



Asian Environmental Markets Report

September 2011



FOREWORD

The Asia Pacific region is home to 50 percent of the world's population and two of its largest and most dynamic economies. Since 2008, Asia has demonstrated resilience in the face of the global financial crisis and has attracted vast capital inflows from developed nations.

The pace and scale of economic development in the region call for rapid escalation of responsible investment activity. At the same time as they benefit from dramatic market growth, countries in Asia face huge sustainability challenges: environmental degradation, resource constraints and climate change, as well as social inequality and institutional weaknesses.

These conditions are driving a set of rapidly expanding Environmental Markets in the region, including renewable energy and energy efficiency, water treatment and waste management. There is a growing realisation among Asian governments that successful management of environmental issues is crucial to continued growth. Significant policy shifts in some countries, together with technology innovation, are beginning to create very strong investment potential.

The Association for Sustainable and Responsible Investment in Asia (ASrIA) is delighted to partner with Impax Asset Management, which has been investing in Asian environmental markets since 1998, to present a report on the current status of these investment opportunities. This report is being formally launched at the ASrIA 10th Anniversary Conference in September 2011 – a fitting moment to take stock of developments in these markets over the last ten years and to look forward to the growth ahead.



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INTRODUCTION

In an uncertain economic climate, as investors seek robust, long-term growth, the private sector markets shaped by legislation designed to address the chronic shortage of natural resources and to limit pollution are increasingly attractive. Although these “Environmental Markets” have historically been focused on Europe and North America, Asia has recently emerged as a key centre of demand for environmental goods and services, and has also become the home to a large and rapidly growing number of successful companies. This report provides an overview of these developments and sets out the landscape of investment opportunities¹.

Around 100 years after the start of the industrial revolution, European governments began to consider measures to counter the detrimental effects of rapid economic development. The first large-scale environmental law was the Alkali Act, passed in 1863 in Britain to regulate harmful gaseous hydrochloric acid given off in the production of soda ash. However, it was not until the latter half of the 20th century that governments, principally those in developed countries, began to design and implement comprehensive policies to reduce air, water and soil pollution and to reduce the rate of consumption of natural resources such as fossil fuels.

Since the start of the 21st century, urbanisation and rising affluence in the emerging markets of Asia has put increasing and unsustainable pressure on weak infrastructure and has exacerbated the problems of energy security, resource depletion and pollution. In line with growing public awareness across the region, the rather piecemeal approach to environmental legislation of the past is giving way to all-encompassing regulation in most Asian countries. For example, China’s 12th Five Year Guideline² is expected to translate into a US\$770bn investment in low carbon energy by 2020 and, since 2008, South Korea has

allocated more than 70% of its fiscal stimulus package to supporting environmental markets. The regional Environmental Markets shaped by these more comprehensive policies now rival those in Europe and North America, with comparable size, superior growth rates and healthy capital markets.

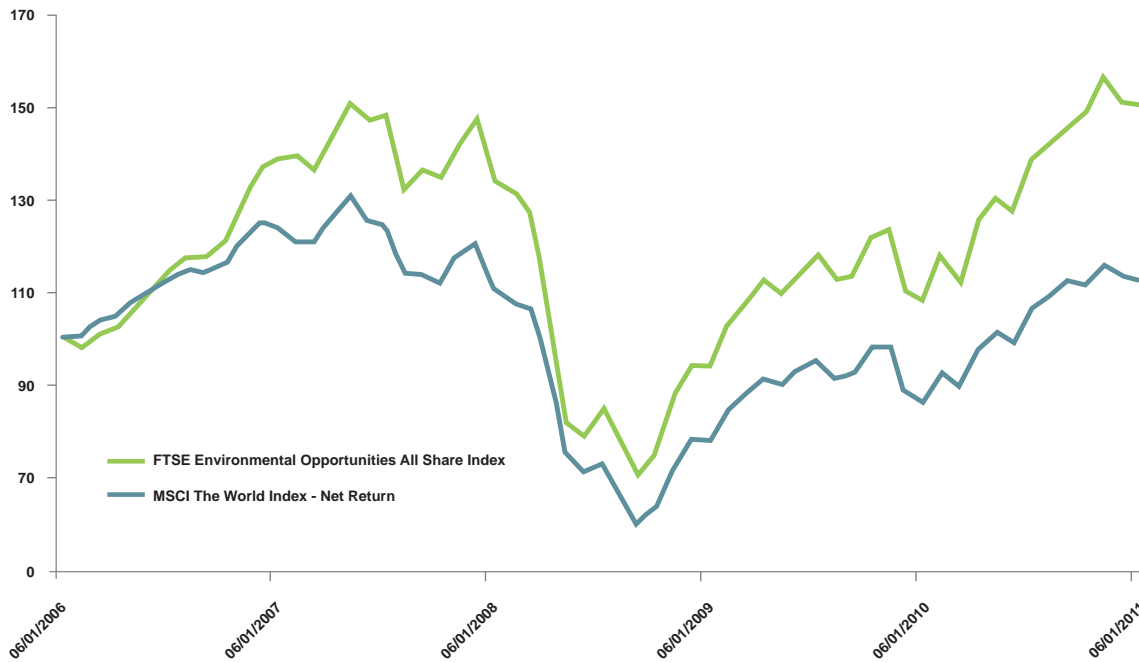
Figure 1 FTSE Environmental Classification

Sectors	Sub Sectors
Renewable & Alternative Energy	Renewable Energy Developers Solar Generation Equipment Wind Power Generation Equipment Biofuels Other Renewable Equipment
Energy Efficiency	Power Network Efficiency Industrial Energy Efficiency Buildings Energy Efficiency Transport Energy Efficiency
Water Infrastructure & Technologies	Water Infrastructure Water Treatment Equipment Water Utilities
Pollution Control	Pollution Control Solution Environmental Testing & Gas Sensing
Waste Management & Technologies	Waste Technology Value Added Waste Processing Hazardous Waste Management General Waste Management
Environmental Support Services	Environmental Consultancies Carbon & Other Environmental Assets Trading General Environmental

Source: FTSE Environmental Markets Classification System, 2009 available at www.ftse.com/environment

Goals set through environmental policy in Asia and elsewhere have underpinned the expansion of Environmental Markets, particularly renewable energy, energy efficiency, water, pollution control, waste management and environmental support services sectors to produce aggregate annual revenues of ca. US\$500 billion world-wide and compound annual growth rates of 10-20% (Figure 1). Companies offering cleaner, more efficient products and services in these Environmental Markets, often incorporating advanced technologies, have a track record of out-performance against general global equities (Figure 2). There are currently ca. 1400 listed companies world-wide that have a material level of activity in Environmental Markets and, in aggregate, account for ca. 8% of the total valuation of stock markets around the world.

Figure 2 FTSE Environmental Opportunities All Share Index versus MSCI World Index



FTSE Environmental Opportunities All Share Index is a global index containing companies with at least 20% of their business derived from Environmental Markets and technologies. Five year performance in US\$ at 30 June 2011. Source: Factset, WM Reuters. FTSE index is total return, MSCI index is total net return.

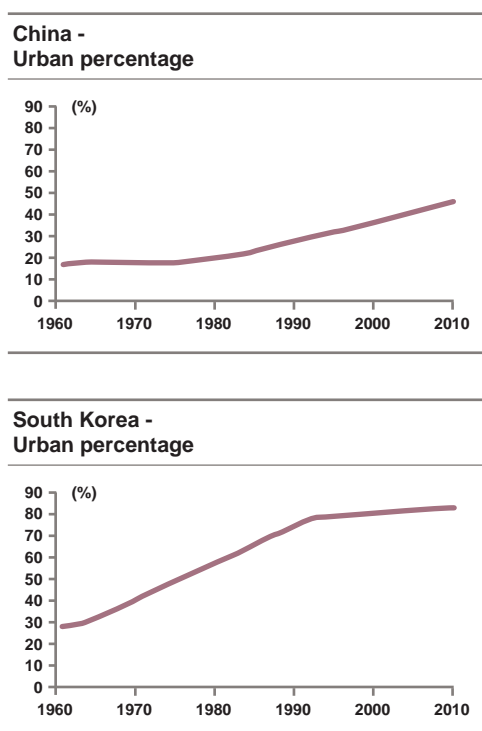
INVESTING IN ASIAN ENVIRONMENTAL MARKETS

Constrained Environmental and Natural Resources

Asian governments face a number of demographic, natural resource and environmental challenges arising from recent rapid economic growth and the region's geography.

Asia is the world's most populous continent, home to 57% of the global population³, but representing only ca. 30% of the land area. Ongoing industrialisation and high rural-to-urban migration rates are resulting in intensely overcrowded towns and cities. For example, South Korea's urban percentage grew from 30% in 1960 to 70% in 1990, whilst urbanisation in China began to rise rapidly in the early 1980s (Figure 3) to give an urban population of 666 million in 2010⁴.

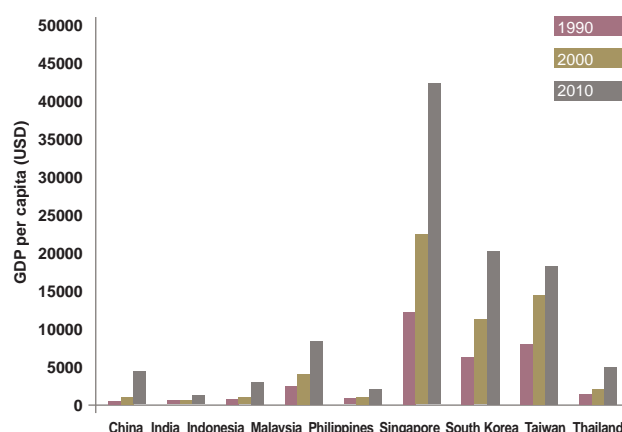
Figure 3 Growth in Urban Population in China and South Korea



Source: CLSA Global Ageing, June 2010

This expansion of urban populations in Asia has occurred alongside rapid economic growth. The Chinese and Indian economies alone have accounted for more than 25% of global GDP growth over the past five years, and China's GDP per capita has increased by over 12 times since 1990 (Figure 4)⁵. The creation of a "middle class" segment of Asian urban society, which is expected to make up 30% of the population by 2015⁶, has had a dramatic impact on levels of consumption.

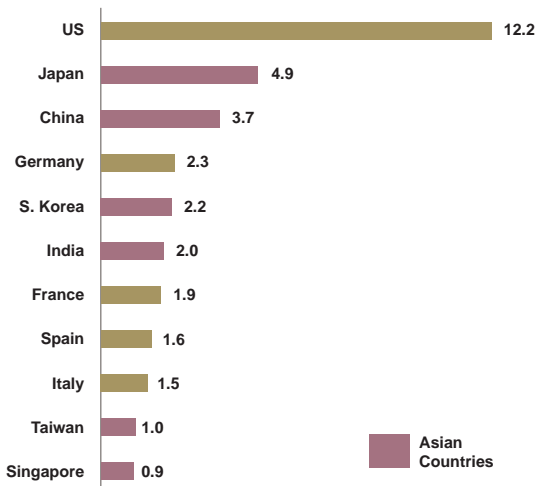
Figure 4 GDP Per Capita 1990, 2000 and 2010



Source: IMF, August 2011

As average per-capita disposable income rises across the region, demand for energy and other commodities is escalating. Many Asian countries lack key natural resources, particularly fossil fuels, and economic growth in many countries has often been characterised by a high dependency on imports of natural resources. China, South Korea, India, Taiwan and Singapore are among the world's largest importers of oil, and as a result are vulnerable to rising energy prices and have significant energy security concerns (Figure 5).

Figure 5 Oil Imports (2008) (million barrels per day)



Source: US Energy Information Administration

Fossil fuels are not the only resources that are limited in Asia: water scarcity is another pressing issue. India, China, Thailand and Korea all have water resources per capita well below the global average, while accessible supplies are being depleted. For example, water resources per capita in China are only a quarter of the global average, but water consumption (per unit of GDP) is more than five times this amount. As a result, supplies are declining (Figure 6) and more than 400 cities in the country suffer water shortages, which have had a significant impact on GDP⁷.

Asia's resource problems are exacerbated by inadequate infrastructure. At the end of 2008, 37% of China's rural population lacked connections to water pipelines, and many cities lack wastewater treatment facilities. Furthermore, the facilities that are in place are often ineffective; for example, weak piping networks mean that 12% of sanitation plants in China operate at utilisation levels of below 60%⁸.

This depletion of scarce water resources is merely one example of the many adverse environmental impacts of rapid Asian economic growth. Water and air quality is also a cause of severe concern across the region. China's CO₂ and sulphur dioxide (SO₂) emissions are now the highest globally, nearly 50% of China's cities

are affected by acid rain, and 20 of the world's 30 most polluted cities are located in the country⁹. Similarly, high pollution levels are found across the region; according to the World Health Organisation, 17% of all deaths in the Asia-Pacific Region are related to environmental problems¹⁰.

These demographic, natural resource and infrastructure challenges are complicated by the region's physical geography and high climatic variability. Many Asian countries have particularly long coastlines and large areas of low lying land. For example, the Philippines, which has 7,000 islands and 34,000 km of coastline, is heavily affected by violent Pacific weather systems, and a large proportion of its population is exposed to significant risk of flooding. Similarly, the economically developed eastern and southern parts of China, which are home to over 50% of the national population, are severely threatened by flooding; the average loss resulting from floods in recent years has been ca. 1.5% of China's GDP per annum¹¹.

Figure 6 Water Resources Decline in China



Source: Morgan Stanley Equity research, 'Sound Global Ltd: One-stop Wastewater Treatment Solutions Provider', February 2011

Climate change is expected to compound these challenges, as floods, droughts and other extreme weather events such as tropical storms, become more intense and less predictable. Moreover, high population densities mean that the impacts of accelerated glacier melt, slope destabilisation and rising sea levels are expected to be particularly damaging¹².

To deliver future economic growth and satisfy the aspirations of increasingly wealthy populations, Asian governments are designing and implementing policies to increase the efficiency with which natural resources are used, and provide more robust, cost effective infrastructure.

Rapid Rollout of Environmental Legislation

Policies to encourage private sector investment in Environmental Markets are now in force across the region. These focus on the provision of infrastructure to supply basic services, the development of clean power, and the reduction of air and water pollution. In addition to providing the means for governments to address significant demographic, resource and pollution challenges, these policies are often also designed to stimulate employment and reduce import dependence and energy security concerns.

Adopted in March 2011, China's 12th Five Year Guideline¹³ is arguably the most impressive programme to tackle these objectives. The plan gives preferential treatment to a series of strategic industries, including energy efficiency, alternative energy and environmental protection, and seeks to attract private investment. Measures include a preferential solar-feed-in tariff and a 50% VAT refund for wind farm developers¹⁴ intended to facilitate the construction of 100 Gigawatts of wind power and 15 Gigawatts of solar power by 2015¹⁵. The plan also makes sizeable infrastructure investment commitments, such as a US\$114bn allocation for urban waste water and municipal solid waste treatment¹⁶.

Similar policies are in operation across the remainder of the region. For example, India plans to add 17 Gigawatts of renewable-based power generation capacity between 2012 and 2017 as the country attempts to bridge its energy deficit and move to cleaner energy sources¹⁷. It has also developed a "National Urban Renewal Mission" to improve water supply and sanitation, road networks and urban transport¹⁸.

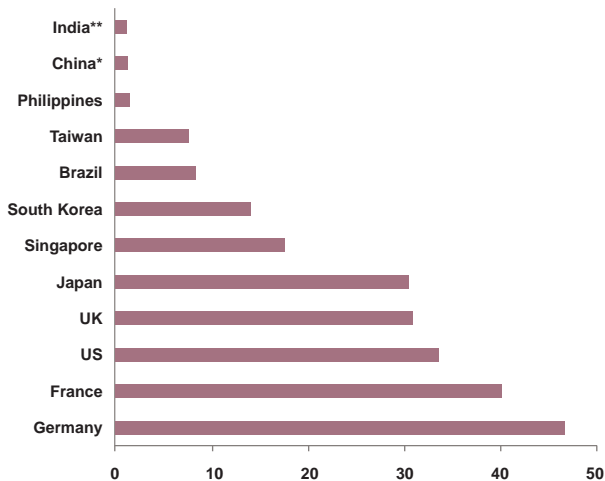
Reducing environmental pollution is an equally important part of working towards cleaner, more efficient economic growth. The Philippine government's Clean Air Act of 1999, which makes emission monitoring systems for companies in the oil, gas, cement and chemical sectors obligatory and provides tax incentives for pollution control devices, was one of the earliest attempts to reverse some of the detrimental side-effects of previously unrestricted economic development¹⁹. Since then, Asian governments have developed a wide range of schemes designed to limit future environmental degradation and also support the accelerated development of cleaner, more efficient technologies. For example, India has a goal to reduce the amount of CO₂ emitted per unit of economic output by between 20 and 25 percent (from 2005 levels) by 2020, and the Indian 2010/11 budget proposed a levy of US\$1 on every tonne of coal produced or imported²⁰.

Improving water quality is similarly high on the agenda. India has allocated US\$88m for environmental remediation programmes, including the clean-up of important lakes and rivers²¹, whilst China's 12th Five Year Guideline sets targets to reduce the overall discharge of nitrogen oxides by 10% from 2010 levels²². As a result, stringent nitrate removal checks have recently been introduced at Chinese thermal power plants in an attempt to increase the denitrification rate from 15% in 2010, to 100% by 2015²³.

Technological and Industrial Leadership

Asia's well established manufacturing capabilities and efficient labour markets provide a solid foundation for multiple environmental sectors. Labour costs across Asia are a fraction of those in developed markets, and significantly lower than those in developing Europe or Latin America (Figure 7). Asian manufacturers also have globally competitive operations across the heavy machinery, chemicals, metals, semiconductor, and power electronics sectors. This enables the local production of key components and reduces the costs associated with design, sourcing, logistics, marketing and time-to-market within the supply chain, generating significant scale economies.

Figure 7 Hourly Compensation Costs, US\$ 2009



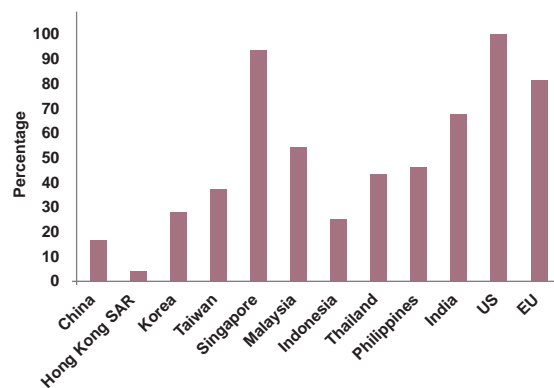
Source: US Department of Labour. Estimates for China and India for 2008 and 2007, respectively

Asian manufacturers have exploited these advantages to establish global leadership in many Environmental Markets (for example, solar, wind and energy efficient lighting). For example, China is the lowest cost producer across every segment of the solar power generation equipment manufacturing process²⁴, and accounts for over 60% of solar cell shipments worldwide, as of 2010²⁵.

To retain their leadership positions, Asian governments have launched incentives to support technology investment. In 2007, in a bid to increase R&D expenditure from 1.4% of GDP in 2006 to 2.5% by 2020, the Chinese government introduced tax deductions for R&D expenses and increased government-backed lending. For example, corporation tax on high-tech enterprises in China is 15%, versus a regular rate of 25%²⁶. Chinese patent volumes have recently surpassed those in Europe and are forecast to exceed volumes in both Japan and the US to become the largest in the world during 2011²⁷.

Manufacturing and technology leadership is underpinned by supportive financial markets. Unlike in Europe and the US, economies in Asia were buffered against the worst of the recent financial crises, and prospective growth projections remain optimistic. For example, GDP growth in China is expected to be above 9% per annum over the next six years²⁸. In addition, most Asian countries have strong balance sheets and manageable levels of indebtedness (Figure 8).

Figure 8 Public Sector Debt to GDP %, 2011



Source: IMF, 2011

This financial resilience is underpinned by a well capitalised banking system. In 2010, Asian banks' capital adequacy ratio under Basel III, 2010E was 11.7%, compared with 9.3% in the US and 10.2% in Europe²⁹.

Furthermore, Asian equity markets continue to function well. For example, during the first half of 2011 Huaneng Renewables, a Chinese wind farm developer, and OCI, a South Korean producer of solar grade polysilicon, raised US\$800m and US\$700m in Hong Kong and Singapore respectively. China currently dominates clean energy public market fundraising, with US\$2.3bn and US\$1.6bn raised in the first and second quarters of 2011, accounting for 63% and 49% of the global total³⁰.

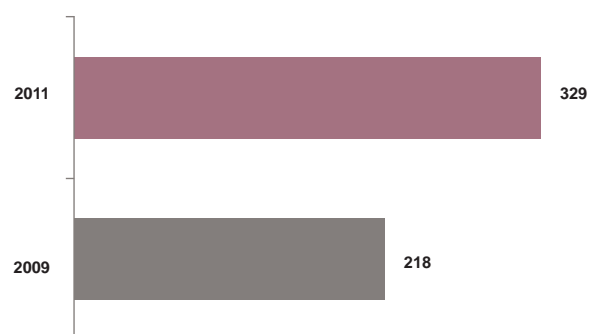
Well Populated and Expanding Universe of Companies

In recent years the number of companies active in Asian Environmental Markets has grown rapidly in response to favourable market developments and the inherent advantages of being in the region. This growth has come both through initial public offerings (“IPOs”) and as a result of strategic decisions by larger, more diversified companies to expand into Environmental Markets.

Today, the Asian portion of the global Environmental Markets universe contains over 320 companies with a combined market capitalization in excess of US\$450m³¹ (Figure 9), and offers extensive scope to outperform the basket of general Asian equities.

Figure 9 Growth in Asian Environmental Universe

October 2009 to August 2011, Number of Asia Pacific Environmental Companies >US\$50m



Source: Impax, 2011

Attractive Opportunities for Experienced Investors

Asian Environmental Markets are complex as a result of rapidly evolving environmental legislation and technology, and traditional investment methodologies are inadequate to identify mispriced opportunities. This complexity means that a number of additional elements need to be included in the research and analysis process.

The FTSE Environmental Markets universe and classification system (Figure 1) provides an international peer group against which the business model, management team capabilities, risks, and valuation of Asian companies can be compared. However, when it comes to assessing governance, there are a number of issues that are specific to Asia. These include:

- Concentrated ownership structures (often found in China), where the CEO may be the Chairman, founder and controlling shareholder of the company.
- Strong influence of sponsor/promoter (particularly in India), where conflicts of interests can arise between the sponsor and investors on issues such as fund raising, the company’s capital structure, related party transactions, and acquisitions and divestments.
- Board members are often friends or family of the sponsor/promoter.
- “Back door” listings in Hong Kong and the US, often when companies have short histories or have gone through a major change in business focus.

The complex business models of the industrial conglomerates that are diversifying into Environmental Markets means that identifying these governance issues typically proves challenging. Furthermore, sell-side coverage of Asian Environmental Markets companies is often fragmented across a range of generalist brokers with construction, chemical or utility sector remits. As a result, this type of research frequently fails to highlight relevant opportunities and risks in Environmental Markets. An investment manager’s local presence, and frequent company visits are therefore crucial elements of the research and analysis process.

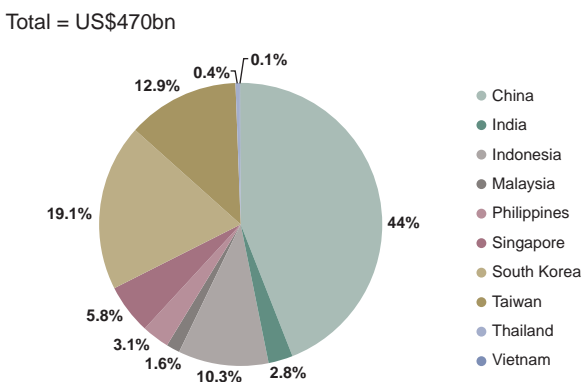
REGIONAL OVERVIEW

This section describes the investment landscape of Asian Environmental Markets by comparing countries and sectors.

Asian Environmental Universe by Country and by Sector

China offers the deepest and broadest Environmental Markets investment opportunity due to strong environmental policy momentum, well capitalised banks, low labour costs and a burgeoning high-tech sector (Figure 10). In Korea and Taiwan, a number of industrial conglomerates have developed significant environmental technology capabilities, whilst Environmental Markets companies in India are found predominantly in the water, renewable energy and pollution control sectors. Indonesia, Singapore, Malaysia, Philippines, Thailand and Vietnam represent a smaller part of the universe.

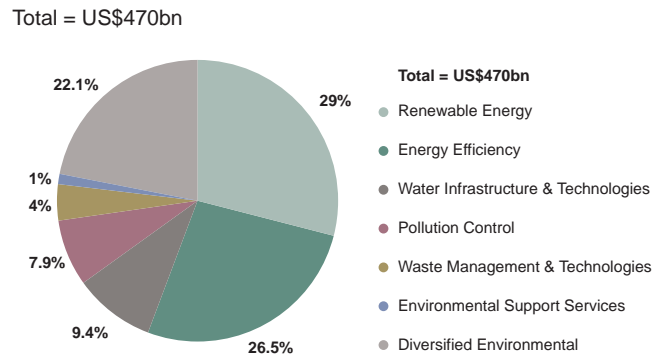
Figure 10 Asian Environmental Universe by Country (by market cap)



Source: Impax, 2011

When classified by sector, renewable energy companies account for nearly 30% of Asian Environmental Markets, whilst companies in the energy efficiency sector that are involved in the transportation, industrial, buildings and utility markets account for 22% (Figure 11). Water infrastructure and technology companies make up a significantly smaller proportion of the universe, whilst the pollution control, waste management and environmental support services sectors are typically small throughout the region.

Figure 11 Asian Environmental Universe by Sector (by market cap)



Source: Impax, 2011

Detailed Country Level Analysis

To provide a more detailed account of the overall investability of the Environmental Markets in each country we have used a combination of qualitative and quantitative factors to evaluate the following:

1. **Policy and regulatory support** reflects the number and scope of each country's environmental policies, standards, subsidies and regulations as well as the overall political commitment to the targets and objectives;
2. **Domestic Environmental Markets** considers the size and growth of the national Environmental Markets with particular consideration given to the market structure, the availability of natural resources, and flexibility of private businesses;
3. **Strength in export markets** evaluates the extent to which the companies in the country are exporting environmental products and services worldwide, particularly in key global sectors such as solar, wind, energy efficient lighting, energy storage, filtration, and power electronics;
4. **Investible universe** reflects the number of listed companies and the combined market capitalisation of the companies based in each country.

Summary Comment

- China**
- Strong environmental policy momentum supported by 12th Five Year Guideline
 - Active domestic market supported by well-funded governments, banks and corporates; good renewable energy resources
 - Dominant position in global solar market and growing position in LEDs, energy efficiency and wind
 - Diversified range of listed investment opportunities across the environmental sub-sectors

- Korea**
- Well-established policy framework with increasing momentum in renewables and energy efficiency
 - Domestic markets dominated by large conglomerates, limited renewable energy resources
 - Export driven market led by industrial conglomerates with expertise in electronics and heavy industrial sectors
 - Investment opportunities within large conglomerates

- India**
- Strong and broad environmental policy (sometimes lacks enforcement)
 - Significant domestic markets as government mandates seek to address infrastructure deficits in water and power
 - Limited participation in export markets
 - Investment opportunities in water, renewables and power infrastructure

- Taiwan**
- Well-established environmental policy and legislation
 - Few domestic renewable resources and small Environmental Markets growth
 - Strong position in the LED and power electronics value chain supported by core competence in the semiconductor industry
 - Investment opportunities concentrated in a few sectors (LEDs and energy efficiency)

- Singapore**
- Tight environmental quality standards with strong enforcement
 - World leader in desalination projects with active water treatment market
 - Export water treatment, recycling and biofuels technologies
 - Listed opportunities reflect water sector focus

Summary Comment

- Philippines**
- Limited environmental regulations but strong framework to encourage investment in renewable energy and water infrastructure
 - Good renewable energy resources (particularly hydro and geothermal); deregulated power and water sectors
 - Very little participation in international Environmental Markets
 - Listed equity opportunities in water and renewable energy utility sectors

- Indonesia**
- Emerging environmental policy framework
 - Limited market with high future potential due to resource availability (notably geothermal), economic growth and infrastructure deficit
 - Limited export activity
 - Investment opportunities in pollution control, recycling and biofuels

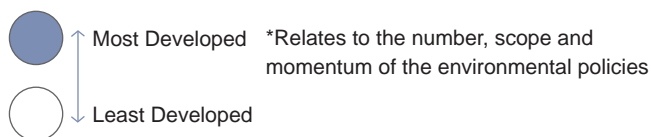
- Malaysia**
- Evolving environmental policy framework in recent years but limited implementation
 - Attractive water regulatory framework and good renewable energy resources
 - Some participation in international markets including energy efficiency and pollution control
 - Investment opportunities in water, biofuels and industrial-related sectors

- Thailand**
- Evolving environmental policy framework but limited implementation
 - Small domestic Environmental Markets but good renewable energy resources and partial de-regulation of the water sector
 - Some participation in international markets by energy efficiency companies
 - Small number of companies across water, biofuels, power electronics and recycling sub-sectors

- Vietnam**
- Evolving environmental policy framework
 - Domestic markets undeveloped but high future potential due to renewable energy resources, economic growth and infrastructure deficit
 - Limited participation in international markets
 - Tiny investible universe

Table 1 Asian Environmental Markets - Overall Listed Equity Investability Ratings by Country

	Policy support*	Domestic environmental market	Importance of exports	Investible universe	Overall Investability
China					
Korea					
India					
Taiwan					
Singapore					
Philippines					
Indonesia					
Malaysia					
Thailand					
Vietnam					



Using Investability Rating to Identify Case Studies

This wide variation in policy support and market strength across the region means that the investability of the environmental sub-sectors varies significantly from country to country. This leads investors to evaluate Environmental Markets on a country-by-country basis, rather than on a regional level.

In Table 2, we break the overall investability rating of each country down to a sub-sector level and find only a limited range of opportunities in Indonesia, Malaysia, Philippines, Thailand and Vietnam. However, a number of these are particularly attractive, for example renewable energy developers in the Philippines, and water infrastructure and technology companies in Singapore. There is a broader range of investment opportunities across China, Taiwan, Korea and India. We choose six areas across a range of countries to explore in detail in the next section.

Table 2 Asian Environmental Markets (Breakdown by Sector)

	Renewable and Alternative Energy		Energy Efficiency			Water Infrastructure and Technologies		Pollution Control	Waste Management and Technologies		Environmental Support Services		Overall
	Renewable energy developers	Renewable generation equipment	Industrial energy efficiency	Buildings energy efficiency	Transport energy efficiency	Water infrastructure	Water treatment equipment	(Air) Pollution control solutions	Waste technology equipment	Value added waste processing	Environmental consultancies	Diversified environmental	
China	●	●	◐	◑	◑	◐	◑	●	◑	●	○	●	●
Korea	○	◑	◐	●	●	◑	◑	◑	○	◑	○	●	◑
India	◐	◐	◑	○	◑	●	◑	◑	○	◑	○	◑	◑
Taiwan	○	◑	●	●	◑	○	○	○	○	○	○	◑	◐
Singapore	◑	○	○	○	○	◐	◐	◑	○	◑	○	◑	◐
Philippines	●	○	○	○	○	◑	○	○	○	○	○	○	◐
Indonesia	○	○	○	○	○	○	○	◑	○	◑	○	○	◑
Malaysia	○	○	○	○	○	◐	○	○	○	○	○	◑	◑
Thailand	◑	◑	◐	○	○	◑	○	○	○	○	○	○	◑
Vietnam	◑	○	○	○	○	○	○	○	○	○	○	○	○



CASE STUDIES

RENEWABLE AND ALTERNATIVE ENERGY CHINA: WIND

The Chinese wind energy industry has been driven primarily by national renewable energy policies to reduce China's energy dependence on imported fossil fuels, limit air pollution and develop a diversified energy mix. In its Renewable Energy Development Plan (2007), the Chinese government set a target to make non-fossil fuel energy account for 15% of the country's energy mix by 2020 (compared to 9.6% in 2010), in which wind energy should account for between 3% and 5%³². In the most recent 12th Five-Year Guideline (adopted in 2011), the Chinese government strengthened its commitment to wind power development, with a target of 90 GW of wind power capacity by 2015³³; for comparison, the European Union's target is 130 GW³⁴.

Chinese installed capacity is the fastest growing globally. In 2010, China overtook the United States as the country with the most installed wind farm capacity by adding 18.9 GW of new wind power capacity, thus reaching a total installed capacity of 44.7 GW³⁵. This growth was driven by a record level of investment of around US\$22bn in 2009³⁶. And in 2011, China alone is expected to represent more than half of the global total³⁷.

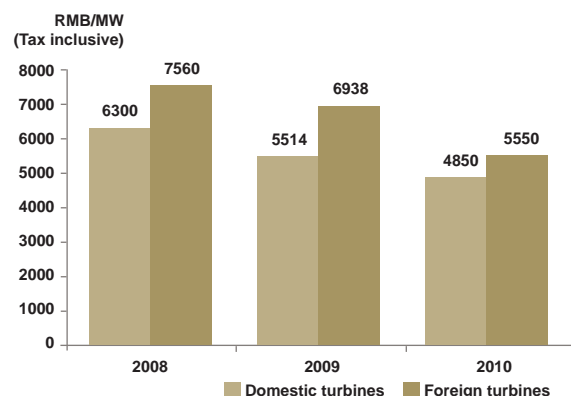
China has a huge land mass and a long coast line, and hence offers enormous wind energy resources and significant development potential. The Chinese government report "Development Planning of a New Energy Industry" estimated that the cumulative installed capacity of China's wind power will grow at a compound annual rate of 16% to 2020, when it will generate 440 TWh of electricity annually, creating more than RMB 250bn in revenue (at the time of writing the exchange rate was 6.4RMB per USD)³⁸. This strong growth is expected to extend well beyond the next

decade: according to the Chinese Renewable Energy Industries Association (CREIA), China has a potential to develop up to 1,200 GW of wind power³⁹.

China offers attractive wind farm economics. In 2011, the feed-in-tariff for wind power is in the range of RMB 0.51-0.61/kWh, compared to electricity generated by coal at around RMB 0.30/kWh (at which coal plants are making loss). As coal tariffs are fully liberalised and the cost of wind turbines falls, the differential between these tariffs is expected to disappear by 2015⁴⁰. There are also favourable tax policies for wind farms in China, including a 50% VAT rebate on power sales, a VAT rebate on equipment purchases, and income tax breaks.

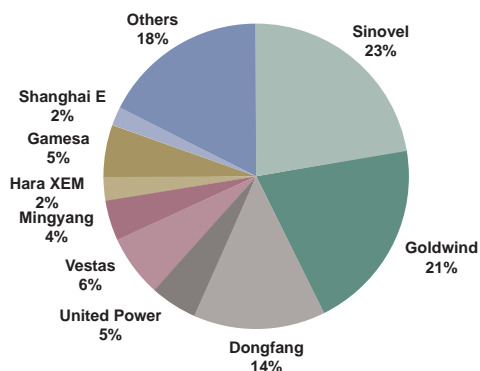
Upstream, the equipment manufacturing market is highly concentrated. The leading domestic turbine manufacturers, Sinovel, Goldwind, Dongfang and Mingyang supplied around 62% of the total installed capacity in China by 2010⁴¹ (Figure 13), while China High Speed has more than 50% of the Chinese wind gearbox market⁴². As shown in Figure 12, domestic wind turbine prices have been falling by ca. 12.26% annually since 2008, while the price gap between domestic and foreign turbines has been narrowing.

Figure 12 Falling prices of wind turbines



Source: Company data, Macquarie Research, April 2011

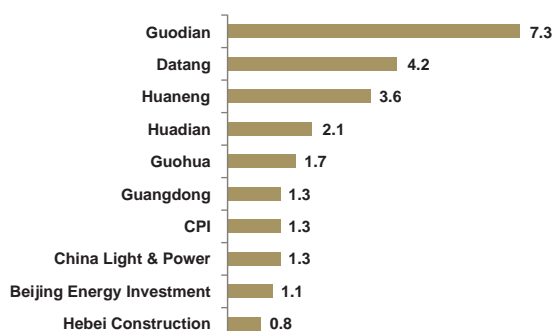
Figure 13 Market share of total installed capacity 2010



Source: CWEA, Macquarie Research, April 2011

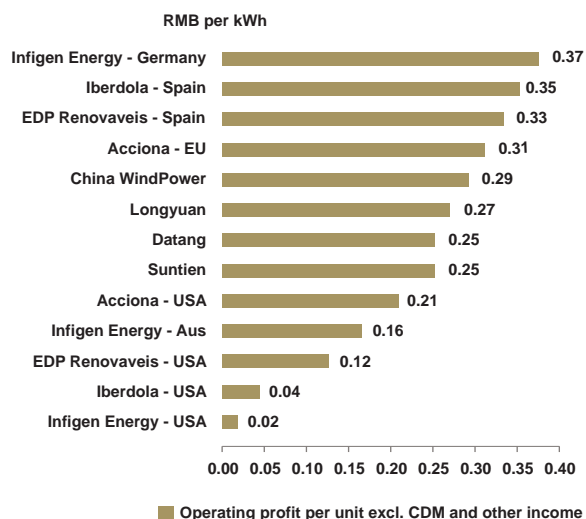
The downstream wind farm development market is also concentrated and led by big State Owned Enterprises, many of which are listed and have private sector shareholders. In 2010, the top four listed developers, i.e. Guodian (Longyuan), Datang, Huaneng and Huadian built almost 40% of the cumulative installed capacity (Figure 14). The profitability of the larger Chinese developers ranks mid-way between their European and US counterparts⁴³ (Figure 15).

Figure 14 Top 10 developers YE 2010 cumulative installed capacity (GW)



Source: Bloomberg New Energy Finance. Note: Attributable or equity adjusted capacity. Onshore projects only.

Figure 15 2010 Operating profit per unit



Source: Company data, Macquarie Research, April 2011

Notwithstanding its strong potential, the Chinese wind industry still faces some serious issues. Inadequate grid connections are expected to remain a bottleneck for at least another two years. Meanwhile, rising Chinese interest rates will increase the cost of finance for developers. Separately, some turbine manufacturers have experienced product quality problems, which have reduced availability/utilization, while the lack of reliable operations and maintenance service providers has eroded realized returns.

Company	China Longyuan Power Group Corporation Ltd.
Listed	Listed on the Hong Kong Stock Exchange in December 2009.
Company Description	<p>Largest wind power operator in China with over 6.5GW of installed capacity and a market share of 21% at end of 2010.</p> <p>Established in 2009 out of the reorganization of the China Longyuan Electric Power Company, which was founded in 1993.</p> <p>Access to over 50GW of projects.</p> <p>Wind farms mainly located in the three Northeast Provinces, Inner Mongolia, the Southeast coastal provinces, Xinjiang, Gansu and Hebei.</p> <p>74% of operating profit from wind farms in FY2010.</p> <p>Largest shareholder, Guodian Power Group, is one of the largest Chinese independent power producers.</p>
Investment Thesis	<p>Only wind power producer in China with a proven track record of plant construction, grid connection and operation.</p> <p>Well funded with strong government and industry connections.</p> <p>Large, geographically diversified portfolio of wind farms.</p> <p>Targeting an additional 2GW of wind capacity per year.</p> <p>Expanding into offshore wind projects and overseas projects.</p> <p>Construction of an ultra-high voltage transmission network by state grid company should support growth.</p>
Key Metrics	<p>Market Cap: US\$6.4bn (All market capitalisation figures as at close of 26th August 2011.)</p> <p>Revenue, LFY: US\$2.2bn</p> <p>Revenue, Yr/Yr, LFY: 46%</p> <p>ROE, LFY: 9%</p>
Risks	<p>Interest rate hikes and credit tightening.</p> <p>Delay in resolving wind power dispatch issues in certain provinces.</p> <p>Wind farms capacity factors reduced by unexpected weather conditions.</p>

Company	China High Speed Transmission Equipment Group Co Ltd
Listed	Listed on the Hong Kong Stock Exchange in July 2007.
Company Description	<p>Focused on mechanical transmission equipment for industrial applications.</p> <p>Founded in 2006 when China High Speed Transmission Equipment Group acquired Nanjing High Speed & Accurate Gear Group Ltd and then Nanjing High Speed & Accurate Gear Group Ltd.</p> <p>Supply of wind gearboxes accounted for over 70% of its total sales in 2010.</p> <p>Delivered first batch of 3MW offshore wind power gear boxes in 2010.</p> <p>Commenced R&D for 5MW wind gear transmission equipment.</p>
Investment Thesis	<p>Leading wind gearbox producer in China with over 50% market share.</p> <p>Strong R&D capability and well-developed manufacturing capabilities.</p> <p>Close working relationship with GE which assists in product development and is also a customer.</p> <p>Potential to benefit from the industry's move to larger turbines.</p> <p>Growth drivers from gearbox non-wind applications in transport and agriculture businesses.</p> <p>Increase in export orders.</p>
Key Metrics	<p>Market Cap: US\$0.8bn</p> <p>Revenue, LFY: US\$1.2bn</p> <p>Revenue, Yr/Yr, LFY: 31%</p> <p>ROE, LFY: 23%</p>
Risks	<p>Execution and capability to manage rapid technology advancements.</p> <p>Slower demand in China for wind equipment.</p> <p>Increased competition from local peers.</p>

ENERGY EFFICIENCY TAIWAN: LEDs

The market for energy efficient lighting products is expanding rapidly, driven to a significant degree by government policy. With the aim of reducing energy demand and/or lowering greenhouse gas emissions, governments around the world (including the US, the EU, China, Brazil, Australia, New Zealand, Canada, Venezuela and Cuba) have, during the past five years, announced a ban on the sale of incandescent bulbs, while the EU has gone a stage further and placed significant restrictions on fluorescent bulbs, which contain mercury.

Lights based on light-emitting diodes (“LEDs”) have significantly longer lifetimes, better colour characteristics and lower energy consumption than conventional lighting products. Demand for LEDs, which represented ca. 1% of the US\$80bn global lighting market in 2010⁴⁴, is expected to grow at a compound annual rate of 49%, reaching US\$6.4bn by 2015 and US\$47bn by 2020⁴⁵.

Future demand for LEDs is likely to be driven by flat screen TVs (which, in 2010, represented the largest segment) and general lighting (which represented 9% of LED demand). In contrast, LEDs are now dominant in mobile phones (the first significant LED market) and laptop computers⁴⁶.

The LED value chain comprises eight segments (Figure 16) and can be summarized as:

- Upstream: the semiconductor substrate and crystal (grown in a process called epitaxy) plus the controlling chip
- Midstream: electronics and a heat management system
- Downstream: the lighting unit (“luminair”) plus packaging and distribution

Asia’s well-established semiconductor industry makes it well positioned for the LED sector: in 2009, an estimated 81% of LEDs were manufactured in the region⁴⁷. Several German and US LED companies also have large production bases in China and Malaysia and/or outsource to Taiwan. In contrast, with their proximity to nascent markets, North America and Europe are relatively stronger downstream (Figure 17).

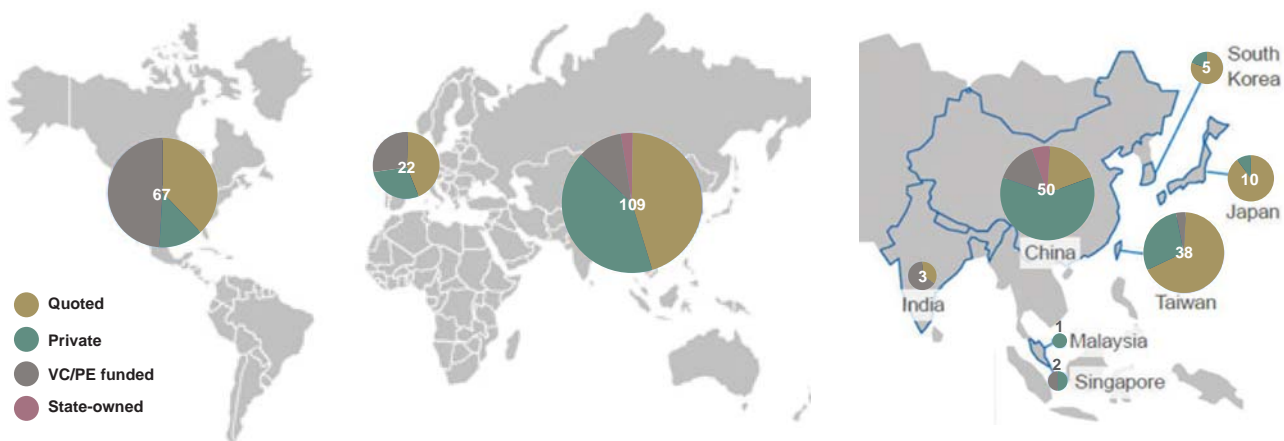
Taiwan’s strong semiconductor sector has provided a solid foundation for an LED industry cluster that encompasses the full value chain. In 2009, Taiwan was home to 35 LED factories, accounting for 40% of the global total⁴⁸, and by 2010, total investment in the Taiwanese LED industry was the largest in the world at ca.\$600 million⁴⁹. Taiwan is currently the world’s number one LED supplier by volume and number two by revenue⁵⁰.

The leading Taiwanese LED companies are Epistar, which claims a 50% market share (globally) in red/yellow/orange LEDs and a 20% global capacity share in blue/green/white LEDs, and Everlight, which is the world’s seventh largest LED manufacturer⁵¹.

Figure 16 The LED Value Chain



Figure 17
Distribution of organisations active in LED lighting worldwide and Asia



Source: Bloomberg New Energy Finance

In seeking to retain a commercial edge in a highly competitive global industry, leading upstream Taiwanese LED businesses are investing heavily in acquisitions in order to secure valuable intellectual property and achieve economies of scale. Meanwhile, downstream players are likely to source their LED technology from third parties and are trying to reduce their costs by producing lower value components such as lead frames in-house.

The most serious challenge facing Taiwanese LED companies is sustaining attractive returns on capital employed in the face of competition from new market entrants; particularly experienced Korean electronics companies with strong capabilities, and new, low cost Chinese companies producing lower end products but causing oversupply in the overall market. Upstream, experienced well-funded competitors from Japan, Germany, and the US also continue to develop and patent new technologies, obliging Taiwanese companies to invest heavily in R&D. Downstream there is evidence that flat panel TV manufacturers in several countries are seeking to bring some or all of the LED value chain in-house.

Company	Epistar Corp.	Taiwan Surface Mounting Technology Corp.
Listed	Listed on Taiwan Stock Exchange in May 2001.	Listed on Taiwan OTC in December 2001.
Company Description	<p>Market leader in the high-brightness LED industry.</p> <p>Specializes in the upstream production of LED chips.</p> <p>Founded in 1996.</p> <p>Manufactures high-brightness LEDs with low power consumption and long lifespans.</p>	<p>Founded in 1990.</p> <p>Taiwan's largest supplier of surface mounting technology (SMT)⁵².</p> <p>SMT involves fitting microprocessor, memory and other electronic components onto a PCB substrate with a high-speed chip mounter.</p>
Investment Thesis	<p>Leading Taiwanese LED company with superior technology and capacity.</p> <p>Diversified, cost competitive product lines.</p> <p>Growing opportunity as an outsourced chip provider to global lighting groups.</p> <p>JV with Toyoda Gosei (Japan) and produce devices for groups such as Philips.</p> <p>Horizontal integration gives strong pricing power over LED packagers.</p> <p>LED lighting market growth from 2012 driven by ongoing brightness, efficiency improvement and cost reduction.</p>	<p>Leading global market share in controller board and light-emitting diode (LED) light bar businesses.</p> <p>Flexibility to shift labour force and transport equipment to ensure high staff retention and optimal utilisation of production lines.</p> <p>Strong design and sourcing capabilities.</p> <p>Beneficiary of increasing adoption of LED-backlit applications.</p> <p>Market-share gains as a result of declining LED costs.</p>
Key Metrics	<p>Market Cap: US\$1.7bn</p> <p>Revenue, LFY: US\$0.7bn</p> <p>Revenue, Yr/Yr, LFY: 63%</p> <p>ROE, LFY: 14</p>	<p>Market Cap: US\$0.5bn</p> <p>Revenue, LFY: US\$1.4bn</p> <p>Revenue, Yr/Yr, LFY: 37%</p> <p>ROE, LFY: 23%</p>
Risks	<p>Competition from panel makers or companies in the downstream market.</p> <p>IP litigation from global participants.</p> <p>Weakening consumer end-demand.</p>	<p>Slower-than-expected increase in the LED penetration rate.</p> <p>Lower consignment orders than anticipated.</p> <p>Increased price competition.</p>

POLLUTION CONTROL CHINA: NATURAL GAS

With abundant reserves, China has historically relied on coal as its primary energy source. The country is the world's largest coal consumer and has been a net importer since 2009. However, extraordinary growth in the demand for energy and concerns about its balance of payments, coupled with a realization of the environmental impact of coal combustion, has led the government to develop domestic forms of clean energy.

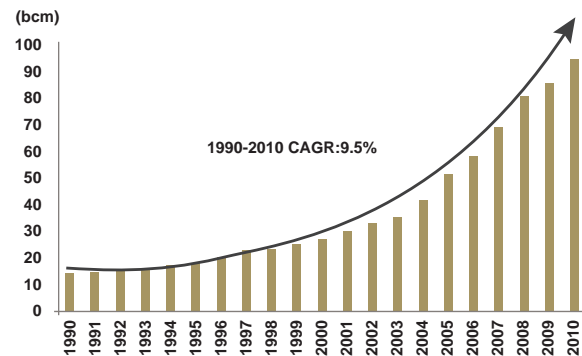
In this context, natural gas, of which China has 1.5% of the world's proven reserves, is expected to become a more important part of the energy mix⁵³. Natural gas typically produces less than 50% of the CO₂ emissions of coal (to generate a unit of electricity) while SO₂ and NO_x emissions, both major contributors to acid rain, are also significantly lower. The country expects to triple its gas power generation capacity by 2015 (to 88GW compared to an installed base of 28GW in 2010⁵⁴).

China intends to raise the proportion of natural gas in the primary energy mix from 3.9% in 2009 to 8.3% by 2015, representing a compound annual growth rate of 19.4%⁵⁵ compared to historical annual growth of 9.5% (Figure 18). This substantial increase should help to reduce current high air pollution levels; annual average particle matter in Beijing is 150 micrograms per cubic metre, compared with only 40 micrograms per cubic metre in Tokyo⁵⁶.

To facilitate these developments, the government is currently limiting the price of natural gas to ca. 40-60% of the price of liquefied petroleum gas (LPG) and diesel (on an equivalent basis), whose prices are more closely correlated to the price of internationally traded crude oil⁵⁷.

Until recently, lack of a suitable transmission infrastructure restricted the natural gas sector's development. The majority of China's gas reserves are located inland (in the western and north-western regions), whereas demand is mostly in the eastern

Figure 18 China: Historical domestic natural gas production

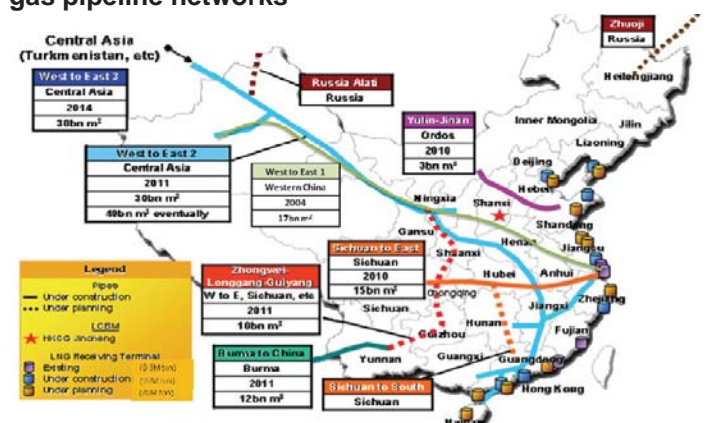


Source: CEIC, Nomura research

regions (including the coast). For instance, although 80% of buildings in Beijing are connected to the gas network, the average connection level nationwide is only 22%⁵⁸, compared to 46% in the United Kingdom⁵⁹.

To ensure that future demand can be satisfied, newly commissioned gas pipelines are supplying both domestically produced and imported gas. For example, the West-to-East Pipeline II commenced operation in 2010 and is to reach Guangdong (a major "power deficit region") by the end of 2011. Other planned pipelines include the Sichuan-to-East pipeline, the West-to-East III and IV pipelines, the Burma-to-China pipeline. There are also plans for a new pipeline from Russia (Figure 19).

Figure 19 China: existing, developing and planned gas pipeline networks



Source: CEIC, Nomura research

Three listed state owned oil companies (CNPC, Sinopec, and CNOOC) dominate China's upstream natural gas sector. CNPC is the dominant holder of domestic gas resource (75% share) and pipeline network (80% share). Sinopec's core gas resources are concentrated in Shandong (coastal province south of Beijing) and Sichuan (landlocked western province), whilst CNOOC provides offshore gas by pipeline from the South China Sea to Hong Kong, and from the East China Sea to Shanghai.

Downstream gas distribution companies that were previously owned and managed by local governments are the principal private sector investment opportunities. Today there are more than 60 companies

providing midstream pipeline transmission and downstream gas distribution. The sector is evolving rapidly, with high levels of investment funded by capital markets and frequent corporate transactions.

Despite its promising growth potential, the Chinese natural gas sector has several investment risks. Government intervention to control prices creates significant uncertainty for investors, whilst the high rate of growth is challenging for management teams. Limited pipeline capacity also means that the demand deficit in some regions will take some time to resolve, with any delays in pipeline or terminal construction further constraining supply.

Company	ENN Energy Holdings Ltd.
Listed	Listed on the Hong Kong Stock Exchange in April 2001.
Company Description	<p>Founded in 1993 with a single project in Langfang (Hebei province). Specializes in distributing piped natural gas to residential households, commercial buildings and light industrial companies. Operates in over 70 cities and districts covering a total urban population of over 55 million (as of December 2010). Established track record in China's urban gas sector.</p>
Investment Thesis	<p>Early mover advantage with a diversified portfolio and proven track record. Strong management execution capability. Already generating positive free cash flow (unlike many of its peers). New project rollout: Some target cities expect to be connected to the major pipelines (e.g. W-E Pipeline II) within 12 months. Focusing on organic growth instead of bidding aggressively for new projects. Entering into new business ventures and seeking opportunities in overseas markets.</p>
Key Metrics	<p>Market Cap: US\$3.4bn Revenue, LFY: US\$1.8bn Revenue, Yr/Yr, LFY: 33% ROE, LFY: 18%</p>
Risks	<p>Lower-than-expected revenues from connection fees. Lower-than-expected gas sales volumes. Increasing involvement of upstream gas players in downstream markets may result in fewer expansion opportunities and reduced market share at current sites.</p>

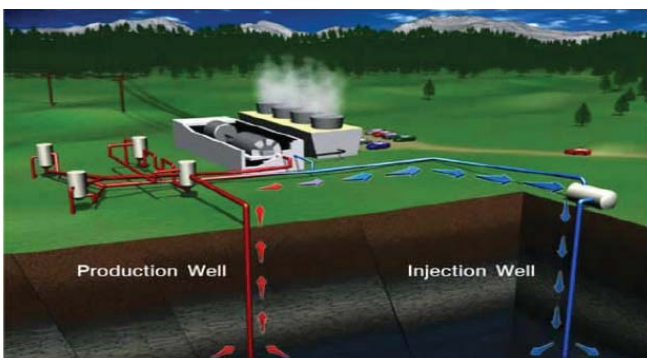
Company	Beijing Enterprise Holdings Ltd.
Listed	Listed on the Hong Kong Stock Exchange in May 1997.
Company Description	<p>Largest natural gas distributor in Beijing.</p> <p>Controlled by Beijing Enterprises Group, which is wholly-owned by the Beijing municipal government.</p> <p>Owns Beijing Gas, which has over three million connected households and more than 3.6 billion cubic meters of annual gas sales (the largest in China).</p> <p>Involved in the Shaanxi-Beijing Gas Pipeline which transmits natural gas from gas fields in Shaanxi to Beijing and other northern Chinese cities.</p> <p>Active in the water treatment sector, operates toll roads and owns a controlling stake in Yanjing Brewery, one of the top three brewery brands in China.</p>
Investment Thesis	<p>Main business focused in Beijing, one of the country's most dynamic markets.</p> <p>Competitive advantage from ownership of the Shaanxi-Beijing gas pipeline.</p> <p>Benefits from full policy and financial support from its key shareholder (i.e. the Beijing government.).</p> <p>Growth expected to accelerate in 2012, after the commissioning of two new gas-fired power plants in Beijing and higher utilisation of the Shaanxi-Beijing pipeline leads to greater gas sales volume.</p> <p>Growth from expansion into other regions and non-gas businesses.</p>
Key Metrics	<p>Market Cap: US\$5.4bn</p> <p>Revenue, LFY: US\$3.5bn</p> <p>Revenue, Yr/Yr, LFY: 14%</p> <p>ROE, LFY: 8%</p>
Risks	<p>An inability to pass on rising upstream gas costs.</p> <p>Lower-than-expected utilisation of the Shanxi-Beijing pipeline.</p>

RENEWABLES PHILIPPINES: GEOTHERMAL

The bulk of the Philippine's power supply comes from imports of coal and oil, which account for ca. 30% and 20% of the energy mix respectively⁶⁰. High levels of fossil fuel combustion have given rise to chronic levels of air and water pollution; in Metro Manila, particulate matter exceeds twice the national air quality standards⁶¹, and all surface waters, except for upper portions of the Marikina River (Eastern Metro Manila), are considered "biologically dead" during the dry months of the year⁶².

Despite large imports of fossil fuels, the Philippines suffers from a power deficit, with frequent blackouts. However, the country is endowed with significant renewable energy resources, including vast unexploited reserves of geothermal energy which can be extracted and separated into steam (that is directed into the power plants for power generation), and hot water (that is returned to reservoirs to replenish the steam source (Figure 20)).

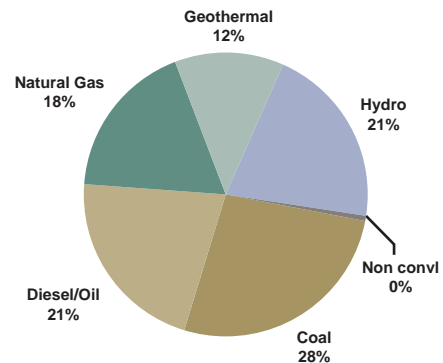
Figure 20 Production of Geothermal Power



Source: EDC, Nomura Research, 2010

Geothermal power is cost effective, reliable, and causes minimal environmental impact. However, at the end of 2010, geothermal energy accounted for just 12% of the Philippine's energy mix, with only ca. 2GW in operation from a total resource of ca. 6GW (Figure 21)⁶³.

Figure 21 Philippines Energy Installed Capacity 2010



Source: Nomura 2010

The government of the Philippines is committed to increase renewables to 40% of the energy mix by the end of 2013 with a further 1.2GW of geothermal power and additional capacity from solar, wind and biomass⁶⁴.

The Philippines Renewable Energy Act of 2008 provides a variety of fiscal incentives, such as a seven year income tax holiday, designed to meet this goal. Regulatory risk will be lowered once the first critical milestone, the establishment of renewable energy feed-in tariffs, is announced (Table 3). The Energy Regulatory Commission has yet to approve them⁶⁵. A priority dispatch for electricity generated from renewable sources is another mechanism to be announced, reportedly in late 2011.

Table 3 Proposed Feed-In Tariffs (in Php/kWh)

Technology	Proposed by RE Developers			NREB Approved	
	June 2010	Oct. 2010	Nov. 2010	April 2011	Degression Rates
Biomass ^{1/}	9.84	11.48	9.94	7.00	0.5% after 2nd year
Run-of River Hydro ^{2/}	7.80	7.44	7.4	6.15	0.5% after 2nd year
Solar ^{3/}	22.64	23.81	20.55	17.95	6% after 1st year
Wind	11.23	11.92	11.85	10.37	0.5% after 2nd year
Ocean	18.52	18.52	18.52	17.65	None

^{1/} For a solid biomass project

^{2/} For a project with capacity between 1MW and 10MW

^{3/} For a ground-mounted project with more than 500kW capacity

Source: National Renewable Energy Board (NREB) of Philippines

A supportive market structure underpins these measures. Since the approval of the Electricity Power Industry Reform Act (EPIRA) in 2001, the government of the Philippines has been restructuring and privatizing the assets of the National Power Corporation (NPC) to design a favourable framework for independent power operators. The EPIRA allows power generation companies freely to adjust tariffs in a competitive market, but continues to regulate the transmission and distribution sectors. This reform allows vertically integrated power companies, such as Abioitz Power, to adjust power generation prices at the same time as benefitting from the stable revenue generated by a regulated distribution business.

As a consequence, ca. 70% of the Philippine's power generation sector is in private hands and is relatively consolidated, with the top three companies representing 68%⁶⁶. The geothermal portion of this generation is similarly concentrated; Energy Development Corp. (EDC), the renewable energy unit of the Lopez Group, owns over 1,000MW of geothermal power plants, representing a 60% share of total geothermal facilities in the Philippines.

Electricity generated by power generating facilities is transmitted via a high-voltage system to over 100 small distribution utilities and electricity co-operatives. The exception is the company Meralco, which has 55% market share and is listed on the Philippine Stock exchange. Meralco benefits from a stable power supply and is undergoing a process of vertical integration towards upstream power generation.

The majority of the Philippine's geothermal energy potential has yet to be harnessed, and the sector therefore represents an attractive growth market for private investment. Principal risks stem from the country's long history of political volatility and likelihood of delays to the privatization and restructuring of the power industry. Some technical challenges concerning the extraction of geothermal heat and the optimization of the power generation process also remain.

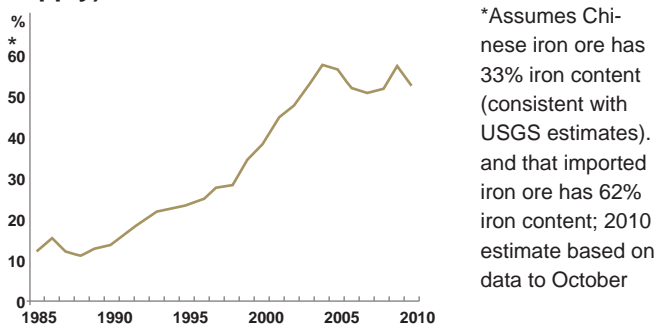
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Company	Aboitiz Power Corp.	Energy Development Corp.
Listed	Listed on the Philippine Stock Exchange in July 2007.	Listed on the Philippine Stock Exchange in December 2006.
Company Description	<p>Largest vertically integrated power company in the Philippines.</p> <p>Diversified portfolio of power generation assets with capacity of 2,050MW.</p> <p>Interest in the Philippines' 2nd and 3rd largest distribution utilities.</p>	<p>Founded in 1976 under the Philippine National Oil Company.</p> <p>Owns over 1,000MW of geothermal power plants and the underlying steam fields.</p> <p>Owns a 60% stake in an 110MW hydroelectric plant.</p>
Investment Thesis	<p>Portfolio diversified across fuel supply and power generation.</p> <p>Market leader in mini-hydroelectric plants with 340MW installed capacity.</p> <p>Existing green-field developments add additional capacities.</p> <p>Potential for further acquisition-based growth.</p> <p>Strong growth from ancillary services (Magat and Benguet Hydro plants).</p>	<p>The Philippine's market leader in geothermal power with impressive track record and technical expertise.</p> <p>Exclusive exploration and development rights over seven key geothermal reserve areas through long-term government contracts.</p> <p>Cost-effective vertically integrated business model.</p> <p>Healthy organic growth prospects.</p> <p>Additional growth from recently acquired Bacon Manito plant (150MW capacity).</p> <p>Continued upward tariff reversions at Palinpinon and Tongonan plants (total capacity of 225MW).</p> <p>Potential for international expansion.</p>
Key Metrics	<p>Market Cap: US\$5.1bn</p> <p>Revenue, LFY: US\$1.4bn</p> <p>Revenue, Yr/Yr, LFY: 160%</p> <p>Return on equity, LFY: 55%</p>	<p>Market Cap: US\$2.6bn</p> <p>Revenue, LFY: US\$0.6bn</p> <p>Revenue, Yr/Yr, LFY: 13%</p> <p>Return on equity, LFY: 14%</p>
Risks	<p>Potential power tariff regulation changes and reductions.</p> <p>Lower than expected electricity demand.</p> <p>Uncertainty from contract re-negotiations with Luzon, an electricity grid company.</p>	<p>Volatile regulatory environment.</p> <p>Lower than expected electricity demand.</p> <p>Operational volatility.</p>

WASTE MANAGEMENT CHINA: RECYCLING

China's basic resources are limited and recent rapid industrialization and urbanisation has led to a rising dependence on commodity imports. For example, in 2010, China imported 620 million tonnes of iron ore⁶⁷, and 11 million tons of pulp⁶⁸, representing 52%⁶⁹ and 60% of total supply respectively (Figure 21)⁷⁰.

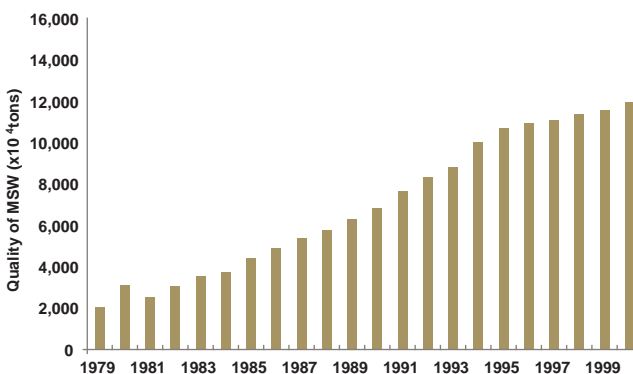
Figure 22 China - Iron Ore Imports* (% of total supply)



Source: CEIC; RBA; UN Comtrade

Waste volumes in China have risen at an equally rapid rate (Figure 22) and exceeded those in the US since 2004. Urban areas alone now produce 1.5 billion tonnes of waste annually⁷¹ and landfill and waste-water account for over 18% of the country's green house gas emissions⁷².

Figure 23 Increase in municipal solid waste (MSW) between 1979 and 2001



Source: J Mater Cycles Waste Management (2006)

Recycling reduces the proportion of waste that ends up as landfill and produces substitutes for imported raw materials. As a result, the Chinese government has launched a number of schemes to accelerate the growth of the recycling sector.

For example, 35% of MSW is composed of paper products that can be recycled to produce pulp, and the Chinese government has earmarked investments of US\$26.6bn by 2015 to increase the MSW treatment rate from 70% to 80%.

The government is also eager to reduce dependence on metal imports, and China plans to build six to eight new scrap copper plants, eight to ten scrap aluminium facilities and ten lead recycling projects. At full capacity the plants will process ca. 1.4 million tonnes of scrap copper; 1.8 million tonnes of scrap aluminium and 0.5 million tonnes of scrap lead annually⁷³, reducing the country's reliance on imported metals.

As a result of schemes such as these, China's recycling industry is expected to grow at a compound rate of 9% per annum to process ca. 290 million tonnes of material in 2015, up from ca. 170 million tonnes in 2010⁷⁴.

The recycling industry consists of four key processes; collection, aggregation, processing, and final consumption. Collection and aggregation are carried out by small private informal collectors (such as street foragers), but at the processing stage of the industrial value chain, the added value is much higher and there are a number of sizeable companies. Future industry consolidation is expected, and should increase economies of scale and improve margins across the sector.

China's recycling markets are highly fragmented. The top four paper recyclers process only ca. 5% of China's total recycled waste paper volume, and the top ten metal scrap processors have a 12% market share⁷⁵. However, leading paper recycling companies, such as Nine Dragons and Lee & Man, are expanding

their businesses to include the manufacture of final products, such as containerboard. These economies of scope help to stabilise material costs and provide higher margins and a larger market share. The government is also encouraging industry consolidation in the scrap metal markets by issuing industry leaders, such as China Metal Recycling, with operational licenses for particular categories (e.g. car recycling and home appliance recycling).

Despite strong government support and environmental and economic benefits, there are several risks associated with investments in the Chinese recycling industry. To date, growth has been held back by a lack of incentives for private investment, and consolidation is needed to achieve economies of scale and higher efficiency. Additionally, the industry is highly sensitive to commodity price volatility.

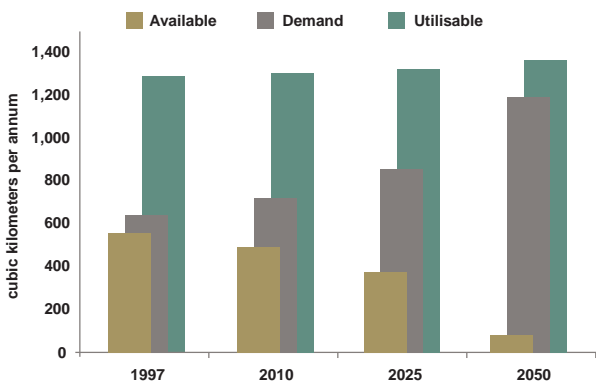
Company	Lee & Man Paper	China Metal Recycling Holdings Ltd.
Listed	Listed on the Hong Kong Stock Exchange in September 2003.	Listed on the Hong Kong Stock Exchange in June 2009.
Company Description	<p>Principal activities are manufacturing and selling paper and pulp.</p> <p>Operations in China (Dongguan, Changshu, Chongqing) and Vietnam.</p> <p>Second largest producer of containerboards in China and in the top five globally.</p> <p>Annual capacity of 4.5m tonnes a year.</p>	<p>Largest metal recycling company (by revenue) in China.</p> <p>Recycles scrap metals into new crude metals.</p> <p>Major customers are metal manufacturing companies in China.</p> <p>Actively expanding market share.</p>
Investment Thesis	<p>Well established market position.</p> <p>Strategic location and proximity to major customers.</p> <p>Diversified raw material sourcing base.</p> <p>Two new facilities producing products with higher average selling price and higher profitability to come on-line in late 2011 and early 2012.</p> <p>Strategic partnership with Nippon Paper to allow more efficient development of new products and open up overseas markets.</p>	<p>Expected to be an industry consolidator.</p> <p>Strategically located production facilities for scrap metal, strong supply of raw materials, and convenient access to water transportation.</p> <p>Strong profile of high quality customers and an expanding procurement network.</p> <p>Growth in sales volume underpinned by increased activity at Jiangyin, Wuhan, and Zhongshan plants.</p> <p>Growth potential from a new JV in Tianjin and a newly obtained home appliance recycling license in China.</p>
Key Metrics	<p>Market Cap: US\$2.3bn</p> <p>Revenue, LFY: US\$1.8bn</p> <p>Revenue, %Yr/Yr, LFY: 26</p> <p>ROE, LFY: 17%</p>	<p>Market Cap: US\$1.3bn</p> <p>Revenue, LFY: US\$2.9bn</p> <p>Revenue, Yr/Yr, LFY: 150%</p> <p>Return on Equity, LFY: 23%</p>
Risks	<p>Slower than expected market demand for containerboard.</p> <p>Slowing capacity expansion.</p> <p>Exposed to fluctuations in corrugated container prices.</p>	<p>Price volatility in steel and copper prices.</p> <p>Lower than expected sales volume.</p> <p>Uncertain working capital requirement.</p>

WATER INFRASTRUCTURE AND TECHNOLOGIES

INDIA: WATER

With only 4% of the global water resources but 17% of the world's population⁷⁶, India's rapid population growth and rising affluence means that demand for water is forecast to exceed overall supply within the next two decades⁷⁷. The country already suffers from severe water scarcity (Figure 23), as poor planning and local government budget constraints mean the infrastructure available to transport water to population centres is inadequate.

Figure 24 Demand for Water in India



Source: Indian National Commission on Water, 1999

No major Indian city receives a continuous water supply, leakage rates are as high as 30%⁷⁹, and even in Delhi residents receive water for only a few hours a day. Furthermore, there is virtually no waste-water provision in rural areas and only 30% of the urban population is connected to a sewerage system. As a result 75% of India's surface water resources are polluted¹.

There is an urgent need for expansion and modernisation of the country's water infrastructure network, and the Indian government has more than doubled expenditure (to a total of US\$29bn) on water supply and sanitation in the 11th Five-Year Plan.

Running parallel to the Five-Year Plan is the "Jawaharlal Nehru National Urban Renewal Mission (JNNURM)", a source of national government funding designed

to encourage private sector involvement in the improvement of municipal infrastructure networks. Nearly half of JNNURM's budget has been allocated to water infrastructure and treatment, with an initial focus on pipe replacement (to reduce leaks), and water metering (to enable pricing). When a basic water infrastructure is in place, JNNURM will be able to address water supply problems through projects such as the build-out of desalination facilities. These offer good margins and high returns for private investors.

A number of pilot private-public partnerships under the JNNURM already exist. For example, in Chennai, where water demand is almost three times supply, the JNNURM is providing 90% of the funding for the construction of a 100m litre per day desalination facility.

In addition to investing in water infrastructure and treatment, the Indian government is encouraging the more efficient use of water, particularly in rural agriculture, on which over 70% of the population is dependent. The flood irrigation techniques conventionally used in Indian farming have high evaporation and run-off rates⁸⁰ and are only ca. 50% efficient. In an attempt to improve efficiency and increase crop yields, the government is providing subsidies for micro irrigation system (MIS). These deliver a controlled flow of water to crops, provide water savings of up to 25% (versus flood irrigation) and enable the growth of higher value crops. The MIS market is expanding at 30% per annum, and with market penetration currently less than 10%, has substantial room for further growth. Jain Irrigation (see below) dominates the MIS market with a 55% share.

A series of challenges must be overcome for India to sufficiently improve water supply and quality. Execution risks are high; successful water infrastructure build out is dependent on land acquisition, environmental clearances, raw material availability and construction contracts. The sector is subject to receivables and long payment delays (which put pressure on working capital), and influenced by interest rates, inflation, and raw material prices, (which can affect margins and project returns).

Company	Jain Irrigation	VA Tech Wabag
Listed	Listed on the Indian National Stock Exchange in October 1989.	Listed on the Indian National Stock Exchange in October 2010.
Company Description	<p>One of India's leading agriculture solution providers with presence across the full value chain.</p> <p>Manufactures and installs micro irrigation systems (MIS) and collects revenue from the Government.</p> <p>Manufacturing facilities in India, the US, Israel and Turkey.</p>	<p>Multinational water treatment company with presence in India, Austria, Middle East, North Africa and Central and Eastern Europe.</p> <p>Operates in both municipal and industrial markets.</p> <p>Focus on engineering and design components of the value chain.</p> <p>Offers life-cycle solutions including conceptualisation, project design, installation and O&M support.</p>
Investment Thesis	<p>Government subsidies of 50% encourage adoption of MIS by small farmers.</p> <p>Capital intensive business model creates a barrier to entry and has resulted in a 55% market share.</p> <p>MIS market growing over 30% per annum.</p> <p>Margins are in excess of 30%.</p> <p>MIS recently made part of the Five-Year Plan Budget allocation, improving visibility for the company.</p>	<p>Operates in 16 of the fastest growing water markets.</p> <p>12% share of the Indian water treatment market.</p> <p>Technology content enables pre-qualification for bids and reduces competition.</p> <p>Three research centres and ownership of 155 process patents (with a further 37 under registration).</p> <p>Municipal work (funded by WorldBank, ADB and JNNURM in order to reduce payment delays) represents 80% of revenue.</p> <p>Plans to move into the Build Own Operate Transfer (BOOT) model with Sumitomo Corp. to bid for large water/waste water treatment plants in India and overseas.</p>
Key Metrics	<p>Market Cap.: US\$1.5bn</p> <p>Revenue, LFY: US\$0.9bn</p> <p>Revenue, Yr/Yr, LFY: 21%</p> <p>ROE, LFY: 21%</p>	<p>Market Cap.: US\$0.2bn</p> <p>Revenue, LFY: US\$0.3bn</p> <p>Revenue, Yr/Yr, LFY: 3%</p> <p>ROE, LFY: 13%</p>
Risks	<p>Poor monsoon season hurts farmer incomes and can lead to lower MIS sales growth.</p> <p>Increased competition.</p> <p>Reduction of subsidy levels.</p>	<p>Delays in project awards.</p> <p>Increased competition.</p> <p>Exposed to oil price (due to manufacture of PVC pipes).</p>

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