese power sector where the government has spent much of the past 10 years formulating a more transparent and realistic pricing regime. While much progress has been made, sector returns have often not been predictable in large part due to a reluctance to pass on higher capital costs and often volatile fuel costs.

As in any business, the decision to operate is dependent on whether the price received justifies the cost incurred, and water is no different. As discussed, in the BOT business model, the company negotiates with the municipality or industrial park developer a bulk water supply or treatment price for the duration of the contract. The up-front financing cost that the business incurs is then recouped over the duration of the contract, requiring careful analysis of a variety of forward-looking factors. The price may be set over the duration of the contract or rise incrementally based on projected cost increases. By contrast, the full concession contract allows the operator more discretion in negotiating with the local municipality over the tariff received.

Water pricing is still a new concept

China first began pricing water in 1985. Previously, water was considered a public good, to imply it was non-rival and non-excludable, whereby the benefit of its use by one person did not affect the benefit derived by another, and no person could be excluded from consuming the resource. In the initial years, Beijing directed water-pricing policy, though since then this has come increasingly under the authority of provincial price bureaus which approve and implement all tariff changes. Either way, in the roughly 20 years since water was first assigned a price, tariffs have increased only modestly. By comparison to countries with four times the available resource, China's price for water is between 70-80% lower. That prices have been kept so far below the cost of production is one of the reasons that China's state of water infrastructure is in such disrepair.

Low water price is one of the reasons that China's water infrastructure is in disrepair

Water prices have, however, come to increasingly take into account levels of scarcity and willingness to pay. Industry and residential users have tended to pay more than agricultural users, and rapid consumption growth in major cities has been a catalyst for price hikes. While Beijing has experienced the highest and most frequent tariff increases, they are still at roughly one third of the OECD average (See Figure 9). The 2002 Water Resource Law has served as a turning point for the implementation of higher tariff prices, as it required that all provinces to levy a basic water resource fee, averaging then USD\$0.02 per m³.

Figure 9: Residential Water Price Comparison

Location	USD Price/ton
OECD average	1.36
World average	1.33
Japan	1.03
Hong Kong	0.98
Singapore	0.90
Beijing	0.46
China urban average	0.26
Malaysia	0.15
Shanghai	0.13
Shenzhen	0.09
Dongguan	0.05

Source: Reproduced from CLSA Asia Pacific Markets, "Thirsty China", Summer 2006, p. 32.

Opportunity requires a willingness to pay

Certain poorer regions in China still lack a willingness or ability to pay for water and related services, as the resource is treated as a pure public good and is provided at the government's expense. This is particularly true among agricultural users, who can present a challenge to local politicians tasked with the responsibility for raising prices. In instances where tariff hikes may tarnish reputations or be the cause of social objection, local governments are often slow to react to water scarcity problems. In addition to being unpopular, increasing prices would counter China's policy goal to raise rural incomes and stem an increasing rural-urban income gap. With agricultural users consuming roughly two-thirds of China's water supply, others see no viable strategy for curbing excessive water consumption among agricultural users without relying on tariff increases. Such incentives would ideally lead to the implementation of water-saving irrigation technology.

For many companies, the lack of a willingness to pay can present both financial and political risk. Lessons from other Asian countries have revealed that the potential for social conflict following tariff hikes may be more disruptive to a company's overall operations than the value of added revenue. This was partially the case in Suez's exit from the Philippines. This implies that many companies are therefore careful to choose their sites of operations in regions which are able to and willing to afford higher water prices. This is one of the reasons that private water companies in China have chosen to operate largely within or near wealthier residential and industrial centers. Locating within such areas where there is ability to pay has also implied that private companies avoid areas where there may be greater need but a low willingness to pay. This is a commonly cited reason against the transfer of water utilities into the private sector, because companies avoid service provision within low revenue and often poorer areas. Stated differently, it remains challenging for private sector entities to assume pricing and political risk in untested markets.

A LOOK AHEAD - TRADING, FUNDS, AND NEW TECHNOLOGIES

Over the long-term, the investment climate in Asia's water sector will become defined by growing water scarcity and an interest in ensuring water security for both human consumption and economic growth. With Asian governments' increasing transfer of water ownership, management, and to a certain degree price-setting ability to the private sector, the sector's growing sophistication will attract new and possibly larger regional water companies and investors. The constraints of more limited access to and supply of clean water in the future may create market conditions similar to those seen in other resource markets. As we have already begun to see, the situation will shift from a question of supply to one of resource efficiency and demand management. Under this new landscape, we believe the investor issues that will become increasingly relevant for the financial community over the long-term will relate to water trading, investment funds, and a strategic bet on certain water-related technologies.

A Water Trading Market for China

As this report has illustrated, while China's water sector has much less experience with privatization than other regional markets, it has witnessed the greatest level of global investor interest driven by heightened water scarcity and the government's cautious application of market principles to water pricing. As evidenced from other countries and regions, these two conditions are the primary prerequisites for the development of a water trading market. Under such a trading system, the purchase and sale of water rights is based on different users' assigned value to the resource. Rather than price the resource according to government regulation, free market principles based on supply and demand dictate an equilibrium price like that of other commodities. Under such a scenario, agriculture users may find it more economical to sell a portion of their right to other users and invest in less water intensive crops or efficient irrigation technologies.

Free market principles based on supply and demand dictate an equilibrium price like that of other commodities

The first clear sign of a possible move in this direction is China's massive water reallocation project to transfer water resources from the country's more water rich South to the relatively arid North. This is in essence a one-way trading scheme at the most macro level that attempts to bring demand and supply into balance. The project diverts water to productive areas in the North that assign a much higher value to the resource's use than those in the South. That this project has become a reality, having been discussed for 50 years, further speaks to the excessive cost of accessing new water resources in the North.

There are clearly a number of key fundamentals that must be in place in order for a water trading scheme to fall in place, and China faces a number of challenges as a result. Not least, it requires assigning water rights that can be priced free of government intervention. The later point is a major hindrance so long as authorities are slow or reluctant to assign and raise prices for basic production and supply costs.

Water trading also requires a high degree of information related to resource availability and knowledge of sellers with buyers willing to trade. Last, it is dependent on market oversight, which is complicated in China's case where authority is defined in different ways according to municipal, provincial and national levels.

Despite the challenge of implementing a water-trading scheme on a large scale, pilot projects have apparently been tested at a local level in Zhejiang Province.²¹

With added maturity to a trading market, there are a variety of investor opportunities similar to other commodity markets that could show promise based on examples from the US, Australia, Chile and Mexico, where water markets have been in place for some time. This could extend to water banking and the use of aquifers to store surplus water and sell it during times of greater scarcity, as well as options and futures trading based on projections of water droughts and surplus periods.

Water as a key infrastructure fund

Infrastructure investments can offer some of the most stable long-run returns with relatively low risk

As a host of private equity groups and investment banks, led most prominently by Australia's Macquarie Bank, have begun to discover, infrastructure investments including roads, toll ways, ports, and even airports can offer some of the most stable, long-run returns with relatively low-risk. The rationale is straightforward: there are significant market barriers to entry that limit competition, they operate as almost pure monopolies, and demand for infrastructure-related products and services is relatively inelastic.

For governments and other public operators, the sale or possible long-term lease of public infrastructure assets can provide enormous appeal as it offers up-front capital that can improve budget deficits and offer needed capital for other public expenditures. The investment group making the purchase can also be generously rewarded. The Spanish Group Cintra, a partner with Macquarie Bank in the 99-year lease of the 7.8-mile elevated Chicago Skyway, reported that seven months into the lease signed in 2004, it had recovered 44% of its investment through re-financing²².

Growing investor interest in China will of course need to occur with the government's transfer of state-assets into private sector hands. This has begun to occur as operators like Suez and Veolia are given increasing control of water infrastructure as the government has more recently allowed them to operate full concession contracts over more publicly managed production only contracts. Water infrastructure is further a coveted asset for such infrastructure funds. In 2003, Macquarie purchased the UK's South-East Water, and in October 2006, a Macquarie-led consortium, Kemble Water, purchased the German-based RWE Thames, which has exposure in international markets including China.

Promising Water Technologies

Certain water companies, and in some cases with some support from their government, have also made a strategic bet on specific technologies that may be in high demand in the event of future water shortages. For example, Hyflux is placing a strategic bet on technologies in the desalination field. In 2005, the company successfully completed Asia's largest desalination plant in Singapore that turns seawater into drinking water. Second to Hyflux in terms of market capitalization on the Singapore exchange, Bio-treat, a Chinese company, has taken a different path in its technology development opting to perfect a biological rather than physical component to the treatment process. Commercialized in 2001, the Best Micro-organism System (BMS) additive reduces the time and improves the quality of the treated sludge output. As the market develops greater familiarity with water themes, we would expect to see a range of companies and investible entities seeking both long-term and risk capital.

INVESTOR QUESTIONS FOR COMPANIES

Internal policies and targets

- Do increases in water pollution affect the cost of operating your facilities?
- How much do you spend on R&D?
- Do you engage with industrial customers to implement high technology wastewater discharge equipment to lower your own costs in reclaiming this water for reuse?
- Regarding industrial park facilities, what impact will a company's bankruptcy have on your revenue stream and potential long-term profitability?

External policies, dialogue and disclosure

- Are there provisions for public dialogue about water sector investment?
- Has the tariff structure been reviewed to determine if there are cross-subsidies?
- How will an increase in tariff prices affect the company's BOT contract? If your price received is paid by the municipality, will the added cost to customers reduce the quantity demanded in a material way?
- How will public concerns about water pollution affect your current operations as well as where you invest in the future?
- Does your company's senior management participate in a regular policy dialogue with the government?
- Does the lack of an independent regulator provide substantial investment risk?

Technology Based

- Do you have proprietary technology and how vital is this to your business profits?
- Are there closely replicable technologies that achieve the same desired level of efficiency and quality?

RESOURCES

Company websites

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- Beijing Capital www.beijingcapital.com.cn
- Berlinwasser International www.berlinwasser.net
- Bio-Treat www.bio-treattechnology.com
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- Guangdong Investment www.gdi.com.hk
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End notes

- 1 A commonly cited case study is that of Cochabamba, Bolivia, and the exit of an international water consortium, led by American Bechtel Corporation, which attempted to privatize the municipal water supply. Following substantial price hikes, averaging 300%, massive protests forced the government to declare martial law and ultimately back down, rescinding on a signed 30-year contract. Poor local governance was also to blame in the situation's development.
- 2 For a useful description of public private partnership models, showing the relative degrees of private and public ownership, see The Canadian Council for Public-Private Partnerships, About PPP, http://www.pppcouncil.ca/aboutPPP_definition.asp
- 3 While Japan, Australia and New Zealand comprise prominent Asian markets, we have focused our research to the universe of publicly traded stocks in Asia's emerging markets, which commonly excludes the above countries.
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ABOUT ASrIA

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ASrIA is a not for profit, membership association dedicated to promoting corporate responsibility and sustainable investment practice in the Asia Pacific region. ASrIA's members include investment institutions managing over US\$4 trillion in assets, however membership is open to any organisation which has an interest in sustainable investment.

ASrIA has taken a leadership role in promoting sustainable investment in Asia since our founding in 2001. ASrIA has run conferences, seminars and workshops, and published wide-ranging research on SRI issues. ASrIA has also created a very wide network of organizations and individuals interested in the broad range of policy issues and investment strategies which are essential to the implementation of SRI in Asia. ASrIA's website, www.asria.org, is the primary resource for SRI in Asia, attracting over 4,000 page views per day and over 5,000 subscribers to our regular e-bulletin.

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