

Low Carbon Investment in Asia

Unlocking Asia's Potential

Climate Change Risks and Opportunities across Six Key Sectors

January 2011



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The Association for Sustainable & Responsible Investment in Asia (www.asria.org) 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 organization which has an interest in sustainable investment.

ASrIA's goal is to build market capacity for SRI. We provide insightful, up to date and accessible information on the development of SRI in Asia and globally. We have also become the platform for different sectors within the community to exchange information and perspectives on SRI, and to take practice forward.

About the UK Foreign and Commonwealth Office (UK FCO)

The UK Foreign and Commonwealth Office works around the globe to drive forward international action to tackle climate change. Addressing climate change requires a sustained global effort to reduce greenhouse gas emissions. The British Consulate-General in Hong Kong aims to support the Hong Kong government, businesses and investors in developing low carbon strategies, through promoting debate and sharing UK expertise.

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Foreword

Let us be aware that clean energy and a low-carbon economy are among the keys to unlocking the door to a safer, more peaceful and prosperous world for all. We count on you — leaders of Governments, civil society and the private sector — to turn this vision into reality.

— *Ban Ki-Moon, Secretary General, United Nations, speaking at the 4th World Future Energy Summit, 17 January 2011*

Low Carbon Investment in Asia (“LCIA”) is a pan-regional project focused on raising awareness among investment professionals in Asia about the risks and opportunities associated with climate change. It provides a framework to incorporate key climate issues into portfolio analysis and decision-making.

ASrIA had over fifty discussions with investors in the Asia Pacific region about the topic of climate change. The report draws together the common themes identified around the practical considerations faced by institutional investors when integrating climate change into investment decisions, including investment policy development, strategic asset allocation, risk and opportunity assessment, valuation and proxy voting.

The recent news that low carbon energy investment more than doubled in the last five years to US\$243 billion in 2010 confirms that “climate change” is indeed an investment “mega trend”. While the opportunities are undeniable, many investors become overwhelmed by the magnitude and time scale of the issue. It is challenging to understand how this chronic, global problem directly impacts today’s investment analysis and decision-making.

Furthermore, Asia faces urgent and critical challenges associated with climate change which require a well-informed and substantial investment response. The LCIA project has already achieved significant traction in the region with large and small investors alike, and this report can assist further by facilitating impactful, targeted investments in the climate space.

Asia is home to seven of the world’s top 20 pension funds and four of the 10 largest sovereign wealth funds. There is no scarcity of capital in the region. Moreover, several of these asset owners have recently made significant policy shifts towards sustainable investment, with the New Zealand Superannuation Fund and Korea’s National Pension Service, for example, demonstrating best practice in some areas.

At the broader investor level, one of the most interesting initiatives is the recent US\$232 million Asian Development Bank Clean Energy Bond issue, targeted at Japanese retail investors. This example shows that the general public in some parts of the region is also demanding low carbon investment opportunities and solutions, and it is to be hoped that similar products are developed in other Asian markets.

Next Steps

Asia needs greater, focused investment to enable the countries of the region to adapt to climate change and shift to low-carbon economy. The scale of development needs in the Asia-Pacific calls for rapid and collaborative action from both financial institutions and policy makers.

There are already well-supported groups of institutional investors working on climate policy in other parts of the world, and both asset owners and fund managers in Asia see a clear need for a similar Asian grouping, which could focus on the specific challenges and opportunities pertinent to this region.

In response, ASrIA is pleased to present a proposal for the establishment of the Asian Investor Group on Climate Change (“AIGCC”). The aim of AIGCC will be to facilitate deal flow in clean-energy/low carbon enterprise and to assist investors in managing and reducing climate-related investment risks. While investment is an inherently competitive business, there is scope to reduce costs and risks and increase opportunities through collaboration. This is the point of AIGCC and we hope institutional investors from across the region will choose to join and help develop a strong programme for Asia.

We welcome your participation in this essential initiative.



Alexandra Tracy
Chairman, ASrIA



Tessa Tennant
Founding Chair and Director, ASrIA

Executive Summary

The Low Carbon Investment in Asia (LCIA) project is focused on the implications for investment of climate change and the shift to a low carbon economy in Asia. Climate change risks and opportunities are highlighted for select sectors. Sponsored by the UK Foreign & Commonwealth Office, the following sectors are reviewed as part of this research and engagement project:

- Information Technology (IT) & Mobile Communications
- Transport
- Property & Construction
- Agribusiness
- Energy
- Finance

The aims of the project include raising awareness amongst investment professionals (IPs) in Asia about how climate change issues will affect investor-decision making and investments, and providing a framework review for IPs to actively encourage greater integration of climate change and low carbon considerations into investment decisions. The latter is covered in the accompanying LCIA report *Integrating Climate Change Criteria into Investment Decisions*, while the former is reviewed in this report.

Relevance of Climate Change to Investors

There is wide consensus that recent increases in the amount of greenhouse gases in the atmosphere are due primarily to human activities. The increase in greenhouse gas concentrations is changing the earth's climate, bringing a variety of risks and opportunities to the Asian economy. Climate change vulnerability is particularly high for Asia, making adaptation and mitigation measures for industry a concern if not acted upon in the short term.

The *Energy, Property & Construction* and *Finance* sectors are particularly problematic from a carbon perspective, as the majority of the carbon intensity is hidden in downstreamⁱ products and services, thereby hindering investment professionals to prepare valuations based on associated climate change risks. The *Transport* and *Agribusiness* sector on the other hand pose a problem due to relatively high direct carbon emissions, while expectations for the *IT & Mobile Communications* sector are high as a cross-sectoral solutions provider.

Carbon disclosure by companies is beginning to emerge in Asia, but requires further development to catch up with the level of disclosure and information available for OECD markets.

ⁱ Refer to Appendix A for definitions of Scope 1 and 2 emissions, as well as Scope 3 upstream and downstream emissions.

Risks and Opportunities

A variety of hidden risks and opportunities in investments are generated through downstream carbon intensity.

Physical risks such as increases in temperature and sea levels, drought, and changing weather patterns, will impact urban areas, infrastructure, and supply chains with direct consequence on economic activity. Regulatory risks could take the form of government taxes, subsidies and regulations to slow the rise in GHG emissions and thereby assist the shift in moving towards a less carbon-intensive economy. Competitive risk may result from a change in consumer preferences for low carbon products and services which may lead to low carbon supply chains that could create not only competitive advantage but could potentially shelter from litigation risk. Reputational risks may result in companies facing negative consumer reaction with respect to climate change or carbon intensity.

On the opportunity side, emphasis on more energy efficient manufacturing plants, property and equipment will lead to lower operating costs and growth in new technologies. Differentiated, low or zero emission products and services will lead consumers towards premium prices and create higher gross margins. Uptake should accelerate once public sentiment towards increasing efficiency and reducing individual carbon footprints solidifies. In this environment companies enhance reputation and customer loyalty by developing low carbon products as evidence of a company's technological prowess. Nevertheless, it is clear that cost issues and energy security remain as primary drivers for a low carbon economy for the time being, not public sentiment. Although public awareness about climate change has increased in recent years, there are still very conflicted communications about the issue so consumer purchasing patterns remain muted. This could rapidly change however, increasing demand for lower carbon products and services.

Based on the sector reviews, there is huge potential for Asia to show leadership in creating a low carbon economy. The opportunity is now. In many cases opportunities are being realized ahead of competition from other global markets. Given that climate change is a significant threat to Asia in particular, appropriate mitigation and adaptation measures for industry are paramount. Policy developments and regulatory mechanisms will play a leading role in driving reductions in carbon intensity provided that current momentum in regional policy developments is maintained.

Acknowledgements

The Association for Sustainable & Responsible Investment in Asia (ASrIA) would like to thank the generous individual and institutional supporters who made the Low Carbon Investment in Asia (LCIA) project possible, in particular the Foreign & Commonwealth Office of the British government.

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We could not do our work without the partnership and strategic collaboration of our members. We also extend a warm thanks to the following financial institutions in Hong Kong, Mumbai, Singapore and Shanghai which provided insight into the research and investor engagement process:

Aberdeen Asset Management Asia Ltd	CIMB-CK Securities (HK) Ltd.	Goldman Sachs Asset Management	RedTech Advisors
AlpInvest Partners Ltd	CLSA Research Ltd	IFCI Ltd	Shanghai Energy Exchange
AsiaCrest Capital	CRA Management Pte Ltd	India Merchants' Chamber	Shanghai Stock Exchange
Bank of America Merrill Lynch India	Deutsche Asset Management (Asia) Ltd	Macquarie Capital Securities Ltd	Standard Chartered Bank
Benchmark Asset Management Company Private Ltd	Edmond de Rothschild Asset Management (EdRAM) Hong Kong Ltd	Mirae Asset Securities (HK) Ltd	State Street Global Advisors
BNP Paribas (Asia) Ltd	Ennovent	Nexus Venture Partners	TATA Capital Ltd
BNP Paribas Investment Partners	Environmental Investment Services Asia Ltd (EISAL)	Nikko Asset Management Singapore Ltd	The Hongkong and Shanghai Banking Corporation Ltd (India)
BNP Paribas Securities (Asia) Ltd, Hong Kong	Fair Klima Capital	Nomura International (Hong Kong) Ltd	Unigestion Asia Pte. Ltd
China Europe International Business School, Shanghai	First Climate AG	Rabobank International	YES BANK Ltd
Chubb Group of Insurance Companies			

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Introduction

This summary briefing paper discusses climate change issues relevant to investment in select sectors in Asia, and the implications of moving towards a low carbon economy. Low carbon policies and anticipated regulatory developments in the region are reviewed in relation to these industries, with a focus on China, India, Korea and South East Asia.

For the purpose of this project, six key sectors in Asia were assessed, namely:

- Information Technology (IT) and Mobile Communications
- Transport
- Property & Construction
- Agribusiness
- Energy
- Finance

This report brings to light key findings from sector specific research, and highlights climate change risks and opportunities in each of the sectors and how it impacts on investments.

Project Summary

Background Study

In June 2009 ASrIA conducted a scoping study about awareness amongst investment professionals on climate change and its implications, entitled *A study of Asian Investment Professionals' Awareness & Interest in Climate Change Issues*, funded by the UK Foreign and Commonwealth Office (FCO) and administered via the British Consulate-General in Hong Kong. The study's key findings were based on an online survey of investment professionals, direct interviews with investment professionals, and a literature review, the key points being:

Asian investors want to understand the implications of climate change on their investments

- **Investment professionals are seeking to find out more about the financial risks and opportunities associated with climate change and its investment implications.** The low carbon future will affect businesses and investorsⁱⁱ want to know how their decision-making and rate of return will be affected by these emerging realities. **Our online survey found that climate change awareness is 'average' among investment professionals. The majority do not possess the level of knowledge** that would allow them to make informed decisions, but there is a strong desire to learn more about the issues and how investments will be affected.
- **Interviews with investment professionals highlighted the view that challenges may differ across the region.** Investors recognise that implications and challenges differ by sector and country. There was therefore an interest to attend local workshops. Interviewees believed their organizations would be interested in climate change issues also.
- **A review of literature found an inherent interest in impact of climate change on investment decisions** but the task of incorporating the issues into investment decisions is not clear, primarily because of insufficient expertise among mainstream IPs.
- **All stakeholders need to work together to provide an 'enabling environment'** for information and 'best-practice' exchange. Climate change is only part of the 'extra-financial' aspects of investment analysis and the investment horizon is an important consideration because of the longer-term nature of some of the issues.

ⁱⁱ The term investment professional (IP) and investor is being used interchangeably throughout this report. Unless otherwise specified an investor is defined as a professional working in the investment industry.

Response

The LCIA project intends to bolster the investment decision making process

As a response to the findings of this scoping study, the Low Carbon Investment in Asia (LCIA) project commenced via additional funding from the UK FCO. The purpose of the project is to create greater awareness about the impact of climate change amongst investment professionals and thereby help them to better incorporate climate change considerations into their investment decisions.

The outputs of the project are to firstly increase awareness and understanding amongst investment professionals about the impact of climate change on investments. Secondly, direct engagement with investment professionals in Asia to involve them in reviewing and commenting on the findings of the project's research. Thirdly, a review of existing climate change analytical frameworks to be developed and shared with investment professionals to help them assess the financial risks and opportunities associated with a low carbon economy. Overall the project is intended to help investors to better incorporate climate change into valuations of companies they invest in.

Direct investor engagement is key for a complex issue like climate change

As a first step towards meeting these objectives, sector briefing packs that distil the financial implications of climate change for a select group of fundamental sectors in the Asian economy were developed. As a follow up, one-on-one meetings with investment professionals took place in Shanghai, Hong Kong, Singapore and Mumbai throughout the summer and fall of 2010, helping to refine the overall analytical framework. A web portal was constructed to serve as a resource and training tool for investment professionals to learn more about the implications of climate change for the Asian economy.¹

The LCIA project comes to a close with briefings events in early 2011 to discuss the sector findings and how to integrate climate change into investment decisions, thereby engaging the investment community in open forums about Asia's shift towards a low carbon economy. As the logical next step of this project, ASrIA is proposing to launch a new initiative, the Asia Investor Group on Climate Change, as outlined in the accompanying LCIA report *Integrating Climate Change Criteria into Investment Decisions*.

Climate Change as an Investment Driver

Global investment in low carbon energy has more than doubled in the last five years – reaching US\$243 billion in 2010 – confirming that investors have had significant opportunity in this area.² This section provides an overview of the sources of climate change and of the carbon intensity of the sectors researched as part of this project.

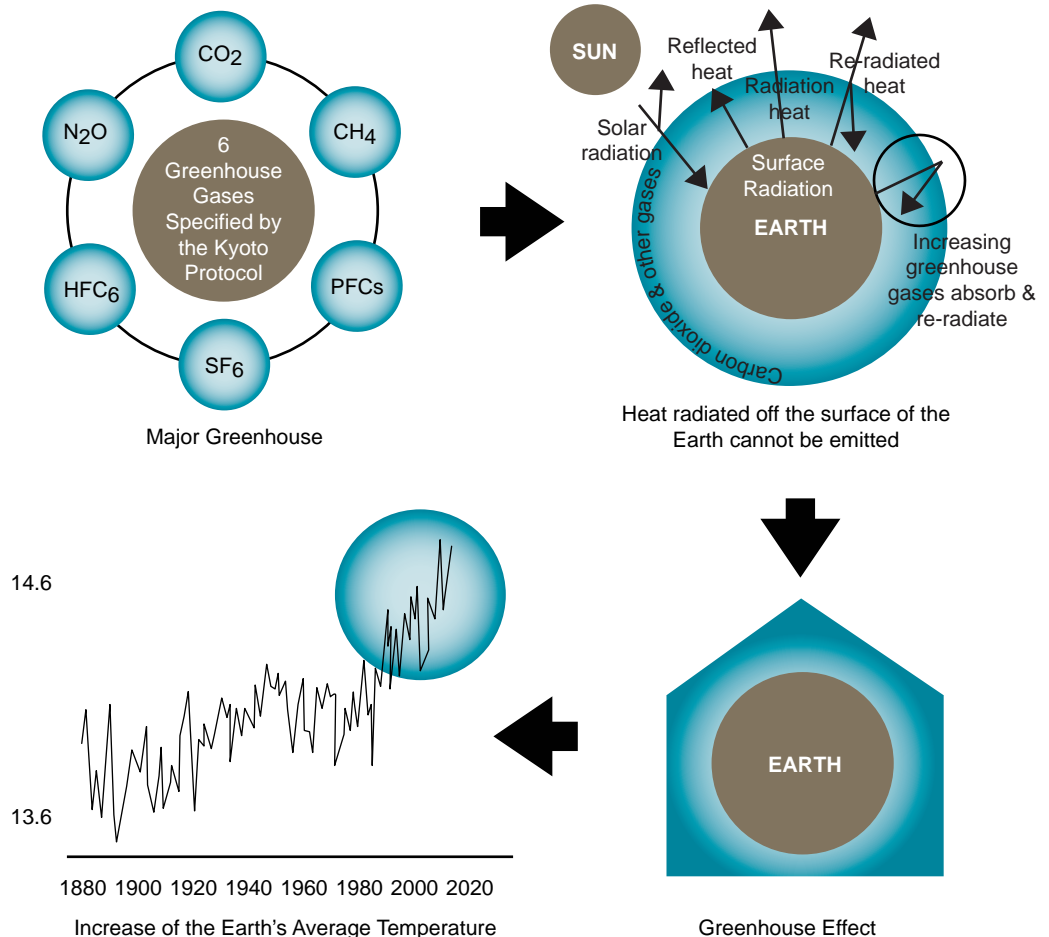
What is the greenhouse effect and why is it important?

Climate change impacts corporate and project valuations

It is increasingly the view of the world's scientific community that the rising level of greenhouse gas emissions in the atmosphere due to human activities is a key contributor to climate change.³

Figure 1 illustrates the effects of carbon and other greenhouse gases on the mechanics of global average temperatures, commonly known as global warming, caused by the greenhouse effect. However, as documented in a recent assessment about climate vulnerability published by ASrIA member HSBC in December 2009⁴, the impacts of climate change go far beyond an increase in average temperatures. All aspects of economic activity are affected by follow-on effects such as rising sea levels, shifting weather patterns, water scarcity, flooding, and increased storm activity.

Figure 1: Mechanism of Climate Change



Source: Hyundai Motor Company

Climate change impacts go well beyond rising temperatures

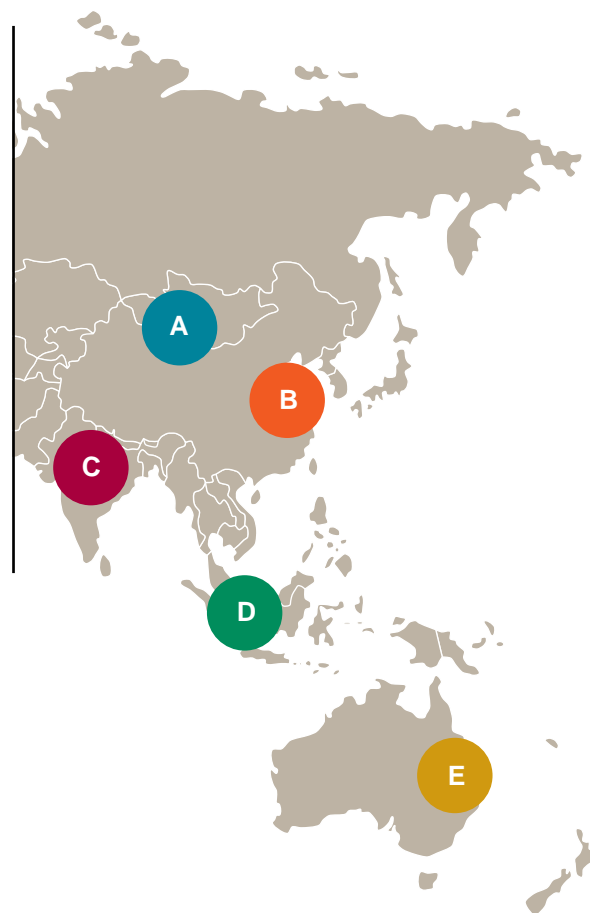


Figure 2: Regional Trends in Climate Change

- **A North Asia**
 - This region will experience the greatest level of warming in Asia
 - 4.3°C average temperature increase
 - 10-25% increase in average rainfall
- **B East Asia**
 - 3.3°C average temperature increase
 - Increase in 'hot days', duration
 - Disappearance of 'cold days'
 - 9% average increase in precipitation across all seasons
 - Increase in intense rainfall and high wind speeds associated with tropical cyclones
 - Sea level rise threatens many coastal areas
- **C South Asia**
 - 3.3°C average temperature increase
 - 5% decrease in precipitation in dry season, 11% increase in wet season
 - Overall increase in average rainfall
 - Increase in intense rainfall and high wind speeds associated with tropical cyclones
 - Major threat from rising sea levels
- **D South East Asia**
 - 2.5°C average temperature increase
 - Warming significantly greater over land interior than coastal regions
 - 7% overall increase in precipitation
 - Decrease in rainfall in the dry season with an increase in the wet season
- **E Australia**
 - 1.0 - 5.0 °C increase by 2070
 - 10% decrease in average annual rainfall by 2030
 - 20% decrease in rainfall by 2070
 - Impacts include drought, bushfires and water scarcity
 - Increase in extreme events

Source: RepuTex Analytics, April 2010

Asia among most vulnerable regions

Asia is considered to be one of the most vulnerable regions in terms of the physical impacts of climate change, particularly the Southeast Asian region. In 2008, 40% of all natural disasters occurred in Asia while 62% of economic damage loss was in Asia. China received the brunt of climate related losses.

Asia is also particularly vulnerable to the risk of rising sea levels given that 70% of the region's population lives in low-lying coastal regions. Given the economic damage and loss that climate change is causing and will cause in the future, the financial risks from climate change needs to be understood by the markets so that the risks can be mitigated.

Carbon intensity measures the amount of greenhouse gas emitted per US\$ millions of revenue

IT will be a solutions provider for a low carbon economy

Sectoral Carbon Intensity

An overview of the carbon intensity of the sectors covered in this summary briefing paper is provided. The basis of the overview is a global carbon emissions database maintained by ASrIA member RepuTex and prepared specifically for this project. The database includes over 4,000 companies from around the world, primarily from Europe and North/Central America (63%) as well as the Asia-Pacific region (37%). Definitions for Scope 1, 2 and 3 emissions are provided in the Appendix.

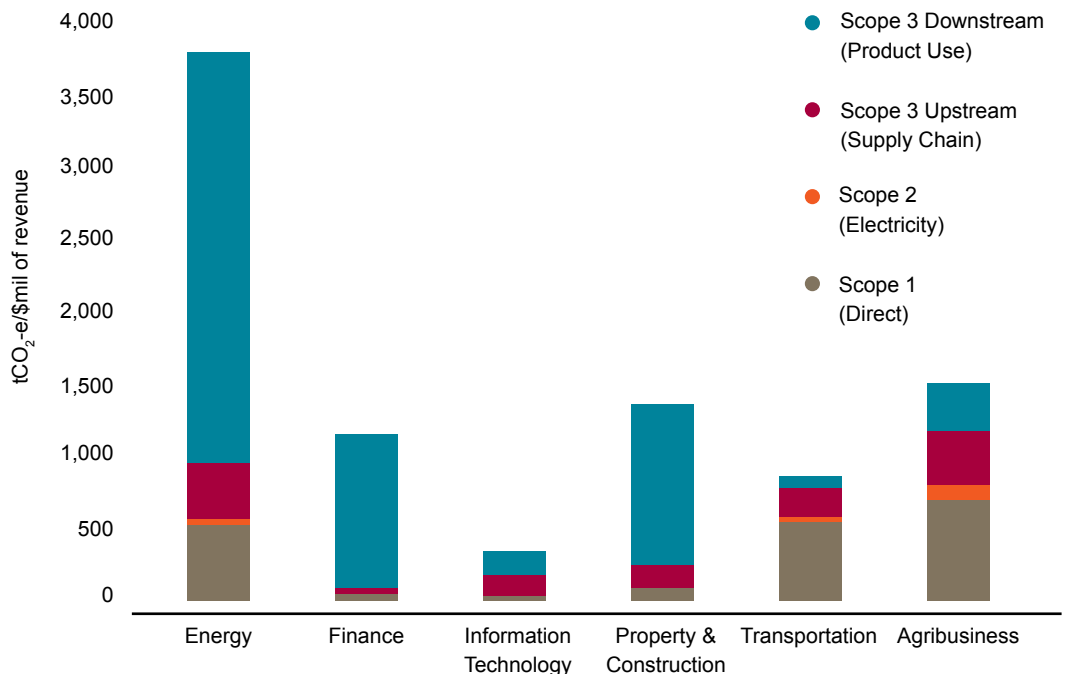
Figure 3 shows the value chain (Scope 1, 2 and 3) carbon intensity profiles of the Energy, Finance, IT, Property & Construction, Transport and Agribusiness sectors for 2009.

The Information Technology (IT) and Mobile Communications Sector

The direct emissions from the IT sector have been growing steadily over the last few years and sector emissions from current levels are expected to triple by 2020, largely driven by growing demand in China and India and also large increases in data storage and data transmission services.⁵ In terms of direct emissions, this sector is not the most carbon intensive with most emissions being indirect originating from supply chain operations, data storage and data transmission.

However, the upstream manufacturing supply chain for this sector is highly carbon intensive as it includes the manufacturing of silicon and other carbon intensive telecommunication products.

Figure 3: Value Chain Carbon Intensity Breakdown by Sector 2009



Source: RepuTex Analytics, 2010

Assuming the sector can manage its own growing direct emissions, the IT sector also has a critical role to play as a solutions provider to other sectors in terms of enabling them to reduce their carbon footprint via the introduction of smart technologies to improve energy management – examples would be in green property, sustainable transport and conference calling rather than air travel

The Transport Sector

Transport has high direct carbon emissions from hydrocarbon fuels

The transportation industry has high direct carbon emissions (Scope 1) due to usage of carbon intensive fuels such as diesel and petrol. The supply chain carbon intensity arises from the manufacturing of cars, buses and planes as well as from the manufacturing of parts. The construction of transportation infrastructure such as rails also counts towards the upstream emissions for that industry. Electricity consumption in the sector (Scope 2) is low in comparison, however with the emergence of electric vehicles this may change in the coming years.

The Property & Construction Sector

Property operations have high carbon intensity

Direct emissions (Scope 1) from the property and construction sector are most intense for the construction of roads and buildings, primarily due to natural gas and diesel fuel usage. Electricity (Scope 2) represents the smallest impact, presumably due to the fact that most construction machinery comes under Scope 1 relying heavily on carbon fuels.

The supply chain (Scope 3 - upstream) has a relatively high embodied carbon footprint, due to carbon intensive materials such as steel and cement. The high carbon intensity of product use (Scope 3 - downstream) for the sector shows that the operation of buildings, facilities and infrastructure has the largest impact of all the sector activities.

The Agribusiness Sector

Agribusiness GHG emissions are arguably the most difficult to measure and monitor

GHG emissions from agribusiness can be substantial, but analysis of carbon intensity is far more challenging compared to other sectors in this series. Accurate monitoring and reporting of GHG emissions from agriculture is a complex issue, because emissions from agriculture are based on biological systems. This means that they are subject to variations over time and across regions, induced by interactions between climate, land type, management, and genetic characteristics of crops and livestock.

Farm level monitoring is currently unfeasible

In terms of greenhouse gas emissions, agriculture makes up around 14% of global emissions. Agriculture produces three main greenhouse gases – carbon dioxide, methane from the digestive systems of livestock and nitrous oxide from chemical processes and microbe activity in agricultural soils. But actual emissions depend to a large extent on natural phenomena entirely outside human control. Due to limited technology and high transaction costs, farm level monitoring is currently unfeasible and needs further research to become technically and financially viable.

Expect an increase in energy sector's carbon intensity from the drop during the global economic downturn

The Energy Sector

The indirect carbon emissions from the energy sector arise from upstream oil and gas extraction and downstream processing and refining. Operations dropped significantly in 2009 (as compared to 2008) due to the slowdown in production originating from the global financial crisis and the downward pressure on oil and gas prices.

The carbon intensity of this sector is dominated by the downstream emissions arising from the usage of fuels such as natural gas and LPG. Direct carbon intensity (Scope 1) stems from flaring, gas processing and oil refining operations. These direct emissions are likely to incur a carbon price under any future trading schemes.

The Finance Sector

There has been a gradual increase in the direct emissions from the finance industry since 2006. The sector is not directly carbon intensive, whereas most of the direct emissions can be attributed to energy usage for heating in buildings and transport related emissions. The carbon growth trend is generally in line with the expansion of the sector as a whole.

Carbon intensive clients could default on loans

Of more significance to the finance sector, the downstream carbon intensity refers to carbon risk embedded within a firm's investment portfolio or fund. For instance for a bank, carbon intensive clients could default on loans due to high carbon costs. This requires a bank to change its credit risk models to account for such risks. It is notable that the credit business, monetary authorities, and insurance carriers have the highest downstream emissions (Scope 3) in the finance industry.

Summary of Sectoral Carbon Intensity

Table 1 provides a sector carbon intensity matrix to summarize the above as follows:

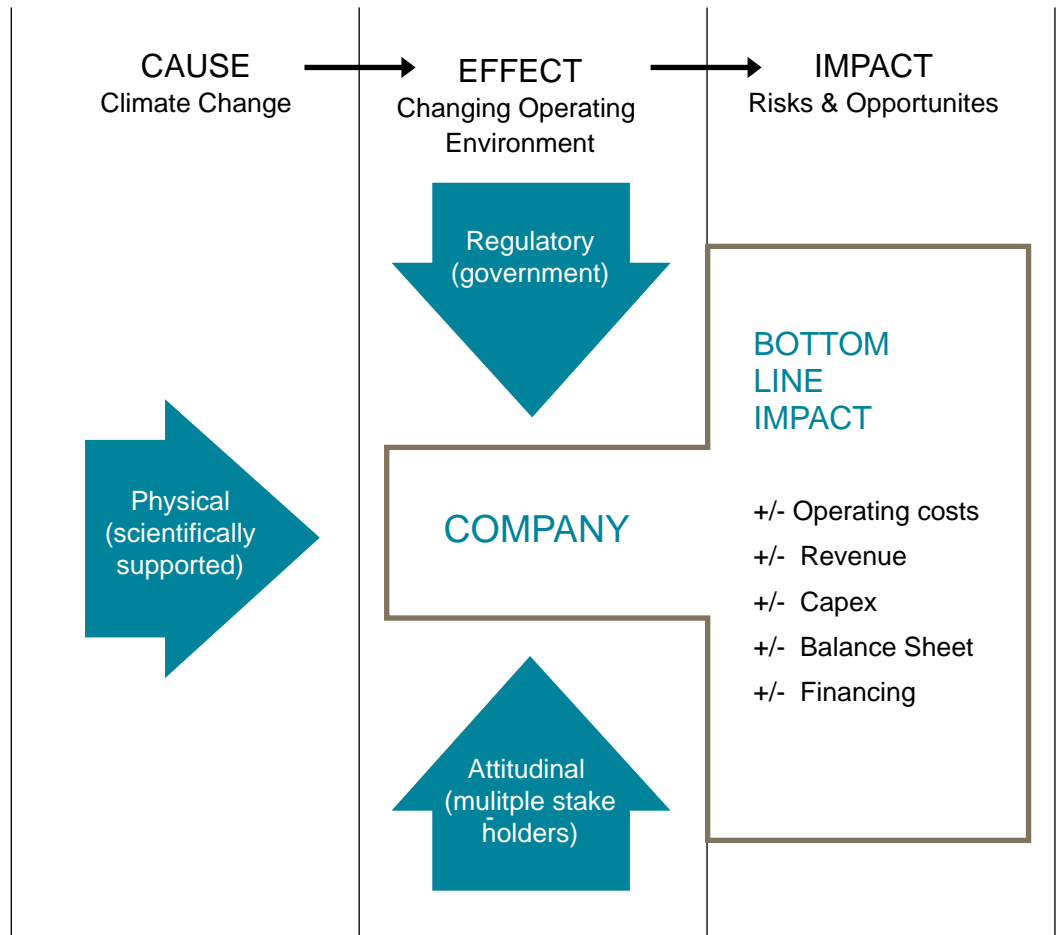
Table 1: Summary of Sectoral Carbon Intensity

	Direct Emissions		Indirect Emissions	
	Scope 1	Scope 2	Scope 3 upstream	Scope 3 downstream
IT and Mobile Communications	low	low	low	medium
Transport	high	low	high	low
Property & Construction	low	low	medium	very high
Agribusiness	high	low	high	high
Energy	high	low	high	very high
Finance	low	low	low	very high

Climate Change Impacts on Industry

This section examines the financial and economic risks and opportunities due to climate change and the implications of moving towards a low carbon economy. Figure 4 illustrates the link between physical climate change and its effects on the operating environment of companies, as affected by regulatory and attitudinal influences. The investment community can see how climate change can affect the rate of return on its investment as the relationship between the risks and opportunities associated with climate change transfer through the company via multiple channels (reputation, competition, etc) culminating in the bottom line.

Figure 4: Climate Change Cause, Effect and Impact on Companies



Source: Generation Investment Management LLP

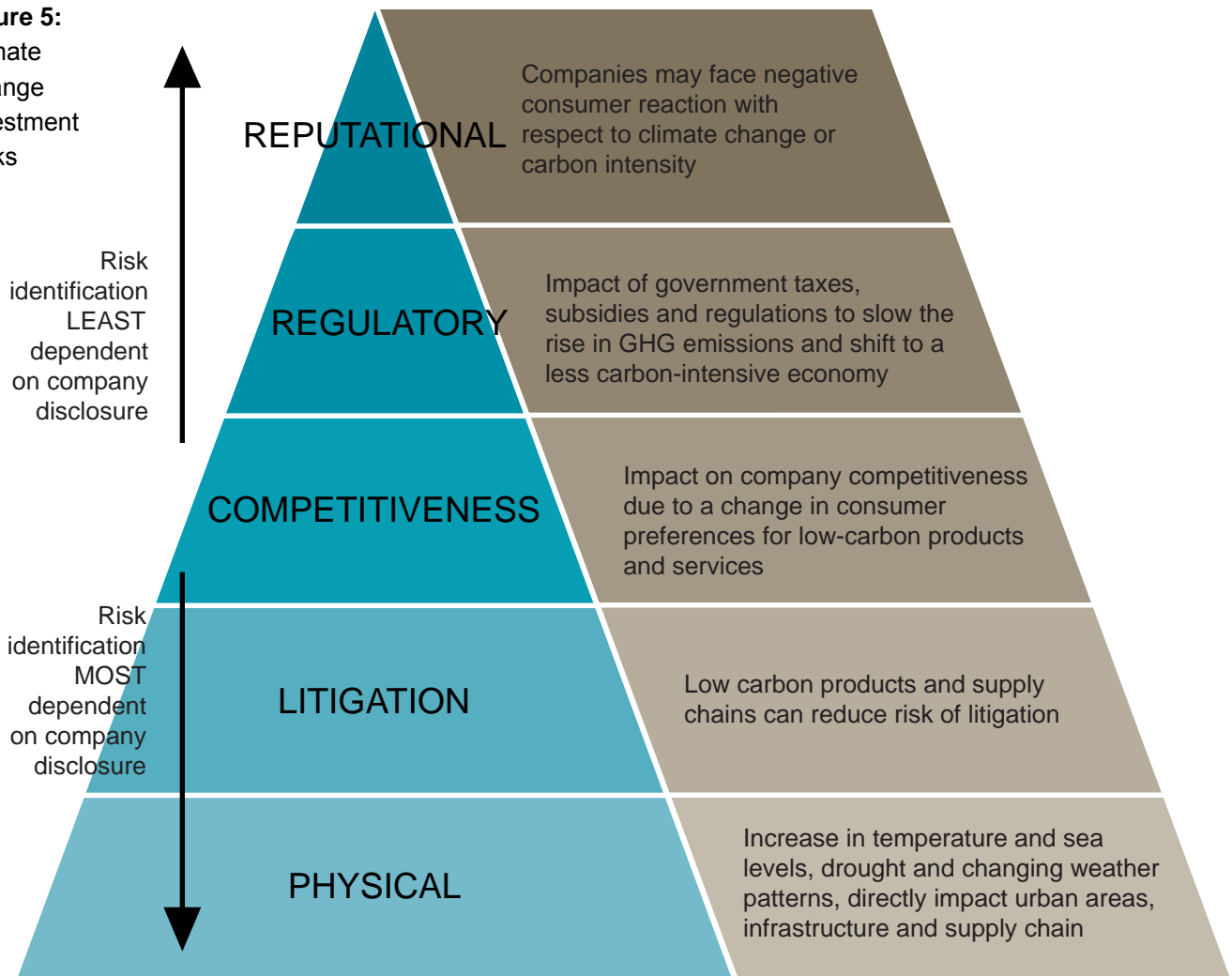
Five investment risks are highlighted

Investors need companies to disclose material information concerning physical risks

We classify five investment risk categories, namely physical, regulatory, litigation, competitive, and reputational risks. At one extreme are the physical risks where investors are heavily dependent on disclosure by companies about their operations to be able to assess how vulnerable these operations are to climate change and low carbon trends. At the opposite extreme are the intangible reputational risks, where investment professionals will need to rely more on his/her own judgment (see Figure 5).

IPs will probably be more reliant on investee companies to supply them with the material information concerning physical risks. In contrast, disclosure about regulatory, competitive, litigation and reputational risk, while perhaps highlighted in corporate communications, would be gleaned in part from external sources through select ASrIA members⁶, other third-party service providers, and media reports.

Figure 5:
Climate Change Investment Risks



Source: ASrIA Research

Physical Risks

Weather patterns are showing increasing signs of instability. A high degree of unpredictability in the frequency or magnitude of extreme events still prevails. As a result, industries in Asia are reluctant to price climate change risks and find it very challenging to do so.

Physical impacts can disrupt supply chains and lower operating margins

Based on regional trends in climate change identified for Asia (see Figure 2), physical risks can be classified as follows:

- Increasing temperature
- Increasing sea level
- Drought
- Changing weather patterns and types

These can result in direct impacts, such as increased risk of flooding and damage to physical assets, disruption to supply chains, the availability and cost of water, food and a range of associated adaptation and mitigation costs to governments, industry, societies and individuals.

Regulatory Risks

Transparency of the regulatory process helps investors manage risks

Efforts by governments at the international and national levels to regulate climate change issues will directly impact industry, particularly when investing in energy intensive companies with high emissions. The challenge remains for industry to adapt to new regulations and their success at adjustments will depend on when regulations are announced, how market risk and credit risk react to new regulations, and how associated costs are managed.

To enhance “regulatory visibility” means that the regulatory process should be as transparent as possible. Transparency allows investors to manage regulatory risks because they can “see” the direction of the policy makers, thereby lowering volatility. A more detailed review of regulatory and policy development in Asia is available in this report in the section *Description of Regulatory Developments in Asia*.

Litigation Risks

Litigation could occur if companies do not effectively manage climate change risks

Investors need to consider whether companies could face risks from lawsuits due to failure to prepare for climate change risks or provide less carbon-intensive products and services. In developed markets there is the precedent of legal proceedings brought by local governments against carbon-intensive power companies⁷ and there could be similar lawsuits in others sectors and regions in the future.

Carbon off-shoring is an emerging issue in cross-border transactions

Flush with cash, Chinese and Indian firms are buying energy-related assets abroad. Coal India, the world's largest coal producer, Reliance Industries, Essar Group, China's ENN Energy Trading, and China National Offshore Oil Corporation Ltd. (CNOOC) have all recently bought or are in the process of buying stakes in the U.S. CNOOC's proposed US\$2.16bn deal for a 33.3% stake in Chesapeake Energy's interest in the Eagle Ford Shale (South Texas) would reportedly be the largest Chinese investment ever in the U.S. energy sector.

The Associate Director of the Columbia Center for Climate Change Law points out: "the acquisition by foreigners of U.S. fossil fuel resources, such as coal mines, is such a new phenomenon that practically no one in the climate world has anything to say on the matter." But investors would do well to remember that these types of acquisitions are fraught with regulatory and political risk – with national security and climate change intertwined. Because the Pentagon's 2010 Quadrennial Defense Review emphasizes climate change as a threat to national security, the Committee on Foreign Investment in the United States (CFIUS) could conceivably obstruct the deals that result in carbon off-shoring on national security grounds.

Source: Climate Law Blog⁹, ASrIA Research

Competitive advantage comes from anticipating changes in the operating environment

Internal governance to manage climatic reputational risk requires investment

Competitive Risks

Taking positive and proactive measures to mitigate climate risk is a good way to create competitive advantage. Lack of industry-relevant climate change research or loss of a industry-relevant climate change-related opportunity can increase financial risks and cost, reduce customer loyalty and market share, and may even result in loss of market position.

Reputational Risks

Companies that are unwilling or unable to integrate climate change considerations into operational and investment decisions may be viewed negatively by customers and IPs. Sufficient funding and board support for climate-related investment is essential for companies to manage external public issues and reputational risk.

Opportunities

Companies that develop less carbon intensive products and services may create a sustainable competitive advantage and enhance shareholder value relative to their peers:

- Lowering operating costs: picking the "low hanging fruit," including more energy efficient manufacturing plants, property and equipment;

- Generating higher gross margins: End users willing to pay premium prices for differentiated, low or zero emission products and services;
- Optimizing capital efficiency: In addition to maximizing profitability from improved operating margins, firms which invest in low carbon solutions could be eligible for tax credits;
- Enhancing reputation and customer loyalty: Development of low carbon products is evidence not only of a company's technological prowess but also testament to the expectation that low carbon products and services are the standard of the future economy. Such products often have lower running costs and/or longer life spans which further enhances customer loyalty.

Investors can engage with company managers on effective ways to communicate with markets about linking key value drivers with GHG reduction. The more explicitly the corporate managers can communicate about these linkages, the more markets will be in a position to value those efforts more quickly. Figure 6 summarises those linkages.

Figure 6: Investment Case to Find and Unlock the Hidden Value of Climate Change

Linking key value drivers with climate change spurs strategic value creation

	Minimise taxes	Maximises profits	Optimise capital efficiency	Energise growth	Reduce cost of capital	Communicate with markets
	Investing in low carbon solutions → favourable tax treatment	improving margins by measuring and cutting operating inefficiencies	incentivising improved GHG performance by emphasising improved capital efficiency	marketing low carbon, premium products → new business opportunities → strengthened product portfolio mix	lowering risk profile requires an understanding of the climate change-related impacts	raising market's awareness of how to value environmental factors → intrinsic value~market value
Example	Tax breaks on renewable energy projects	More stringent building standards → water and electricity bills ↓	Lower speed shipping utilises excess cargo capacity → GHG emissions ↓	IT enables carbon analytics → carbon foot printing and labeling of F&B products	Carbon intensive clients could default on loans → banks change their credit risk models	Investor relations effectively speaks about the value proposition of GHG emission reductions

Source: ASRIA Research

Climate Change Investment Products in Asia

Implications of climate change for investment in Asia are not only about risk management. New investment funds and indices are emerging from the inevitable shift to low carbon economies. Decision-makers that realize the connection between this shift and Asia's resource scarcity (water, energy, for example) help drive capital towards long-term solutions.⁹ This section profiles select information services as well as financial solutions, allowing investors to gain exposure to environmental markets in their portfolios.

Sources of Information about Climate Risks and Opportunities for Asian Companies

Investors can no longer hide behind the excuse that reliable climate-related data is not available as inputs into the investment process, in general, and into investment vehicles, in particular. While obstacles remain, data collection, analysis and distribution is maturing due to a variety of initiatives.¹⁰ The Carbon Disclosure Project (CDP)¹¹, the Corporate Social Responsibility (CSR) reporting network Corporate Register¹², and CSR statements obtained via company websites are primary sources of information about corporate low carbon strategies. Below we highlight two sources of information on Asian corporations: CDP 2010 ex-Japan report produced by ASrIA and Bloomberg's Sustainability Reporting Initiative.

Carbon Disclosure Project is a primary source for Asian corporate data

CDP holds the largest database of primary corporate climate change information in the world. Launched in 2000, CDP accelerates solutions to climate change by putting relevant information at the heart of business, policy and investment decisions. 534 financial institutions with assets of over US\$64 trillion were signatories to the CDP 2010. In 2009, 2,500 organisations in some 60 countries around the world measured and disclosed their greenhouse gas emissions and climate change strategies through CDP,

in order to set reduction targets and make performance improvements.

In 2010, the CDP Investor questionnaire was sent to 635 companies to form the Asia ex-Japan sample. In September 2010, ASrIA launched the CDP 2010 ex-Japan report, making analysis available to a wide audience including institutional investors, corporations, policymakers and their advisors, public sector organisations, government bodies, academics and the public.

The corporate response rate has been significant for Asia ex-Japan. There is an overall increase in the number of companies responding to the CDP survey, up to 190 across the whole region, primarily led by Korea, which has the highest response rate at 88 and India which had 44 responses. Overall though, 2010 was a year of consolidation and differentiation for CDP in Asia, as responding companies across the region significantly increased the quantity and quality of data, widening the leadership gap between them and non-responding companies.¹³

Bloomberg's Sustainability Reporting Initiative

For IPs desiring quick access to corporate disclosure information without the necessity of visiting multiple websites, ASrIA member Bloomberg has recently launched its Sustainability Reporting Initiative, through which it is building an ESG database for a growing number of companies in Asia. Sources of information for this database are corporate sustainability reports, CDP data, and direct disclosure via the Bloomberg Sustainability Survey.

Table 2 lists the percentage of companies disclosing ESG data and an associated average disclosure score (out of 100 possible points¹⁴). The 'LCIA' category refers to the companies specifically reviewed for each sector in this project (i.e. a selection of large cap companies in Asia-Pacific), while the 'Global' category summarizes disclosure for all companies in the Bloomberg database, and the 'Developed' category identifies trends for developed markets only.

Table 2: Levels of Company Disclosure via Bloomberg ESG

Sector	LCIA		Global		Developed	
	Disc (%)	Avg Disc Sc	Disc (%)	Avg Disc Sc	Disc (%)	Avg Disc Sc
IT & Mobile Communications	14%	23.09	58%	26.93	92%	27.13
Transport	26%	28.78	74%	36.19	97%	35.78
Property & Construction	31%	26.76	65%	28.17	97%	28.14
Agribusiness	29%	36.35	70%	36.64	95%	38.08
Energy	38%	32.10	70%	31.76	94%	31.51
Financial	33%	33.73	57%	31.53	91%	31.98

Source: Bloomberg¹⁵

LCIA – Level of ESG disclosure for companies chosen for the Low Carbon Investment in Asia (LCIA) project

Global – Level of ESG disclosure for all companies in Bloomberg database

Developed – Level of ESG disclosure for developed market companies only

Disc (%) - % of companies participating in data disclosure

Avg Disc Sc – Average Disclosure Score

Based on this evolving source of ESG information, it is clear that Asia is still in its early days of ESG disclosure, with a much smaller percentage of companies disclosing as compared to developed markets or global trends. However, note that the average disclosure score is low (between 20-35 points) across all markets, indicating that overall companies are still not making sufficient efforts to inform IPs about climate and carbon-related risks associated with their business.

Further evidence of how carbon disclosure is gaining traction is the inclusion of a Carbon Disclosure Rating under key statistics and ratios on company summary pages of Google Finance. These ratings cover many Asian corporates, an example of which is provided in Table 3.

Table 3: Example of Carbon Disclosure Data on Google Finance

MTR Corporation Limited (Public, HKG:0066): Key stats and ratios

	Q2 (Jun'10) 2009	
Net profit margin	47.54%	51.28%
Operating margin	54.31%	53.55%
EBITD margin	-	69.46%
Return on average assets	7.61%	5.74%
Return on average equity	12.13%	9.44%
Employees	20,150	-
Carbon Disclosure Rating	-	48/100

Investment Vehicles for Asia's Environmental Markets

As a result of the improvements in data quality and availability, investors can now gain exposure to environmental markets through more sophisticated investment tools and financial solutions. Because investment mandates typically involve a combination of passive and active management, we briefly note both below.

We start with three passive vehicles:

- **FTSE CDP Carbon Strategy Index:** no Asian exposure but likely in the future
- **HSBC Global Climate Change Benchmark Index:** CalPERS US\$500 million environmental investment strategy models this benchmark
- **MSCI Global Climate Index:** 100 top carbon performers worldwide
- **S&P/IFCI Carbon Efficient Index:** focused on eight emerging markets in Asia

Then we turn to active investing and highlight select environmental market funds from ASrIA members and other fund managers.

Passive investing

There are two common reasons to have a climate index (or environmental markets index, more generally) in your portfolio.¹⁶ First, identifying the next “blockbuster” equity listing is next to impossible because of the huge uncertainty surrounding technology risk, political risk, corporate governance risk, and so forth. An index, therefore, allows you to manage risk through diversification while capturing sectoral growth. Second, index investing is beneficial in this fast growing market because it allows you to be exposed more efficiently to industry changes including IPOs, mergers and acquisitions and divestments, without buying and selling individual securities.

FTSE CDP Carbon Strategy Index

Although initially focused on the FTSE All-Share and FTSE 350 indices, the FTSE CDP Carbon Strategy Index Series has the potential to expand to Asian markets. Developed in partnership with ENDS Carbon and CDP, the innovative index series is not solely based on past emissions performance. Rather, the index is a carbon-risk-tilted version of the FTSE All-Share Index which examines future risks, trends and corporate strategy. The constituent companies are the same but the company weights differ based on an evaluation of their carbon risk exposure relative to their sector peers.¹⁷

HSBC Global Climate Change Benchmark Index

Launched in 2007, the HSBC Global Climate Change Benchmark Index¹⁸ lists companies focused on developing solutions to combat the effects of climate change across many business sectors. As of October 2010, the index held 362 companies around the world. It has a heavy bias towards European, Japanese and U.S. companies. Taiwan is the most exposed Asian market with 21 companies (US\$17bn market capitalisation). The US\$500 million internally managed environmental investment programme of the California Public Employees' Retirement System (CalPERS) models the benchmark.¹⁹

MSCI Global Climate Index

The MSCI Global Climate Index, in contrast to the FTSE CDP Carbon Strategy Index series, is an equal weighted index. Developed for investors wanting global exposure to corporate leaders in mitigation efforts, the index selects 100 corporations worldwide demonstrating climate leadership on corporate strategy and performance. Constituent companies are pure plays in three major categories: (1) renewable energies, (2) clean technology and efficiency, and (3) future fuels. Index inclusion criteria include: strategic commitment, investment in research and development, market share, intellectual property and reputation.²⁰

S&P/IFCI Carbon Efficient Index

The S&P/IFCI Carbon Efficient Index is a benchmark allowing IPs to track stock performance in a broad based emerging markets portfolio while reducing carbon exposure. It replicates the risk-return profile of the S&P/IFCI LargeMidCap, the S&P/IFCI Carbon Efficient Index weights the constituent companies according to a carbon metric.²¹ A company's carbon performance, as determined by Trucost Plc, is tons of carbon dioxide equivalent (CO₂-e) divided by annual revenues. When a company does not disclose its carbon performance, then a score is assigned based on its regional and sector carbon average. The index includes eight emerging markets in Asia²² and over 800 stocks.

Active investing

In contrast to passive investing, active management involves the selection of specific securities to outperform a relevant market benchmark or, in the case of an absolute return strategy, to exceed the risk-free rate or an internal benchmark. An actively managed investment thesis typically reads:

Asia's resource scarcity and mismanagement drive the investment opportunity. Differences in how well companies respond to this changing landscape create opportunities to harness competitive advantage, which should increasingly be realized in superior total return performance.

Distance between leaders and laggards appears to be growing

As reported in the CDP 2010 Asia ex-Japan report, we saw a significant increase in the number of companies reporting on growing investments in products and services that improve resource efficiency or which could provide strategic advantage in the shift towards a low carbon economy. The distance between leaders and laggards appears to be growing which active managers can then use to identify mispriced securities. Table 4 lists environmental market funds.

Offset the carbon footprint of investment portfolios

Climate Neutral Investments (CNI) calculates the carbon footprint of investment portfolios and allows the investor to completely offset it with certified carbon credits. This can be applied to portfolios with or without a Socially Responsible Investment focus. An investor chooses an investment based on personal risk/return considerations. CNI calculates the costs to make the investment emission neutral. The investor offsets those emissions, choosing from 160+ emission reduction projects in developing countries. Thus, the true costs of an investment for future generations can be calculated and taken care of by the investor already today. Further, the offsetting projects provide a measurable social impact for the communities they are based in.

Source: Climate Law Blog , ASrIA Research

Table 4:
Environmental Market
Investment Funds

Fund Sponsor/ Manager	Fund Name
	Asia Pacific Carbon Fund ²³
	Clean Energy Financing Partnership Facility ²⁴
	The Climate Investment Funds ²⁵
	Future Carbon Fund ²⁶
	Seed Capital Assistance Facility ²⁷
	Green Bond ²⁸
	Climate Advocacy Fund ²⁹
	Threadneedle Low-Carbon Workplace Trust ³⁰
	Smart Energy Fund ³¹
	Global Climate Opportunities Fund ³²
	Jintrust Carbon Awareness Fund ³³
	Global Investment Funds - Climate Change ³⁴
	Global Trend New Power ³⁵
	Asia Pacific Sustainability Fund ³⁶

Source: ASrIA Research and SRI Fund Portal³⁷

Description of Regulatory Developments in Asia

Governments are responding to climate change

Governments in Asia are taking actions to respond to climate change. Investors need to be kept well informed of these regulatory developments and the implications for their investments. The natural instincts of Asian governments are to encourage voluntary standards rather than legislative frameworks and there is no doubt that Asian governments have been dragging their feet over implementing legislation. However, the Korean and Taiwanese governments in particular have been engaged for some time now in industry dialogue; a process of moving towards the implementation of legislation has emerged.

This section of the report provides a high level overview of climate change related regulatory and policy developments in the Asia-Pacific region.

Copenhagen Accord Emission Reduction Commitments

Policymakers have announced targets and actions

Following the climate change negotiations in Copenhagen in December 2009, countries in the Asia-Pacific region have set voluntary targets for reducing the carbon intensity of their respective economies. Table 5 lists the targets and actions that Asian governments have committed to under the Copenhagen Accord. Targets and actions for Asian governments that are not represented in the UN climate change negotiations are listed in the individual country discussions below.

Review of Country Policy Initiatives

Impressive recent regulatory action on climate change

The variety of low carbon targets and initiatives in Asia Pacific is impressive. Table 6 provides a quick overview of these policy directions, followed by a more detailed discussion about the drivers and responses for each country. A check mark indicates that the initiative is either under discussion with a fair chance of implementation or already in operation.

South Korea

South Korea takes a leading role

Korea is taking a leadership role in implementing policy initiatives to support a low carbon economy. Following an official announcement in August 2008 to drive “Low Carbon, Green Growth” as a key national strategy, the Presidential Committee on Green Growth (PCGG) was set up in February 2009 to oversee the policy development process with representatives from the public and private sector. The *Basic Act on Low Carbon, Green Growth* passed the National Assembly in January 2010 and was promulgated in April 2010. The speed with which the legislative framework was developed demonstrates the commitment and seriousness of the Korean government on this matter, however it is the regulatory enforcement framework underlying the Basic Law that will show the real strength of this policy direction. A number of policies and regulations are expected to follow until next year.

It is clear, however, that commencing in 2011, public institutions and private corporations that emit GHG emissions over an established threshold will be required to report on

Korean emissions trading scheme tentatively set for 2013 launch

emissions, set emission targets and mitigation plans, and verify compliance. This will set the basis to establish an emission trading scheme (ETS) tentatively scheduled for implementation in 2013. A voluntary cap-and-trade scheme is scheduled to commence in 2010.

Korea has made voluntary commitment for GHG reduction in the international sphere, and moved to implement legally-binding mitigation measures domestically. Based on this, it seems that Korea has taken strong steps in implementing emissions reduction policies, perhaps putting itself in a leadership role in Asia-Pacific.

Australia

Mandatory greenhouse gas emissions reporting requirements have been in place for corporations in Australia through the National Greenhouse and Energy Reporting Act since 2007. The scheme requires select corporations to report greenhouse gas

Table 5: Copenhagen Accord Commitments in Asia-Pacific

Country	Targets and Actions	Comment
Australia	5%, 15% or 25% below 2000 levels by 2020	Unconditional commitment of 5%, 15% conditional on global agreement not corresponding to 450 parts per million (ppm), and 25% in case of comprehensive agreement
China	Reduce 2005 emission intensity by 40-45% in 2020	Domestically binding, but is being characterised by China as a “voluntary action”
Hong Kong	Hong Kong is not part of the UNFCCC framework, but has set targets to align with national objectives	HKSAR Government proposes to reduce carbon intensity from the 2005 level by 50-60% by 2020
India	Reduce 2005 emission intensity by 20-25% in 2020	Modelling from the Ministry of Environment & Forests indicates that CO ₂ intensity could fall 24% to 59% between 2005 and 2030 even in absence of new mitigation policies
Indonesia	Reduce projected business-as-usual (BAU) emissions by 26% in 2020	41% reduction contingent on international support
Japan	Reduce emissions 25% below 1990 levels in 2020	Contingent on establishment of a fair and effective international framework
Singapore	7-11% below BAU in 2020	16% cut when a global agreement on climate change is reached
South Korea	30% below BAU in 2020, which is 4% below the 2005	A unilateral commitment to reduce emissions by 4% below 2005 levels by 2020
Taiwan	Taiwan is not part of the UNFCCC framework	The Taiwanese government has set ambitious goals to reduce national carbon intensity through a variety of policy commitments

Source: UNFCCC and Markit³⁸

Australian action on ETS not likely until at least 2012

emissions, energy production and energy consumption, thus setting the necessary framework for implementing an emissions trading scheme. The Carbon Pollution Reduction Scheme (CPRS) has been in development since 2006 and is a cap-and-trade legislative framework to limit carbon emissions. As of April 2010, the national government announced that it will not proceed with CPRS until the end of the current Kyoto commitment period at the end of 2012.

Alternative climate bills have been tabled by opposition parties, however none of them have passed thus far. It seems likely that a major decision on any emissions trading scheme has been postponed until 2012.

On the energy production side, the Australian Renewable Energy Target has been raised to 20% by 2020, effectively expanding renewable electricity production to 36,000 GWh.

China

Amended renewable energy law further incentivizing RE investment

China has commenced discussion of the 12th Five-Year Plan (2011 – 2015), and thus far has put strong emphasis on a low carbon strategy. The Amended Renewable Energy Law was released in December 2009 with a distinct set of incentives to encourage further growth in the renewable energy sector. In particular, grid companies are required to purchase electricity from renewable energy sources; governments are to offer tax breaks and a new national renewable energy fund; and preferential loans to the renewable energy industry will be made available.

Table 6: Summary of Country Policy Initiatives in Asia-Pacific

Country	AUS	CHN	HK	IND	INDO	JPN	SGP	SK	TWN
Emission reduction and related targets	√	√	√	√	√	√	√	√	√
Emission reporting obligations	√						√	√	√
Cap-and-trade schemes	√	√	√			√		√	√
Product labelling regulations and standards				√					√
Product efficiency regulations and standards				√			√		√
Fuel/energy taxes and regulations	√	√	√		√				√

AUS-Australia; CHN-China; HK-Hong Kong; IND-India; INDO-Indonesia; JPN-Japan; SGP-Singapore; SK-South Korea; TWN-Taiwan

Source: ASRIA Research

Thus far, there are three carbon trading platforms in China, namely the Shanghai Environment and Energy Exchange (SEEE), the Tianjin Climate Exchange (TCX), and the China Beijing Environment Exchanged (CBEEEX), however trading is on a voluntary basis and will likely remain so in the short term.

In support of Clean Development Mechanism (CDM) projects, Chinese companies engaged in CDM projects in China will receive additional incentive through exemptions on revenue earned via such a project. There has been some chatter that select political advisors are recommending implementation of a carbon tax on energy-intensive and high emission industries. It is increasingly likely that further policies and stronger targets will be integrated into the 12th Five-Year Plan (2011 - 2015).

Hong Kong

Hong Kong is consulting the public about its proposed climate change strategy

In early 2008, the Hong Kong government commissioned a report to assess the impacts of climate change in Hong Kong.³⁹ Based on this study, the government proposed to reduce carbon intensity from the 2005 level by 50-60% by 2020, compared with the mainland's target of 40-45%.⁴⁰ As of December 2010, the government has launched a public consultation process to receive feedback on the overall government climate change strategy.

Hong Kong is also exploring the feasibility of establishing an emissions trading platform, similar to existing platforms in the mainland. The timing and implementation of such a platform remains uncertain at this time. Recent changes to the CDM process mean that Hong Kong-based companies can now independently develop CDM projects in the mainland and fully own the projects, reducing the need to rely on outside partners.

India

States in India must have their own climate change action plans and programs

The Prime Minister's Council on Climate Change is coordinating national action plans for assessment, adaptation and mitigation of climate change. India's National Action Plan on Climate Change was released in June 2008. It contains support for solar power and mandates a portion of power from utilities to come from renewable energy. The action plan requires power utilities to buy 5 percent of their power from renewable energy sources by the end of 2010. This minimum requirement will increase 1% each year for the next 10 years, reaching 15% by 2020.

In addition, states in India are directed to formulate their own climate change action plans and programs, thereby entrenching climate change capability throughout government.

India offers few specifics in low carbon promotion initiatives

An energy labelling programme was introduced in 2006 and continues to encourage companies to sell energy efficient appliances. The Energy Conservation Building Code from 2007 promotes green building standards, however is focused primarily on commercial and government buildings and remains a voluntary scheme.

Indonesia is first Asian country to enact rules on REDD credits

In general, India's national policy initiatives do not have very specific measures but instead remain generic in promoting low carbon initiatives without providing detailed implementation plans.

Indonesia

As part of its commitments under the Copenhagen Accord, Indonesia pledged to reduce emissions by 26% by 2020 from business-as-usual and even up to 41% pending international support.

Indonesia recently published the Development Planning Response to Climate Change and formed the National Council on Climate Change. In May 2009, Indonesia became the first Asian country to formally enact regulations for generating forest preservation carbon credits through the UN in order to reduce emissions due to deforestation and degradation (REDD).

In May 2010, the World Bank announced US\$200 million in funding through the Climate Change Development Policy Loan (CC DPL) Program in order to directly support the Indonesian government's policy agenda on climate change. Thus far, national policies related to climate change rely heavily on voluntary measures or economic incentives, thereby attempting to foster an organic shift towards a low carbon economy.

Japan

Japan is taking serious steps to implement a mandatory cap-and-trade system

The bill of the *Basic Act on Global Warming Countermeasures* was approved by cabinet in March 2010. This bill is an update to the *Act on Promotion of Global Warming Countermeasures* promulgated in 1998 and last updated in 2005. The new act opens the door for implementing a regulatory framework to enforce a cap-and-trade systems, which is expected to start by 2011. In addition, the tax system will be changed in 2011 to allocate a heavier tax burden on carbon intensity, thereby boosting renewable energy such as solar power.

This development marks a definitive shift away from voluntary (bottom-up) measures, towards a regulated system that operates on top-down governance. This is a clear indication that the laissez-faire approach taken in recent years is ineffective in substantially reducing carbon intensity.

Singapore

Singapore takes lead in implementing green building standards

The Singapore Ministry of Environment & Water Resources introduced a new Energy Conservation Act (NEA) in February 2010. This new legislation, scheduled to come into effect in 2013, will require large energy users (15 GWh or more per year) to implement energy management and reporting systems, and submit energy improvement plans.

The Building & Construction Authority (BCA) implemented legislation on Environmental Sustainability for Buildings in April 2008, thereby making green building design mandatory for all new buildings. It is expected that buildings will be subject to a further

10% increase in energy efficiency through revised legislation at the end of 2010, and starting in 2011 building energy usage data will have to be submitted to government at regular intervals. It is clear that Singapore has taken the lead in implementing green building design in Asia through strong regulatory requirements.

Taiwan

Taiwan's Greenhouse Gas Reduction Act is making its way through the Legislative Yuan

Taiwan has committed to a stepwise reduction of GHG emissions by 50% from 2000 levels by the year 2050. The Greenhouse Gas Reduction Act will serve as the legal framework to implement the necessary regulatory changes, however this has not yet successfully passed through the Taiwanese legislature.

Key aspects of the current legislative initiative include emission permits, GHG emission performance standards, and a cap-and-trade scheme. The Taiwan Environmental Protection Agency (EPA) has initiated the National GHG Registry Platform to collect the necessary emissions data, thereby setting the stage for emissions trading amongst select industries. The designated sectors identified for inclusion in the cap-and-trade system are industry, energy, transport and commercial/residential.

Taiwan's carbon labeling likely to be on a voluntary basis

Promising as well is the *Renewable Energy Act* that passed in 2009 to increase renewable energy capacity by over 50% in the next 20 years, amongst other initiatives. In addition, the Energy Management Act has received updates to further promote energy saving measures. An energy or carbon tax is also being considered in Taiwan, however it is not clear whether and how this will be implemented at this stage. It seems however, at this stage, that carbon footprint labelling will likely be implemented via a voluntary mechanism.

Climate Change Milestones in 2010 and 2011

Governments in the Asia-Pacific region continue to make efforts to push forward with climate change related policy measures and regulations. Table 7 lists a selection of key milestones for Asia-Pacific governments in 2010, including timing of major international negotiations and national initiatives. Table 8 lists upcoming milestones for 2011.

Major governments in Asia were under pressure to announce new initiatives in time for global events including the G20 summit in South Korea in November and COP16 hosted by Mexico in December 2010. We anticipate, for example, Hong Kong's path to a low carbon economy to become clearer after its hosting of the C40 workshop in early November 2010.

Table 7: Past Climate Change Policy Milestones in 2010

Date (2010)	Institution/ Country	Description
Jun 10 - 11	C40	C40 Berlin Workshop 'Strategies for Highly Efficient Cities'
Jun 26 - 27	G20	4th G20 Summit in Toronto, Canada
July 8 - 9	Korea	Regional Preparatory Meeting for the Sixth Ministerial Conference on Environment and Development in Asia and the Pacific (MCED-6)
Sept 29 - Oct 1	C40	C40 Rotterdam Workshop 'Deltas in Times of Climate Change Conference'
Sept 27 - Oct 2	Kazakhstan	Sixth Ministerial Conference on Environment and Development in Asia and the Pacific (MCED-6)
Oct 27 - 28	Singapore	Carbon Forum Asia in partnership with the Asian Development Bank (ADB)
Nov	G20	5th G20 Summit, South Korea
Nov 5 - 6	C40	C40 Hong Kong Workshop 'Low Carbon Cities for High Quality Living'
Nov 8 - 19	UNFCC	2nd scheduled meeting of the KP & LCA working groups to restart negotiations on post-2012 frameworks
Nov 29 - Dec 10	UNFCCC	COP16 Annual UNFCCC meeting hosted by Mexico – unofficial target to finalise post-2012 agreement

Source: HSBC, Markit⁴¹ and ASRIA Research

Table 8: Climate Change Policy Milestones for 2011

Date	Institution/ Country	Description
March 2011	China	National People's Congress endorses 12th Five-Year Plan (2011 – 2015), with key elements on low carbon economic development
Nov 28 - Dec 9 2011	UNFCC	COP17 Annual UNFCCC meeting hosted by South Africa (Durban)
2011	G20	6th G20 Summit in France
2011	Japan	Emissions Trading Scheme expected to start
2011	Korea	Institutions & corporations with large GHG emissions start to report on emissions, targets and plans

Source: ASRIA Research

Sectoral Findings in Asia

As part of this project, ASrIA prepared six reviews on Asian sectors, namely *IT & Mobile Communications, Transport, Property & Construction, Agribusiness, Energy and Finance*. This section provides a summary of the sectoral findings.

The IT and Mobile Communications Sector

Sector Definition and Description

For the purpose of this report, the IT sector is comprised of the *Technology Hardware and Equipment, Software and Computer Services, and Mobile Communications* sub-sectors.

The industry is in a period of significant long-term growth in Asia following the global recession with 3G telecommunications finally gaining wide consumer buy-in, and overall consumer growth in emerging economies for computer hardware and connectivity services. Tough competition is developing between companies such as Acer and Lenovo over access to the China market for PC sales. Data storage, virtualization and cloud computing will rapidly emerge as a major strategic issue. There was no slow down in data storage during the recession and the storage of data will continue to grow exponentially in the coming years.

Key Sector Issues

The IT and mobile communications sector faces a range of ESG issues which have demanded significant attention and investment, driving efficiency and design standards throughout the IT supply chain. Climate change related issues need to be seen within the context of a range of ESG related challenges including toxicity and waste recycling issues, energy and resource efficiency, water access and management, supply chain management and quality control, raw materials sourcing, the issue of 'conflict minerals' from countries such as the Congo, health & safety and labour management issues as highlighted by the recent problems of Foxconn in China.

The IT and mobile communications sector is a high-impact sector in terms of the global fight to tackle climate change. It has a rapidly growing carbon footprint, both in terms of manufacturing and in terms of IT usage. The sector's current contribution to global emissions of around 2% is set to almost triple (0.5 Gt CO₂e to 1.4 Gt) by 2020. Approximately 40% of emissions come from emerging markets and China, and this is expected to grow to approximately 50% of all emissions by 2020. About 50% of emissions come from telecoms and data centres, with about 50% coming from PCs, printers and other peripherals, however the contribution of PCs is projected to grow to over 60% of emissions by 2020.⁴²

The IT industry is a 'solutions' provider to other sectors, facilitating the transition to a low carbon economy. Intelligent IT systems, smart-grid applications and virtualisation, lie at the heart of other sectors' response to climate change and efforts to reduce energy usage. The GESI Smart 2020 Report found that the IT sector could reduce global

Climate change related issues need to be seen within the context of a range of ESG challenges including labour management

IT and mobile communication is a high-impact sector for global GHG reduction efforts

Sector has the potential to enable carbon reductions in other sectors by over 5 times its own footprint

Sector's extended supply chain makes it difficult to monitor the range of regulatory standards and climate-induced risks

Extended supply chain is exposed to disruptions from extreme storms

Transport hubs and placement of industrial areas near water is a long-term issue

emissions by a significant amount through enabling reductions in other sectors (7.8 Gt out of 52 Gt business as usual in 2020, or 15% of total emissions). The sector has the potential to enable carbon reductions in other sectors by over 5 times its own footprint. The sector needs to balance the carbon intensity of its production with the efficiencies its products can bring to markets. For instance, increasingly energy intensive fabs drawing energy from non-clean coal fired power stations need to be balanced against the increased energy efficiency of the products produced.

Investment Risks and Opportunities for the Asian IT & Mobile Communications Sector

A key characteristic of the sector is its extended supply chain, which increases the level of risk to the sector both in terms of monitoring a range of regulatory standards and regimes, and in terms of exposure to physical risks from extreme weather and sea-level rise.

Regulatory Risks

Due to its global manufacturing footprint and the consumer orientation of the industry, with products and services being sold directly into all the world's major markets and to consumers throughout Asia, IT hardware manufacturers have to take account of a wide range of existing and developing regulatory regimes and standards. Asian countries have been slow to introduce mandatory energy efficiency legislation, carbon/GHG emission reduction legislation and carbon taxes, but regulatory roadmaps are now in place for Taiwan and Korea, and China has already introduced energy efficiency standards for larger organisations. Most of the world's major countries have also made emission reduction commitments as a result of the Copenhagen process. As a result, IT companies have to monitor and meet varying standards across the region and in their global operations and markets, and face the risks of constant change in standards globally. A company which fails to not only actively monitor but also actively anticipate change in regulatory standards risks losing markets and global market share.

Procurement Risks

Governments and large institutions worldwide are introducing green procurement standards confronting the IT sector with both market risk and opportunity.

Physical Risks

In the short- to medium-term the key climate-related risk to the sector is disruption to extended supply chains as well as interruption of transport of goods and manufacturing deadlines due to flooding, storms in coastal areas and other extreme weather events including dust storms in inland areas. Some leading IT companies have recognised the increasing frequency and severity of these events and employed consultancies to help estimate the financial losses due to these potential disruptions.

The sector's increased investment in GHG reduction provides opportunities for financial institutions

Currently China, Taiwan, India and Korea have overall advantages in manufacturing in terms of infrastructure investment, however the southern coastal regions of China are at particular risk of increased climate change impact, and competitor countries such as Malaysia and Vietnam which have aspirations to become IT hubs could benefit from this in the future, if they adopt more forward-looking climate-change strategies.

Climate Change Related Investment Risks

In the short- to medium- term IT manufacturers are facing high investments in GHG emissions reduction, waste-heat capture technology and other energy efficiency investments. This is an opportunity for financial institutions, to encourage best practice when providing loans and investing in technology providers.

Sophisticated tools are helping management to identify key areas to focus time, innovation and investment to remain competitive

Competitive Risks – Green Branding

Leading global IT brands have come under strong criticism from civil society groups over issues such as toxics in products and in electronic wastes. However, increasing competition has developed around positioning on green energy standards. Being able to show that products meet the highest global energy efficiency standards has become increasingly a key competitive issue in the industry. Ongoing and emerging challenges include continuing innovation in green design, and improving the ability to identify and manage the carbon footprint of specific components and products.

Placing energy-hungry data-centres near sources of renewable energy will help reduce GHG emissions

Green Technology Opportunities

The IT sector recognises that it has immense opportunities in terms of enabling other sectors such as the property, transport and energy sectors to improve their own footprint and energy efficiency by providing smart IT solutions to manage energy usage, improve facility and manufacturing design, and reduce the need for travel. Increasingly sophisticated tools have or are being developed to assist companies in measuring their carbon footprint and identify key areas to focus management time, innovation and investment.

Placing data-centres near sources of clean energy is also part of the emphasis on finding ways to reduce the footprint of the so called 'virtual cloud' and reduce the impact of the exponential growth in 'data', which is not really virtual but housed in massive and energy-hungry data centres and their interconnected transmission infrastructures.

IT & Mobile Communications has a crucial role to play as it facilitates the transition to a low carbon economy

IT & Mobile Communications Sector Summary

In summary, the IT sector faces multiple serious, short, medium and long-term risks from climate change. Significant investment is still needed by the sector to meet these challenges and carbon markets need to be developed further to facilitate the necessary investment. However, the IT sector also has a critical role to play in terms of being a solutions provider to enable the wider transformation of other sectors into a low carbon economy.

The Transport Sector

Valuable insights into the question of climate change's materiality for investors are found in the strategies and actions of Asia's transport sector. Over the past few years, Asia's transport sector, in particular the airline and shipping sectors, have faced particularly challenging circumstances for doing business.

Sector Definition and Description

The transport sector is defined on the basis of secondary (manufacturers of ships, land vehicles, airplanes and rail) and tertiary (service-oriented, end users) economic sub-sectors. As such, the transport industry is classified into *Aerospace & Defence*, *Industrial Engineering*, *Industrial Transportation*, *Automobile and Parts*, and *Travel and Leisure*.

Given the broad reach and complexity of the transport industry and its various subsectors, the industry is estimated to represent roughly 8% of total Asia-Pacific market capitalization. This makes it one of the larger industries in Asia.

Asia's transport sector is benefiting from relatively strong economic growth in Asia, and the move of Asia's emerging economies up the value chain, led by China and India.

Four key investment drivers for the transport sector are: rising per capita income, technological changes, trade liberalization, and urbanization. Each will have implications for reducing the carbon intensity of Asia's economic development.

According to McKinsey's business-as usual scenario, greenhouse gas emissions in the global transport sector are set to grow about 2.5% per year reaching 11.4 GtCO₂-e by 2030. In absolute terms, the transport sector will be the second largest contributor of GHG emissions, behind the power sector's estimated 18.7 GtCO₂-e in 2030.⁴³

Key Sector Issues

The expected expansion of aviation in the coming decade will exert additional pressure on the carbon emissions, despite significant improvements in jet engine fuel efficiency in recent years. The development of sustainable aviation bio-fuels is a key strategy for reducing carbon impact in the aerospace sector. There is potential for significant regulatory support through incentives and legislation. With fuel costs being a significant operating expense for airlines, sustainable bio-fuels may well become an essential component of aircraft operation.⁴⁴ The sourcing of bio-fuels has been particularly problematic for broader expansion of the industry, because setting aside forest or agricultural land to grow bio-fuels carries inherent risks associated with deforestation and insecure food supply, while in some cases creating more carbon emissions than what is supposedly offset through the bio-fuel itself.⁴⁵

Transport is forecasted to be the second largest contributor of GHG emissions, behind the power sector in 2030

Electrification of vehicles needs infrastructure investment to support its wide spread application

The **automobile sector** has a variety of opportunities to reduce carbon intensity for manufacturing and product development, in particular as vehicle ownership continues to surge in India and China:

- Technological: performance improvement of new cars and trucks to reduce CO₂ emissions of internal combustion engines.
- Fuel switching: electrification of passenger, light truck and freight transport.
- Road infrastructure: Improving traffic flow and reducing congestion to directly lower carbon emissions.
- Carbon pricing: CO₂-based taxation of automobile use to influence driving behaviour to lower overall emissions.⁴⁶

Along with the aerospace industry, Asian governments ex-Japan tend to view **industrial engineering** firms as strategic assets. Consequently, investment attempting to influence a low carbon trajectory in this capital-intensive sector may have government support. As more state-owned heavy-industry companies throughout Asia are publicly listed and traded, investors will need to ask about climate change risks and opportunities as well as carbon strategy and performance.

Electrification of port equipment is potentially a significant investment opportunity in the **industrial transportation** sector. The effect would be that the terminal operator would most likely be shifting, but not eliminating, the carbon emissions to hydrocarbon-based power plants, enabling more efficient use of fossil fuels and more targeted emission source control.

Asian airlines are helping to formulate a global strategy on climate change

The Association of Asia Pacific Airlines (AAPA) claims that “aviation [**travel and leisure**] is the only industry which has developed a globally coordinated strategy” on climate change that rests on four pillars: technology, operations and infrastructure, alternative fuels, and economic measures.⁴⁷ The industry is targeting carbon neutral growth by 2020, meaning that aviation’s emissions would not grow even as demand increases.⁴⁸

Investment Risks & Opportunities for the Asian Transport Sector

Physical Risks

The transport sector will face direct consequences from the physical impacts of climate change, including rising sea levels and more extreme droughts, floods and storms. Investors need to know which of the transport company’s physical operating assets are most at risk from rising sea levels or extreme weather, and what strategy the company has to manage the risk.

Regulatory risk for transport is both global (marine and air) and national and local (land vehicles)

Regulatory Risks

The regulatory risks related to climate change in Asia's transport sector are both country-based and global, as in the marine, air freight, and airline sectors, and therefore subject to both global and national regulatory standards.⁴⁹ Ocean going vessels are by definition operating internationally and economic liberalization is increasing the amount of air transport that operates across borders. As per capita incomes rise across Asia, the travel and tourism industry (airlines) is boosting operations on a regional and global basis.

In contrast, the regulatory risks for the road and rail transport industries are often based on national and local policy measures (fuel taxes, road pricing, subsidies, purchase taxes, emissions trading and limits).

Competitive Risks

We note three competitive risks for the sector. First, there is the risk that long-distance haulers (land, sea, and air) will be replaced by either (a) locally sourced goods and services requiring less transportation or (b) technology, such as tele-presence, which serves as a substitute for transportation. Intra-regional trade is expected to increase due to the ASEAN–China Free Trade Area (ACFTA).⁵⁰ However, it is not clear how the ASEAN-China leaders' Joint Statement on Sustainable Development, issued in late October 2010, will impact the sector as the statement focuses on "dialogue and cooperation in the international climate change negotiations."⁵¹

R&D needs to anticipate consumer demand for low or no-emission vehicles

Another risk involves Asian transport companies failing to respond effectively to rising consumer preferences for low carbon products and services, running the risk of losing business to their competitors. The underlying risk in the sector is whether spending on research and development for emergent technologies is sufficient in, for example, the automotive industry.

There is a debate whether de-speeding is a fad or a long-term trend in transport

A third risk is the counterintuitive strategy of "de-speeding." In an interconnected world, speed is one of the cornerstones of just-in-time management for the transport sector and supply chain management systems in general. With de-speeding in the shipping industry, just-in-time management arguably will still work. However, a company choosing not to go slower may run the risk of increased customer switching as customers monetize the environmental benefits generated by slower transport. On the other hand, companies that over-emphasize de-speeding for environmental reasons stand to lose customers that place a high priority on speed. Companies will have to become more sophisticated in evaluating the trade-offs between speed and associated environmental costs.

Transport has high brand value at risk from climate change

Reputational Risk

One of the transport sector's chief reputational risks is consumer safety during periods of climatic disruption. When a firm's reputation is tarnished by poor handling of an extreme weather event, investors must decide whether it is a one-off failure or whether there is an underlying issue that managers have not resolved.

Lippincott Mercer for the Carbon Trust found that among six industries studied, the airlines and food and beverages industries had the highest intangible (in other words, brand) value at risk from climate change.^{52 53} This value is directly tied to a company's reputation, most notably in the transport sector's downstream industries like Travel and Tourism (Airlines).

Investment Opportunities

"Avoid-Shift-Improve" framework helps reduce GHG emissions

Land transport in Asia will play a particularly influential role in the ongoing shift to a low carbon economy. Experts summarise the strategies to reduce carbon from transport as "Avoid-Shift-Improve":

- **Avoid** travel so that the need and desire is reduced (telecommute, video conferencing).
- **Shift** to non-motorized travel (cycling, walking) as well as public motorized transport (rail, bus).
- **Improve** both public motorized transport and individualized motor transport (car, taxi) in terms of direct and indirect greenhouse gas emissions^{5,4}

Investors in debt securities are in a strong position to influence the construction of Asia's low carbon transportation infrastructure

Of the nearly US\$2.5 trillion needed in transportation infrastructure in Asia over the next ten years, over 70% (nearly US\$1.8 tn) will be for new capacity.⁵⁵ Investors in debt securities, in particular, will help finance the development of transportation infrastructure in Asia's fast growing cities. Therefore, they are in a strong position to influence the construction of not only environmentally-friendly "hard" infrastructure (physical assets: mass transit, roads, bridges, etc.) but also "soft" infrastructure (institutional frameworks, policies, governance mechanisms, etc.).

Transport Sector Summary

The transport sector is benefitting from strong economic growth in Asia, making it one of the largest industries in the region. Given the opportunities of increased efficiencies and the electrification of transport over the coming years, the sector plays a crucial role for both developing and implementing low carbon technology.

Given the potentially grave physical impacts of climate change, the sector faces substantial reputational risk, as it is most at risk from poor handling of extreme weather events.

The Property and Construction Sector

The property and construction industry in Asia has significant exposure to climate change risks while at the same time harbouring considerable potential to contribute towards the creation of a low carbon economy.

Sector Definition and Description

For the purposes of this report the *Property & Construction* sector is divided into the *Real Estate* and *Construction & Materials* sub-sectors/industries.

The *Real Estate* and *Construction & Materials* industries represent 7.4% and 3.6% of total Asia-Pacific market capitalization, respectively. Combined to characterize the *Property & Construction* sector, the Real Estate and Construction & Materials industries market capitalization climbs to 11.1%, thereby making it one of the biggest industries in Asia-Pacific.

Carbon intensity depends not so much on how something is built but rather what is built

The carbon impact of the *Property & Construction* sector is substantial and can be broadly classified as originating from two sources, firstly raw material and energy consumption due to construction activities and secondly resource consumption from the operation of assets (e.g. energy, water, waste and transport). Recent figures indicate that the operation of buildings accounts for 33% of total global CO₂ emissions.

In addition to the frenzied property construction boom unfolding in Asia as part of the urbanization process, expenditure on construction for major infrastructure projects such as high-speed rail, power plants, highways, airports and seaports adds significantly to the sector's carbon emissions. Cement production is a particularly carbon-intensive activity.

Key Sector Issues

With Asia's urbanization along coastal areas, new buildings will be exposed to rising sea levels

By 2050, 70% of the world's estimated 10 billion inhabitants will be part of massive urban networks. Instead of retrofitting and rebuilding existing communities, in many cases new cities are being built from scratch, a trend particularly true for China. In 1980, only 52 cities with more than 500,000 people existed in China; by 2025 this figure is estimated to increase to over 330 cities. Many of the existing and new urban areas around the Asian region are located in low-lying coastal regions, with Asian populations more exposed than elsewhere in the globe to the impact of rising sea-levels.

High level of uncertainty of climate change impacts could make the adjustment of design standards expensive

On the **property** side, the overriding issue is the implementation of green building standards and certifications to improve energy efficiency and manage carbon intensity, an area that has come of age for the real estate sector in particular. Technology and standards have been refined over the last decade, providing the expertise and knowledge for regulatory implementation if the industry does not move forward voluntarily. Singapore has already taken steps to implement a mandatory green building code, and a select group of forward thinking developers in Asia have made a clear business decision to set up sophisticated internal systems to implement such practice.

The unresolved aspect on the property side is adaptation to physical climate change risks, both for existing and new assets. The high level of uncertainty associated with climate change impact forecasting at the level of geographical detail required for engineering works could make the adjustment of design standards an expensive undertaking, while the risk of carrying on with business as usual could potentially be even more costly.

Effectiveness of environmental assessments depends on highly variable enforcement mechanisms across Asia

On the **construction** side, the industry is wrestling with adaptation to physical climate change impacts, innovation of new engineering standards that take into consideration possible climate change scenarios, and development of strategies that ensures sector supply chain security. The price of carbon may affect construction materials, depending on the outcome of policy decisions. Public infrastructure projects are increasingly demanding low carbon and sustainable design solutions, albeit the quality of such designs is not yet standardized.

Environmental impacts of the industry are significant. Assets are built for the long-term and cause environmental change that is irreversible without costly retrofitting. Construction and operational impacts are generally mitigated by requirements for environmental assessments, the effectiveness of which is dependent primarily on enforcement mechanisms and highly variable across Asia.

The good news is that carbon and environmental risks associated with the sector can be mitigated if best available technologies and business practices are implemented for a project, starting from the early planning stages and carried through the engineering design and construction process. This then sets the stage for reduced operational impact of an asset.

Investment Risks and Opportunities for the Asian Property & Construction Sector

Physical Risks

Based on ASrIA's review of company disclosure and studies of the sector, physical climate change risks for the industry can be summarized as follows:

- **Increased cooling requirements** for buildings because of elevated global average temperatures may result in higher operating costs. Current green building standards only represent a minimum benchmark for reduced energy expenditure.

Urban vertical farms could provide appropriate adaptation measures

- **Increased risk of flooding** because of rising sea levels and changes in rainfall patterns may result in higher construction costs. Due to uncertainty associated with the severity of the flood risk, consensus on the response by the engineering industry has not yet been established.
- **Increased storm severity and frequency** could potentially require modified engineering specifications to reduce the risk of structural damage. As of yet, the industry has not reached general consensus on revised engineering specifications. Failing to update design standards may reduce costs in the short-term but will likely multiply financial impacts in the long term.
- **Shifting climate patterns** could reduce availability of basic resources and drastically impact agricultural yields, resulting in higher costs for urban infrastructure. Large-scale infrastructure projects such as desalination plants or urban vertical farms⁵⁶ could provide appropriate adaptation measures.
- **Severe weather events** could cause disruption to supply chain for both construction (e.g. cement, steel, etc.) and operation (e.g. water, electricity, natural gas).

Regulatory Risks

Carbon taxes could raise cost of construction inputs

- **Regulations mandating low carbon design and construction** for new property developments are emerging. Singapore's BCA Green Mark⁵⁷ and similar regulations foreseeable for Hong Kong are raising the bar, however green construction standards for public infrastructure projects are still in their infancy.
- **Mandatory retrofit schemes** to increase the efficiency of buildings may incur additional capital expenses in the short term, but should reduce operational costs in the long term.
- **Carbon taxes or carbon trading schemes** could raise the costs of carbon intensive construction impacts and activities, such as cement and steel.

Competitive Risks

Many commercial tenants look for ways to promote an environmentally-friendly image as well as lower utility bills

- **Green building standards** may raise the cost of construction in the short term, but lower the cost of operation in the long term.
- **Green building assets** are attractive investment opportunities to the portfolios of responsible investors and thereby create an important competitive advantage.

Reputational Risks

- Developers who fail to acknowledge the benefits of improved building efficiency for reducing carbon intensity and operational costs may run the risk of reputational damage.

Opportunities

Opportunities within the property and construction sector result primarily from climate change mitigation and adaptation measures, resulting in competitive and reputational benefits:

- **Incentive programs** for retrofits of existing building stock to decrease energy consumption/carbon footprint of assets have been implemented in several jurisdictions.
- **Reduce carbon impact of construction**, through state-of-the-art technology and material selection.
- **Reduce operational carbon impact** through green building design. This part of the sector has been growing over the last 10 years.
- **Understand carbon impact of supply chain** (construction materials), especially if future legislation requires low carbon buildings.
- **Planning for green/low carbon/sustainable cities** has become a major trend in the property sector.
- **Expertise for assessment of climate change risk** to determine possible impacts on real estate (property), based on currently available modelling and climate change predictions.

As a result of climate change risks, increase in casualty insurance premiums and volatility in property valuations may occur. This financial impact may be highly variable however, depending on the type (vulnerability) and location (exposure) of the development. It will require extra effort on the part of the investor to differentiate projects that have taken precautionary steps to reduce climate change risks.

Property and Construction Sector Summary

The massive urbanization trend unfolding in Asia has fuelled a real estate and construction boom in the region. The implementation of green building standards is a key turning point for the property side, enabling a shift towards a low carbon economy. Sufficient capability exists in the region for widespread implementation of green building standards.

Adaptation to physical climate change is unresolved for the industry, primarily due to uncertainty in climate change modelling which makes forecasting an impending climate change threat a hit or a miss. Carbon pricing may affect the construction industry significantly given the high carbon intensity of cement and steel. Public infrastructure projects are increasingly demanding low carbon design solutions, adding additional pressure to make low carbon a standard business practice for the industry.

Increase in casualty insurance premiums and volatility in property valuations may occur

The Agribusiness Sector

The contribution of agribusiness to reduce the carbon intensity of Asia's economic development is one of the most pressing investment challenges. The sheer size of Asia's food and beverage (F&B) sourcing, manufacturing, and use means that it harbours considerable potential to foster a low carbon economy. The sector needs to play a key role to demonstrate the value of the environmental benefits of lower GHG emissions.

Sector Definition and Description

For the purpose of this report, the following industries are included: Beverages, Food & Drug Retailers, Food Producers, and Tobacco.

The increase in agribusiness sector funds is clear evidence of investor interest in the sector. In a April 2010 briefing document, First State Global Agribusiness Fund notes that the "agribusiness sector is showing signs of a long-term, demand driven trend that is similar to the one experienced by the hard commodities and energy sectors during the past decade."⁵⁸ Some funds explicitly link low carbon economic development with the sector. For instance, Deutsche Asset Management's DWS Global Agribusiness Fund notes that "due to climate change, agro-meteorology expertise will be needed to provide farmers with more accurate weather information and warning systems."⁵⁹

Accurate monitoring and reporting of greenhouse gas emissions from agriculture is a complex issue. More so than in other sectors, emissions from agriculture are based on biological systems. This means that they are subject to greater variations over time and across regions due to interactions between climate, land type, management, and genetic characteristics of crops and livestock.

Key Sector Issues

The key issue for this sector is Asia's ongoing shift towards a higher protein diet, which implies that the sector's proportional impact on global GHG emissions will increase. Research indicates that a dietary shift away from red meat consumption can be a more effective way to lower a household's food-related climate footprint than "buying local." In Asia, the trend is toward eating more red meat, not less.

During the next half century, Asian urbanization within 30km of the coastline is arguably the most significant demographic and geographic change expected.⁶⁰ Cities need F&B products, which are typically sourced from rural areas. Future terms of delivery between the buyer and seller allocating the cost and risk of delivering goods may incorporate a higher expectation of extreme weather events.

Investors are not only gaining exposure in organic farming to the risk-adjusted returns but also to the positive environmental impact including greenhouse gas emissions reduction. Organic farming contributes to a low carbon economy in three key areas:

Agribusiness sector funds are being launched by the capital markets

Asia's ongoing shift towards a higher protein diet implies that the sector's proportional impact on global GHG emissions will increase

Organic farming helps to lower agrichemicals and thereby lowers GHG emissions

Impact of emission trading schemes and carbon taxes on agribusiness is unclear

Agribusiness is arguably the most susceptible sector to climatic physical risks

(a) Helps to eliminate carbon-intensive synthetic nitrogen fertilizers; (b) Promotes high organic matter (soil carbon) which locks in carbon; and (c) Develops pasture based livestock systems.⁶¹ Investors looking for low carbon opportunities need to carefully consider whether an “organic farming” investment is truly what it is billed to be.

Investors should look to New Zealand businesses to be upstream agribusiness leaders in thinking about and responding to climate change risks and opportunities. New Zealand is unique among highly industrialized economies because half its national GHG inventory comes from agriculture predominantly in dairy production.⁶² The New Zealand emissions trading scheme is currently the only cap- and trade scheme which is aiming to include the dairy sector by 2015.

Investment Risks and Opportunities for the Asian Agribusiness Sector

Agribusiness is arguably the most susceptible sector to climatic physical risks. Agricultural productivity declines due to climate change could negatively impact profitability as projections indicate food declines are most severe across the Southeast Asian economies.⁶³ Weather is a highly discontinuous phenomenon which may lead some financial analysts to gloss over its impact and focus on a company’s operational performance, where managers have greater control. The likely increase in extreme weather events (floods, droughts) is expected to make financial modelling that much more difficult.

Uncertainty around the palm oil industry’s response to climate change

As two of the largest producers of crude palm oil (CPO) in the world, Indonesia and Malaysia have significant influence on how the palm oil industry addresses climate change. The industry is important for many reasons including its employment of large numbers of the rural poor and the fact that it is the most efficient vegetable oil in terms of its yield per hectare, meaning less land needs to be cleared for palm oil production.⁶⁴ Its impact on the environment including biodiversity is also felt when, for example, native orang-utans become extinct or are displaced due to plantation growth.⁶⁵

There has been controversy within the industry as members of the Roundtable on Sustainable Palm Oil (RSPO) squabble amongst themselves, culminating in the formation of a splinter group called the Indonesian Sustainable Palm Oil (ISPO), a government-backed certification body. With a Malaysian certification system expected this year, there is debate whether national, regional or global standards on sustainable products will emerge. Part of the debate concerns the industry’s response to climate change. At the 8th RSPO meeting in Jakarta, Indonesia in November 2010, there was reportedly little progress made by the RSPO Greenhouse Gas (GHG) Working Group to determine ways to curb the GHG emissions, making Indonesia the third largest emitter of GHG in the world.

Source: The Jakarta Post⁶⁶, Rainforest Action Network⁶⁷, ASrIA Research⁶⁸

It is rather unclear how agribusiness will be impacted by emission trading schemes (ETS) or carbon taxes. The global trend thus far has been to exempt the sector in trading schemes, such as in the EU Emission Trading Scheme (ETS) and Australia's proposed Carbon Pollution Reduction Scheme (CPRS). We do expect agribusiness to be under increasing pressure, however, to become more energy efficient as increases in electricity prices are passed through in more liberalized markets, and in regulatory environments placing the greatest emphasis on reducing carbon intensity.

A key concern voiced by midstream food producers is that greater demand for land and crops for fuels may put upward pricing pressure on food inputs, causing cost of goods sold to be higher, thereby lowering operating margins for companies. Major agribusinesses are pushing for coherent and predictable global and national energy and climate policies.

Led by Japanese firms, **carbon labelling** has arrived in Asia. Other economies are following suit. For example, Thai food industries are working with European Union partners to build capacity in c-labeling. We see both a pull from global, downstream brands partnering with their Asian F&B suppliers as well as a consumer push. Competitors may generate higher gross margins as consumers pay premium prices for differentiated, low carbon food and beverage products.

Litigation risk for the Asian agribusiness sector is relatively low for socio-political reasons. Governments may be rather reluctant to place short-term burdens on the farmers and fishermen who make up a significant percentage of Asia's developing societies for long term benefits which are often difficult to quantify. However, as investors move downstream into the processing industries, there is a greater potential for litigation.

Corporate management is hearing from increasingly vocal Asian consumers demanding safe, healthy food. In the future, companies may face negative consumer reaction with respect to climate change. Among six industries reviewed by the Carbon Trust, the Food & Beverages industry was found to have one of the highest levels of brand value at risk from climate change.⁶⁹

Opportunities within the sector result primarily from climate change mitigation and adaptation measures in the upstream industries, resulting in cost-saving benefits and revenue generating activities. Key upstream adaptive cost-saving measures include: cropland nutrient management; tillage and residue management; grassland nutrient management; rice and nutrient management; and rice management and shallow flooding.

Improvements in grassland management are arguably the most important to reduce GHG emissions.⁷⁰ There are further upstream investment opportunities in firms which can: (a) Obtain and use better climatic information; (b) Research and develop

Reputational risks are mostly connected with brand value at risk from climate change

Opportunities in grassland management will be some of the most important for reducing carbon intensity

Energy production opportunities could come from animal and vegetable by-products

deployable irrigation systems, early warning systems and heat-resistant crop varieties as well as rice strains which emits less methane; and (c) Manufacture and distribute financial products which allow market participants to share risk including weather index-based insurance.⁷¹

There is massive potential to sequester GHG emissions from animal dung, belching, crop residues and so forth for energy production through biogas plants. Opportunities in Agro-forestry, which combines agriculture and forestry techniques, could increase the number of trees in productive farm and pasture land increasing carbon uptake.⁷²

Agribusiness Sector Summary

Despite the practical constraints in accurately measuring, monitoring and reporting sectoral GHG emissions, investments in the agribusiness sector harbour considerable potential to convert to a low carbon economy. There would have to be substantial investment across a range of agribusiness products and services to tackle the challenge and move towards monetizing the environmental benefits of lower GHG emissions.

The Energy Sector

Asia's energy sector has significant exposure to climate change risks while at the same time having sizeable potential to contribute towards creating a low carbon economy.

Asia's energy sector has significant exposure to climate change risks

Traditional carbon intensive primary energy sources include oil, coal and gas. Nuclear power is a low carbon energy source, but one that raises major safety and waste-product concerns as well as even larger issues around global security. Increasing the traffic in radioactive material does not sit well with heightened concerns about global terrorism post 2001.

Traditional high carbon and nuclear energy projects are often placed along coastlines and major waterways for relatively inexpensive access to primary energy supplies, and for easy access to water needed for operating purposes. These projects are thus vulnerable to rising sea levels and extreme weather that tests structural stability.

Energy projects are also capital intensive and long term. Accounting for their location in vulnerable areas, these factors increase the potential risks from climate change for many energy projects.

Location near major water bodies means extreme weather may test structural stability

Rising primary energy demand in Asia is contributing to the strong growth of a renewable energy sector in Asia, opening up opportunities for investment in power generation from renewable sources including wind, solar, biomass and geothermal, and for investment in the related equipment manufacturing. The growing preference for low carbon primary energy is also creating new investment opportunities in nuclear power (despite unresolved waste concerns) and natural gas.

Sector Definition and Description

Asia's energy sector includes upstream primary energy exploration and production, and downstream refining, power generation transmission and distribution to customers. For the purpose of this report the *Energy* sector is divided into the *Primary Energy* and *Utilities* sub-sectors.

Energy industry's impacts on GHG emissions and economic development are extensive

The energy sector's customers include all sectors of the economy, making the carbon intensity of the energy and power provided by the energy industry a key factor in the economy's overall carbon intensity.

The *Primary Energy* and *Utilities* sub-sectors represent 14.5% of total Asia-Pacific market capitalization, thereby making it the second largest sector in Asia-Pacific after the Finance sector.

Key Sector Issues

Asia is expected to play a key role in driving rising global primary energy demand during the next 20 years, with demands from China and India being particularly notable.

The International Energy Agency published the World Energy Outlook 2009 in November 2009.⁷³ The IEA's Reference Scenario projects a 40% rise in global primary energy demand from 2007-2030, assuming no change in government policies. China and India account for 53% of this demand increase, with additional demand accounted for by strong growth within ASEAN. The IEA concludes that "this is contributing to a refocusing of the global energy landscape towards Asia."

In an environment of strong energy demand growth, energy security is a major motivator for government policy actions, particularly in the economies with the fastest rate of energy demand growth, such as China. Thus, there is the **potential for low-and no-carbon energy sources such as natural gas, nuclear power and renewable energy sources to see strong growth without significantly reducing the overall carbon intensity of the primary energy supplied.**

Given how vital energy is to the modern economy, governments view the sector as strategic and intervene heavily. This puts investors in the energy sector at particularly high risk from shifts in government policy towards the sector.

Government moves to push the sector in a desired policy direction, such as lower carbon intensity, could lead to major new taxation and market pricing distortions. On the other hand, these government policy actions could also open up major new opportunities to benefit from government subsidies and favourable sector pricing.

Asia has a large number of major listed primary energy and utilities companies, spanning the extraction, processing and distribution sectors. Most remain heavily carbon intensive, but they vary greatly in how quickly they are moving to diversify away from carbon, and to what extent they are disclosing publicly about their carbon emissions and their climate change strategies.

Environmental impacts of the energy industry are significant both during the construction phase of projects and during their operating life as assets are highly capital intensive and built for the long term. Thermal power generating plants (coal, oil, gas), for example, generally take 3-5 years to develop and then are expected to last 20-30 years. Nuclear power plants can have development lead times of more than a decade and then have expected operating lives of more than 40 years.

Construction and operational impacts are generally mitigated by requirements for environmental assessments, the effectiveness of which is dependent primarily on enforcement mechanisms and highly variable across Asia. Once operating, most power generation plants are optimally designed for use with a particular fuel type, resulting in a certain level of environmental impact. While power generating plants can be retrofitted to reduce environmental impact, this can be costly.

China and India will account for over 50% of the increase in global energy demand during the next two decades

Asian governments are clearly linking energy security with environment-friendly economic development

Like infrastructure, energy plants operate for decades and therefore can lock-in high or low carbon trajectory, depending on the fuel source

Whether analysts adequately consider the shift to a low carbon economy in valuing firms is questionable

In turn, the potential impact of the environment on the energy industry is also relatively large because of the long term, fixed nature of most energy sector investments. While a gradually rising sea level may be of little concern to a designer of software, it is certainly of concern to the owner of a large oil refinery or power plant located at sea level.

Of course, investors in energy projects are accustomed to taking a longer term view in calculating project values. Use of discounted cash-flow analysis (DCF) and internal rate of return (IRR) is standard. The question is whether financial analysts are adequately taking into account the implications of climate change and the shift over time to a low carbon economy in determining their valuations.

The good news is that carbon and climate-change risks associated with the sector can be mitigated if best available technologies and business practices are implemented for a project, starting from the early planning stages and carried through to the engineering design and construction stages. This then sets the stage for reduced operational impact on the environment and lower investment risk of an asset.

Investment Risks & Opportunities for the Asian Energy Sector

Physical Risks

Based on ASRIA's review of company disclosure and studies of the sector, physical climate change risks for the energy industry can be summarized as follows:

More extreme weather adds to the volatility of primary energy supply and demand

- **Rising sea levels** are a threat to the 70 percent of consumers and businesses in Asia that are located on land that is near sea level, the highest regional percentage in the world. These consumers and businesses are the retail customers for Asia's energy companies. Rising sea levels also threaten primary energy and power industry investments located in low-lying areas.
- **More volatile weather patterns** increase the potential for disruptions of primary energy supply and demand, and increase the potential for calamitous physical failures to energy infrastructure. The BP oil spill in the Gulf of Mexico makes abundantly clear the potential for physical failures in the upstream primary energy sector. Extreme weather events may increase the **potential for catastrophic physical** failures that will test the structural limits of upstream oil rigs, refineries, power plants, etc.
- **Higher air and operating temperatures** increase the cooling requirement for production facilities, reduce the efficiency of energy conversion and transmission, increase maintenance, and reduce asset life.
- **The availability of water** for energy and power production and for industrial production is threatened by climate change, due to potential changes in rainfall patterns, less snowfall in higher mountain regions and shrinking glaciers. Water scarcity is a risk for both traditional and renewable energy sources.

Funding for mitigation and adaptation activities in emerging economies is potentially lower

Regulations may induce short term capital expenses but help reduce long-term operational costs

- **Energy industry infrastructure** located in emerging economies is at relatively greater risk of adverse climate change impacts, due to potentially less availability of funding for mitigation and adaptation activities (such as flood prevention measures).

Regulatory Risks

- **Carbon taxes or carbon trading** schemes could raise the costs of carbon intensive energy projects.
- **Mandatory retrofit schemes** to reduce the GHG emissions from energy facilities may incur additional capital expenses in the short term, but should reduce operational costs in the long term.
- **Mobile air measuring devices** - increasing availability of inexpensive, easy-to-use devices during the next five years are likely to increase pressure on policy makers to tighten up regulation of GHG emissions from specific hot spot locations.
- **Government concessions and franchises** - Energy companies are heavily dependent on governments for their upstream primary energy exploration, development concessions, and their downstream utilities franchises. A shift in government policies toward favoring low carbon primary energy sources could greatly increase the cost of access to high carbon primary energy sources such as oil and coal.
- In advanced market economies, there is relatively higher risk of **low carbon regulatory changes**. Asia's energy companies who source primary energy from advanced market economies or sell primary energy and power to advanced economies are at relatively greater risk of adverse regulatory changes.

Competitive Risks

- A growing desire by national governments, municipalities, businesses and consumers to lower their carbon emissions in the face of climate change could lead to an accelerating shift toward preference for lower intensity energy sources.
- Energy companies that are not prepared to provide energy and electric power derived from low carbon primary energy sources could lose competitive advantage as consumer preferences shift in **favor of low carbon sources**.
- **Low carbon standards** for energy projects may raise the cost of construction, but lower the cost of operation.
- **Renewable energy assets** are attractive investment opportunities for the portfolios of sustainable and responsible investors and thereby create an important competitive valuation advantage.

Renewable energy assets are attractive investments for SRI portfolios

Low carbon primary energy sources are significant investment opportunities

Reputational Risk

- Sentiment in Asia in favour of “greener” sources of energy is rising, with potentially negative implications for the reputation of energy companies that remain high carbon.
- Energy companies that fail to develop a positive “green” reputation may find it more difficult to obtain speedy approval for projects – energy projects generally go through a lengthy public review process due to their large size and environmental impact.
- Energy companies often benefit from government granted franchises at the expense of retail price controls. Companies not seen to be environmentally friendly could find it difficult to obtain consumer and government buy-in for cost pass-throughs.
- Energy company business models often rely on barriers to entry and incentives for rising demand. Companies that are not seen to be developing demand management policies to limit carbon emissions and not providing access for renewable energy sources to grids they manage could find reduced government and consumer support for continuing their transmission and distribution monopolies.

To maintain a strong reputation, it is in the interest of energy companies to provide clear messages to investors and other stakeholders about their medium and long term strategies to manage the challenge of climate change, and the options being pursued to reduce demand for high-carbon energy, and diversify into cleaner energy sources. Companies that show foresight in communicating regarding these issues will be in a better position to manage their reputational risk and attract a valuation premium from investors.

Investment Opportunities

Opportunities within the energy sector result primarily from the potential to invest in relatively low carbon primary energy sources and electric power generation, and in smart grids. The investment attractiveness of renewable energy sources such as wind, solar and biomass is improving over time as government policies increasingly favour these sectors and as economies of scale are achieved.

Energy companies leading the shift to low carbon are particularly well placed to evaluate and profit from these new investment opportunities. There is also the potential for the energy companies and their investors to invest into the renewable energy equipment manufacturers, and into climate change mitigation and adaptation measures including carbon and methane capture, resulting in competitive and reputational benefits:

- **Incentive programs** for retrofits of existing energy facilities to decrease GHG emissions have been implemented in several jurisdictions including Hong Kong, and

To realize the opportunities in methane capture from coal mining requires forward thinking policy makers

are likely to become more common in Asia as governments increasingly develop tougher carbon emission targets.

- **Reduce operational carbon impact** through energy project design. Increasingly, attention is being paid to the potential for GHG emissions capture both during coal mining and during coal burning.
- **Methane capture from coal mining** - potential to capture this GHG for use as a primary energy source. A U.S. company announced in mid-June 2010 plans to develop a coal methane capture project under a U.S. Department of Energy grant.
- Share valuations of companies offering renewable energy alternatives and energy efficient solutions could benefit from **increasing government price support and rising consumer interest**.
- **Share valuations of renewable energy sources** could rise abruptly at times, due to sudden jumps in market concerns about the negative impacts of climate change.

Energy Sector Summary

Asia will play a key role in the world's rising primary energy demand during the next 20 years, led in large part by China and India. Asia's strongly rising energy demand will create investment opportunities in both high and low carbon energy, but demand for low carbon energy and the related investment opportunities is expected to increase much faster than for high carbon energy sources. Meanwhile, the risks of investing into high-carbon energy are likely to increase due to climate concerns and the growing preference for low carbon energy.

The energy sector is unusually vulnerable to the physical risks of a changing climate including more extreme weather events – energy projects are long lasting, capital intensive and often located in low lying areas near water. In addition the energy sector is particularly prone to government intervention due to the strategic nature of the industry, putting investors in high-carbon energy at risk from shifts in policy toward favouring a low carbon economy.

Asia's larger listed energy companies remain carbon intensive and vary greatly in how quickly they are diversifying away from carbon. There are market leaders like Hong Kong power company CLP Holdings that are setting clear targets for shifting to low-carbon energy sources, while there are other energy companies that show no signs of diversifying. Traditional business models in the energy industry have relied on government policies that favored high carbon primary energy sources and on governments and consumers more concerned about increasing energy production than protecting the environment.

As climate change becomes more evident, and as governments and consumers tilt towards favoring low-carbon energy, investors will need increasingly to take into account climate change and a low carbon economy in determining valuations.

Asian financial institutions have the potential to leapfrog their global peers

The Finance Sector

There are significant opportunities for the Asian finance sector to direct investment towards sustainability goals and the shift to a low carbon economy, and to provide insurance against extreme weather events. Asian financial institutions have the potential to leapfrog their global peers, to adopt and adapt global best practice and take a leading role in responding to this challenge, thereby driving forward the transition towards a low carbon economy.

Sector Definition and Description

The following industries were included as part of our review of the finance sector: *Banks, Insurance, Financial Services, and Equity Investment Instruments.*

Many regions in Asia are still relatively unbanked⁷⁴ and it is likely that new players will enter the market. Innovative high quality and affordable financial products related to climate change and the shift to a low carbon economy combined with effective financial education and support could both increase business opportunities for financial institutions and benefit lower income consumers.

Awareness of climate change related risks and opportunities is growing among Asian financial institutions, however they have been slow to respond in a systematic way to the challenges presented by climate change, to recognise the potential risks in their portfolios, or to recognise the key role they as institutions can play in directing capital to support the wider response to climate change. There are bright spots, such as the Indian Banks Association's partnership with The Climate Group and ASrIA member PricewaterhouseCoopers to outline good practice in the industry and recommend steps towards a low carbon economy.⁷⁵

Key Sector Issues

Carbon intensive clients could default on loans due to unexpectedly high carbon costs, requiring banks to change their credit risk models

The finance sector itself is not very carbon intensive, with low direct and indirect emissions arising from heating/cooling and energy usage of buildings. Downstream carbon intensity refers to carbon risk embedded within a firm's investment portfolio or fund. For a bank, unexpected high carbon costs which strain working capital could cause carbon intensive clients to default on loans. Therefore, banks need to change their credit risk models to account for such potential risks. It is notable that the credit business and insurance carriers have the highest downstream emissions in the finance sector.

Another issue is the lack of disclosure on climate risks in the prospectus and other listing documents of companies going public. While securities underwriters face competitive pressures such as speed to market, due diligence for the initial public offering needs to include a sound understanding and disclosure of the material environmental risks to investors. Disclosure is particularly important for coal producers issuing equity, as

Coal India Ltd's IPO disclosure on climate risks left wanting

A poor example of IPO disclosure is the case of Coal India Ltd (CIL), the world's largest coal producer and a state owned company. Although three IPO rating agencies (CARE Research, ICRA and CRISIL) briefly mention expected delays in obtaining forestry clearances, they nor CIL in its prospectus note climate change, per se, as a risk to investors. This poor disclosure is worrying as it indicates a disconnect between the rhetoric of the Indian government on the importance of managing climate change risks and that of a government controlled company. To be fair, CIL's prospectus does recognise regulatory risk: "Coal with lower sulphur content is considered to be of a higher quality as electricity generators worldwide have increasingly become subject to various regulatory restrictions intended to reduce sulphur dioxide emissions ... and as of June 2010, 53 of [its] projects including one coal beneficiation plant have been accredited with ISO:14001 certification."

Source: Coal India Ltd.⁷⁶ and ASrIA Research

Climatic physical risks are expected to have a disproportionately large impact on low income groups in Asia and micro-finance can help alleviate the impacts

coal-fired plants face regulatory and social pressure to curb their contribution to GHG emissions and air pollution.

The finance sector in Asia predicts an increasing credit risk and compliance cost for energy intensive sectors, especially once governments roll out climate change policies and tighten the regulatory agenda. However, governments also have an important role to deploy public finance mechanisms (PFMs), which enable greater climate change investment activities for the private sector. This includes government credit loan guarantees for project finance and R&D grants for early-stage technology development.

Investment Risks and Opportunities for the Asian Finance Sector

Physical Risk

Climatic physical risks may result in direct impacts such as increased flooding, disruption to supply chains, and the availability and cost of water. There are a range of adaptation and mitigation costs to society, with poorer groups less able to afford them.

Microfinance and energy efficiency projects could help reduce the negative impacts of climate change for lower income groups. Banks are uniquely positioned to encourage energy saving practices among their clients via loans and investments in clean energy to improve customer health and income.

Regulatory Risk

Efforts by governments at the international and national levels to regulate climate change issues will directly impact the finance sector, particularly when investing in energy intensive companies with high emissions. The challenge remains for the sector

ESG integration into investment analysis is clearly feasible and is arguably required in all jurisdictions to prevent litigation

to manage associated risks. The severity of regulatory risk depends on when regulations will be announced, how market risk and credit risk reacts to any new regulations, and how effective regulations will be to manage associated costs.

Litigation Risk

As early as 2005, international law firm Freshfields Bruckhaus Deringer, concluded in a report that: "...integrating ESG considerations into an investment analysis so as to more reliably predict financial performance is clearly permissible and is arguably required in all jurisdictions."⁷⁷

Quayle Watchman Consulting brings ESG integration to the point of contract by advising that "it is necessary for investment management agreements or the equivalent contract between pension funds and asset managers to use ESG language in order to clarify the expectations of the parties to the contract. In particular, it is important that it is made absolutely clear to beneficiaries, pension fund trustees and asset managers that ESG is regarded as a mainstream investment consideration."⁷⁸

Reputational Risk

Banks which are unwilling or unable to integrate climate change considerations into operational and investment decisions may be viewed negatively by customers and investors. Without sufficient funding and support for climate-related investment, banks would be unable to thrive because weak internal governance hampers the management of external public issues and reputational risk.

Opportunities

The demand for infrastructure in Asia continues to be strong and the finance sector will ultimately be responsible for directing capital towards climate-friendly solutions in this area. Due to demographic drivers, such as population growth and urbanization, Asia/Oceania cumulative infrastructure spending from 2005-2030 is estimated to be US\$15.8 trillion.

The drive towards a low carbon economy is an opportunity to transform traditional asset classes such as energy efficient property portfolios. Growing capacity and scale supports early adopters in this emerging area, with pension funds leading in investment. Insurers are also launching new products and services for energy providers, micro-insurance for agriculture and similar ventures.

China, India, Japan, and South Korea have all announced new and amended **feed-in tariffs**. This **makes lending to renewable energy projects more attractive**. This is the most popular form of government subsidy for both wind and solar. The utility (at government's direction) guarantees that it will buy all of the electricity produced by a renewable source at either a fixed rate or at a fixed premium as compared to average wholesale prices. This system assures steady returns for investors.

Weak climate change governance may hamper the management of external public issues and reputational risk

Adequate infrastructure finance, including debt instruments, is critical for developing a low carbon economy

Access to climate investment research will provide a competitive advantage

The development of **carbon markets presents an important opportunity** for the financial sector. The EU scheme is the most important government-supported carbon market so far. If markets were established in all the top-20 emitting countries, including China and India, overall market size would grow substantially. Such a large and growing market requires intermediaries, presenting opportunities for many business and professional sectors, especially for financial centres such as Hong Kong, Shanghai, Singapore and Mumbai.

Due to the relatively small but growing Asian debt capital markets, preferential lending will play a key role in fostering a low carbon economy

Research analysts in financial institutions have become a significant part of the climate research profession. Clients are demanding industry-wide research to prevent loss or to manage unavoidable impact. Financial institutions that provide information and education may be able to develop better market positions and brand awareness with the public.

Climate-related funds as a financial service have created significant public awareness about climate change and continue to shape sustainability opportunities in the energy sector. This trend is likely to continue to increase due to the high public profile of climate change issues. There is increasing evidence that asset management that focuses on climate change or on a low carbon portfolio outperforms a benchmark portfolio. Reasons include risk mitigation and capturing new opportunities.

The Asian financial sector is in a position to engage in financing of projects that require either governments providing green loans/credit or banks taking responsibility to improve environmental outcomes. Banks are increasingly providing new lending products, such as a clean car credit and homeowner solar-electric system special financing.

Finance Sector Summary

In summary, the finance sector harbours considerable leverage to develop a low carbon economy. There must be substantial investment across a range of debt and equity products to tackle the challenge and move towards monetizing the environmental benefits of lower GHG emissions.

Investor Questions for Companies

Very large institutional investors often cannot easily sell securities in their portfolio because of liquidity concerns. They are therefore thinking beyond portfolio construction and towards active ownership. Constructive dialogue with companies and voting are two features of active ownership.⁷⁹ This section helps investors become more effective active owners by highlighting questions for corporate engagement.

Carbon Disclosure Project in Asia – investors already engaging companies

Investors already ask companies in Asia about their carbon strategies and performance and companies have been responding. Through the Carbon Disclosure Project (CDP) process, some 3,000 organizations from around the world measure and disclose their greenhouse gas emissions and climate change strategies. In September 2010, on behalf of 534 investors with US\$64 trillion under management, ASrIA launched the CDP 2010 ex-Japan report. Over 600 companies in Asia were asked a range of climate-related questions for the 2010 sample. Nearly 200 companies across the region responded. Select questions from the CDP 2010 CDP questionnaire follow.⁸⁰

Governance

- Where is the highest level of responsibility for climate change within your company?
- What is the mechanism by which the board committee or other executive body reviews the company's progress and status regarding climate change?
- Do you provide incentives for the management of climate change issues, including the attainment of greenhouse gas (GHG) targets?

Risk & Opportunity

- Describe your company's process for identifying significant risks and/or opportunities from climate change and assessing the degree to which they could affect your business, including the financial implications.
- Describe the ways in which the identified opportunities affect or could affect your business and your value chain.
- What are the current and/or anticipated significant regulatory risks related to climate change and the associated countries/regions and timescales?

Strategy

- Please describe how your overall group business strategy links with actions taken regarding risks and opportunities, including any emissions reduction targets or achievements, public policy engagement and external communications.

Communications

- Have you published information about your company's response to climate change/GHG emissions in other places than in your CDP response? How so?

Investor Questions by Investment Horizon and Content

Short-, medium- and long-term investors have influence over how their investments will be affected by climate change

A common misperception is that the implications of climate change for investment in Asia is a long term issue best addressed by investors with a long term view. This perspective too easily removes the responsibility and influence of short and medium term investors. Asian companies which take the CDP process seriously are finding and improving operating inefficiencies. The energy efficiency gains improve a company's bottom line performance, regardless of whether managers invoke "climate change" as a rallying cry. The fact that the FTSE EO Energy Efficiency Index is the top performer in the FTSE EO Index Series over the last five years is evidence that markets are valuing the operational improvements.⁸¹ Table 9 offers suggested questions which are relevant for any investment horizon.

Table 9: Questions for Investment Professionals about Climate Change

	Organizational	Strategy	Financials
Long-term horizon	Describe your firm's climate governance, that is, how is your board and executive committee organised for a low carbon economy?	How has your strategic thinking and planning evolved around climate change? How are your competitors thinking about climate change? How would you describe your investor relations strategy around climate change?	How will different carbon pricing scenarios impact your EBITDA over the next five years? How often are your financial analysts informing company executives about the financial impact of specific climate policy initiatives?
Medium-term horizon	How would you describe managers' incentive structures in relation to climate change? Will the structure be adjusted in the next 12-18 months to incorporate climate risks and opportunities?	Will any new climate-related corporate strategies be announced? Do managers see any hidden competitive advantages of focusing on climate-related risks and opportunities?	How likely is it that plant operations will need to be suspended or shut down due to weather events? How does this risk impact your capital efficiency targets?
Short-term horizon	During discussions over a potential M&A, have target managers disclosed material climate risk and opportunities?	Is there a new product launch relating to climate change in the next quarter? Is the release behind, on, or ahead of schedule?	How likely is it that plant operations will need to be suspended or shut down due to weather events? How is this forecast determined?
Passive Investors	What is the cost of climate or carbon-related index construction and maintenance? Do tracking error limits or index-referenced mandates affect climate and carbon strategies?		

Investment professionals primarily focused on organizational structure, strategy or financial measures will benefit from climate change dialogue

Source: ASrIA Research⁸²

Select Investor Questions by Sector

Below is a brief selection of investor questions specific for each of the sectors reviewed in this project.

IT and Mobile Communications Sector

1. Are you setting targets to reduce the carbon footprint of your own operations?
2. What steps are you taking to measure and reduce your supply chain carbon footprint?
3. Have you prioritized the development of products and services that will help other sectors of the economy become more energy efficient to enable carbon footprint reductions? If so, how?

Transport Sector

1. Are the major airplane purchasers and manufacturers requesting information and disclosure by supply chain companies about greenhouse gas emissions?
2. Have you been working with other stakeholders (property developers, government officials, environmental groups) about the system-wide interaction and impact of climate change among (a) transportation infrastructure and systems, (b) property development, and (c) vehicle usage?
3. How is the trend towards society's electrification (growth in investment in electric passenger vehicles, for instance) influencing demand for electric locomotives? Are there any plans to develop this market?

4. Has "Just-in Time" inventory management given way to a new business strategy of "Go slow" shipping? How could your firm potentially combine these two strategies of supply chain management?

5. Is your brand value at risk from climate change? If so, how is it impacted and how can you effectively communicate that issue to your management? As an automotive manufacturing company, what is your strategy to get ahead of your competition in producing low carbon vehicles?

Property and Construction Sector

1. Have you estimated the annual GHG emissions of your property assets?
2. Does management have a specific strategy for dealing with potential physical climate change risks, such as flooding, severe storms, drought or similar risks?
3. What steps have been taken to integrate physical climate change risks into new construction projects? Is there anything that you are doing differently in light of potential climate change threats?
4. Has your company made any effort to identify and source low carbon materials?

Agribusiness Sector

1. How does your firm map the location of your animal and food production sites with climatic models to assess your exposure to potential effects of climate change including rising sea levels? (Encroaching water could increase the salinity of the water resources that the firm uses in agricultural production.)
2. How would you describe your management system to measure, monitor and report on the food-miles generated by your products and services? If there is no current system, are there any plans to initiate a pilot programme?
3. How is your firm thinking about carbon foot printing and labelling? Is this viewed as a passing fad or is this a strategic opportunity for the firm?
4. Describe two material GHG emission issues that directly impact long-term shareholder value, in terms of either the impact on corporate taxes, cash flow growth, return on invested capital, or cost of capital.

Energy Sector

1. In measuring the carbon intensity of your activities, do you consider the entire energy supply chain?

Carbon Content	Energy Use	Energy Lost
• Primary energy used	• Refining • Generation	• Storage • Transmission • Distribution

2. Clean coal – What is the carbon intensity of the coal you use? Are you shifting to clean coal sourcing? Are you pursuing carbon capture and storage (CCS)?
3. Natural gas – Do you have plans to use more natural gas, instead of oil or coal as fuel? Are there factors limiting your ability to do so?

4. Nuclear power – Is this part of your energy mix present or planned? To what extent are risks associated with operation and waste management covered by insurance? If a new plant is planned, what impact assessments have been made around vulnerability of sites to climate risks, the risks of cost overruns in construction, equipment and fuel source suppliers?
5. What are the opportunities that you are exploring in renewable energy alternatives?

Finance Sector

1. Are you including green banking concepts into your strategy, such as green credit, clean tech funds, or similar products?
2. What is your level of lending or investing exposure to regulatory risk, physical risk, reputational risk, and other risks related to climate change and the shift to a low carbon economy? What is your approach to manage these risks?
3. Are you using insurance to protect against these climate and carbon-related risks in your lending or investment portfolio? What is your level of confidence that your insurance cover is sufficient in the case of extreme weather events?

Conclusion

Climate change is recognized in Asia

The implications of climate change and the move towards a low carbon economy are only beginning to be understood by the investment community. We have found that substantive action to reduce carbon intensity is still in its early days in many industries, implemented only by a small number of large market cap companies. However, climate change is recognized in Asia, whereas ten years ago it was not. Awareness and expertise is bound to continue to grow.

Investors face a variety of risks related to climate change. The complexity of these risks and emerging opportunities has large implications on investment decisions and require careful consideration.

Potential for Asia's low carbon growth is strong

The potential for low carbon growth remains very strong in the region, especially in the real estate and construction sector (through green building standards), the transport sector (through electrification of private and public vehicles), and the IT and mobile communications sector (through intelligent network solutions to increase efficiency). On the other hand, the energy sector continues to be heavily dependent on carbon fuels with little sign of a significant reduction in carbon intensity in the short term (unless carbon capture and storage becomes a viable technology solution) due to strong growing primary energy demand in Asia. The finance sector recognizes the responsibility to support low carbon investment opportunities and in some cases has succeeded in doing so, however the sector relies heavily on carbon disclosure to be able to do so effectively (which in some cases may be elusive). The carbon intensity of the agribusiness sector is difficult to assess, but there is potential to reduce the sector's GHG emissions through capture of biogas emissions, turning waste into energy.

The regulatory environment in Asia is changing, with policy action pointing towards support of low carbon growth. National responses are disjointed and uncoordinated, but local/national jurisdictions have set their own targets given the absence of a global agreement. Several jurisdictions have taken a leading position with a clear intent to capitalize on low carbon growth through advanced technologies and savings through efficiency.

Dynamic regulatory environment means there is a patchwork of targets and plans, requiring increased investor attention

South Korea in particular is attempting to differentiate its economy through this strategy, followed closely by Taiwan and Japan. Singapore and Hong Kong could take a leadership role through their high levels of trade and professional services with neighbouring larger economies and their position as key regional financial centres.

China on the other hand has a very divergent set of achievements ranging from heavily-polluting factories to clean and green eco-cities. In the long term, the transition towards a low carbon economy is a necessity for China, in particular from the social and environmental angles as well as from the economic and global energy security perspective. China's recent regulatory actions and commitments reflect this trend. India has also made some attempts to transform its economy. For instance, the financial community in India partnered with The Climate Group and ASrIA member PricewaterhouseCoopers to outline good practice in India's financial services industry and recommend steps towards a low carbon economy.⁸³ However, the overall effort remains fragmented but open to further growth.

Next Steps

Build the Asia Investor Group on Climate Change to accelerate low carbon growth in the region

Following the publication of this summary report highlighting some of the low carbon risks and opportunities for six key sectors in Asia, ASrIA intends to continue working with asset owners and investment managers to integrate climate analysis into investment decisions. We propose to kick start the Asia Investor Group on Climate Change (AIGCC) to accelerate low carbon growth in the region. The proposal for AIGCC are described in the accompanying LCIA report *Integrating Climate Change Criteria into Investment Decisions*.

Endnotes

¹ The project resource portal is available here: <http://portal.asria.org/LCIA/res.html>

² Bloomberg New Energy Finance (11 January 2011). "Low-Carbon Energy Investment Hit a Record \$243 Billion in 2010, BNEF Says": <http://www.bloomberg.com/news/2011-01-11/low-carbon-energy-investment-hit-a-record-243-billion-in-2010-bnef-says.html>

³ The Intergovernmental Panel on Climate Change (IPCC) is the scientific authority on the study of global climate change. The panel's Fourth Assessment Report is available here <http://www.ipcc.ch/ipccreports/ar4-wg1.htm>. For more on the scientific consensus about climate change, see Proceedings of the National Academy of Sciences of the United States of America (9 April 2010). "Expert credibility in climate change": <http://www.pnas.org/content/early/2010/06/04/1003187107.full.pdf+html>

⁴ HSBC Global Research and HSBC Climate Change (December 2009). "Too close for comfort: The HSBC Climate Vulnerability Assessment – mapping risk for the G-20 in 2020". Available at <http://www.incr.com/Document.Doc?id=531>

⁵ See Smart 2020 Report available at http://www.smart2020.org/_assets/files/01_Smart2020ReportSummary.pdf

⁶ Select ASRIA members focusing on ESG investor research are CAER, Eco Frontier Co., EIRIS, Good Bankers Co., OWW Consulting, Responsible Research. Bloomberg, FTSE and MSCI provide ESG data services. Further details on these and other ASRIA members are available here http://www.asria.org/member/list_category

⁷ For instance, in an initiative led by New York Attorney General Eliot Spitzer, eight states and New York City have filed an unprecedented lawsuit against five of America's largest power companies, demanding that they cut carbon dioxide emissions because of global warming. The companies named in the suit are American Electric Power Co., Southern Co., Xcel Energy, Cinergy and the federal Tennessee Valley Authority.

⁸ Climate Law Blog (November 2010). "Carbon Offshoring: India, China Buying U.S. Coal Mines, Shale Gas Fields, LNG Terminals": <http://blogs.law.columbia.edu/climatechange/2010/11/18/carbon-offshoring-indian-and-china-are-buying-u-s-coal-mines-shale-gas-fields-lng-terminals/>

⁹ The interplay between water and GHG emissions, for example, is an investment consideration. For example, desalination plants may help solve, on the one hand, water scarcity issues. On the other, these plants are huge consumers of electricity which is often sourced from coal-fired power plants, driving up GHG emissions. An interesting project which seemingly addresses the issue is the Sydney Desalination Plant. Built by the Blue Water Joint Venture (Veolia Water Australia and John Holland), the plant completely satisfies its energy needs from the Capital Wind Farm in New South Wales.

¹⁰ See, for example, Deloitte (2010). "New challenges in carbon accounting: an overview": http://www.deloitte.com/assets/Dcom-China/Local%20Assets/Documents/Firmwide/Boao/cn_boao_NewChallengesinCOAc_280410.pdf. Standardization is also a key obstacle. The Climate Disclosure Standards Board (CDSB) works to develop a globally accepted framework, based on existing standards, for corporate reporting on climate change. See <http://www.cdsb-global.org/>

¹¹ For details on the Carbon Disclosure Project see www.cdproject.net. The Asian gateway for carbon disclosure is available on ASRIA's website at www.asria.org/gateway/carbon_disclosure

¹² See www.CorporateRegister.com for more information

¹³ Association for Sustainable & Responsible Investment in Asia (ASRIA) (2010). "CDP 2010 Asia ex-Japan Report": <http://www.asria.org/publications>

¹⁴ Bloomberg grades companies on their Environmental, Social and Governance (ESG) data disclosure. As a news information provider, Bloomberg collects 101 different datapoints related to ESG. For each company, Bloomberg then develops a score that ranges from 0 for companies that do not disclose ESG data to 100 for those that disclose every datapoint collected by Bloomberg. For additional information on the methodology visit www.bloomberg.com

¹⁵ Bloomberg, LP provided the data for this report. Bloomberg's Environmental, Social and Governance (ESG) Data Service provides multi-year, as-reported data on over 3,600 companies worldwide as well as supporting news, research, and analytics. Bloomberg is expanding its ESG coverage in Asia in 2010. To encourage ESG disclosure in the region, the Bloomberg Sustainability Survey will go out to a large number of companies in the market.

¹⁶ We do not profile all the investment vehicles available. For instance, the number of environmental markets exchange traded funds (ETFs) in this space has grown.

¹⁷ FTSE Group (23 June 2010). "FTSE Group, Carbon Disclosure Project (CDP) and ENDS Carbon Collaborate to Launch New Carbon Strategy Indices for the Global Investment Community": <http://www.asria.org/news/press/1277443349>

¹⁸ For further details on the HSBC Global Climate Change Index download <http://www.research.hsbc.com/ibcom/ui/save/public/indices/factSheet/I3k9tfsgweok.PDF>

¹⁹ California Public Employees' Retirement System (10 November 2010). "CalPERS Deploys \$500 Million to New Environmental Investment Strategy": <http://www.calpers.ca.gov/index.jsp?bc=/about/press/pr-2010/nov/calpers-deploys.xml>

²⁰ MSCI (August 2010). "MSCI Global Climate Index": http://www.msribarra.com/products/indices/thematic_and_strategy/esg_indices/MSCI_Global_Climate_Index_Methodology_Aug10.pdf

- ²¹ S&P/IFCI Carbon Efficient Index: [http://www.ifc.org/ifcext/sustainability.nsf/AttachmentsByTitle/p_CarbonEfficientIndex/\\$FILE/Whitepaper_IFCI_Carbon_Efficient.pdf](http://www.ifc.org/ifcext/sustainability.nsf/AttachmentsByTitle/p_CarbonEfficientIndex/$FILE/Whitepaper_IFCI_Carbon_Efficient.pdf)
- ²² Of the 21 emerging markets, eight are in Asia: China, India, Indonesia, Korea, Malaysia, Philippines, Taiwan, and Thailand.
- ²³ Further details on the fund are available here <http://www.adb.org/Climate-Change/asia-pacific-carbon.asp>
- ²⁴ Further details on the fund are available here <http://www.adb.org/Clean-Energy/CEFPF.asp>
- ²⁵ Further details on the fund are available here <http://www.climateinvestmentfunds.org/cif/>
- ²⁶ Further details on the fund are available here <http://www.adb.org/Climate-Change/future-carbon.asp>
- ²⁷ Further details on the fund are available here <http://www.adb.org/Climate-Change/SCAF.asp>
- ²⁸ Further details on the fund are available here <http://www.ifc.org/ifcext/media.nsf/content/SelectedPressRelease?OpenDocument&UNID=1991E8717A1A273A8525770600605493>
- ²⁹ Further details on the fund are available here <http://www.climateadvocacyfund.com.au/>
- ³⁰ Carbon Trust (12 March 2010). "UK's most ambitious low carbon commercial property initiative launched with £350M fund": <http://www.carbontrust.co.uk/news/news/press-centre2010/2010/Pages/uks-ambitious-low-carbon-commercial-property.aspx>
- ³¹ Further details on the fund are available here http://www.sam-group.com/downloads/products/fund_prospectuses/FactSheet_SmartEnergyFund_e.pdf
- ³² Further details on the fund are available here <http://www.fandc.com/new/advisor/Default.aspx?id=79747>
- ³³ HSBC Jintrust (Chinese): <http://www.hsbcjt.cn/column.hsweb?mode=searchtopic&channelid=6&categoryid=2061&childcategoryid=2062>. News report (English): http://www.etnet.com.hk/www/tc/news/categorized_news_detail_eng.php?category=research&newsid=ETE200505156
- ³⁴ Further details on the fund are available at the ASrIA SRI Funds Portal: http://portal.asria.org/sri_fund/detail.php?name=HSBC%20Global%20Investment%20Funds%20-%20Climate%20Change&manager=HSBC%20Investment%20Funds%20Luxembourg%20S.A
- ³⁵ Further details on the fund are available at the ASrIA SRI Funds Portal: http://portal.asria.org/sri_fund/detail.php?name=Vontobel%20Fund%20-%20Global%20Trend%20New%20Power&manager=Vontobel%20Asset%20Management
- ³⁶ Further details on the fund are available here: <http://www.firststate.co.uk/uploadedFiles/CFSGAM/PdfFundFactsheets/APSU.pdf>
- ³⁷ Further details on the fund are available at the ASrIA SRI Funds Portal: http://portal.asria.org/sri_fund/
- ³⁸ Taken from The Markit Magazine (Spring 2010). "Looking for the next wave": <http://www.markit.com/en/about/magazine/issue-7/mm07-focus-4-copenhagen.page>
- ³⁹ The primary aim of the study was to provide a scientific basis for government to develop formal policies to help move the administrative region towards a low carbon economy prior to the year 2020.
- ⁴⁰ Environmental Protection Department of the Hong Kong SAR Government (2010). "Public Consultation on Hong Kong's Climate Change Strategy and Action Agenda": http://www.epd.gov.hk/epd/english/climate_change/consult.html
- ⁴¹ Taken from The Markit Magazine (Spring 2010). "Looking for the next wave": <http://www.markit.com/en/about/magazine/issue-7/mm07-focus-4-copenhagen.page>
- ⁴² Figures extrapolated from GESI Smart 2020 Report <http://www.gesi.org/LinkClick.aspx?fileticket=7X8GQ7HNR%2bg%3d&tabid=71>
- ⁴³ McKinsey & Company (2009). "Pathways to a Low Carbon Economy: Version 2 of the Global Greenhouse Gas Abatement Cost Curve". Available at <http://www.worldwildlife.org/climate/WWFBinaryitem11334.pdf>
- ⁴⁴ CLSA Asia-Pacific Markets (20 August 2010). "Sustainable airlines – Thrifty flyers".
- ⁴⁵ The Global Institute for Tomorrow (GIFT) highlights some of the issues associated with bio-fuels in this press release from April 2010 available here: http://www.globalinstitutefortomorrow.com/article/ideas_for_tomorrow/hong_kong_stock_exchanges_integrity_gap_on_climate_change_discussion/#comments
- ⁴⁶ Rather than only focusing on GHG emissions from vehicles, the International Organization of Motor Vehicle Manufacturers argues for an integrated approach. International Organization of Motor Vehicle Manufacturers, "Climate change & CO₂": <http://oica.net/category/climate-change-and-co2/>
- ⁴⁷ Association of Asia Pacific Airlines (AAPA), "Climate Change and Transportation: Sustainable Aviation" Presentation at the Environmental Asia Conference 2010 Kuala Lumpur, Malaysia, 30-31 March 2010: http://www.aapairlines.org/resource_centre/AAPA_SP_Herdman_AviationEnvironment_KL_30Mar2010.pdf
- ⁴⁸ IATA, "Carbon-Neutral Growth by 2020," 8 June 2009: <http://www.iata.org/pressroom/pr/Pages/2009-06-08-03.aspx>

- ⁴⁹ For the maritime industry we focus on the liner shipping trade because, according to IHS Global Insight's industry valuation study, it is the primary conduit of world trade (Download at: http://www.worldshipping.org/pdf/Liner_Industry_Valuation_Study.pdf). Also, according to the World Shipping Council, container ships and roll-on/roll-off ships carry 60% of the goods by value moved internationally by sea.
- ⁵⁰ A goal of US\$500 billion in trade between the two sides by 2015, up from over US\$200 billion has been reported.
- ⁵¹ ASEAN Secretariat (29 October 2010). "ASEAN-China Leaders' Joint Statement on Sustainable Development": <http://www.aseansec.org/25545.htm>
- ⁵² Carbon Trust, "Brand value at risk from climate change," February 2005: http://www.oliverwyman.com/ow/pdf_files/Brand_Value_at_risk.pdf
- ⁵³ Additional resource: "Questions and Answers for Investors on Climate Risk". Guide prepared for the INCR (Investor Network on Climate Risk) by CERES and the World Resources Institute, December 2004. http://www.iigcc.org/docs/PDF/A_climate_for_change.pdf
- ⁵⁴ GTZ (2007). "Transport and Climate Change. Module 5e, Sustainable Transport: A Sourcebook for Policy-makers in Developing Cities": <http://siteresources.worldbank.org/EXTAFRSUBSAHTRA/Resources/gtz-transport-and-climate-change-2007.pdf>
- ⁵⁵ Asian Development Bank Institute (May 2010). "Infrastructure for a Seamless Asia: Presentation by Masahiro Kawai, Dean and CEO, Asian Development Bank Institute. ADBI/ADB/AFDC Flagship Study Book Dissemination Seminar": <http://www.adbi.org/files/2010.05.27.cpp.kawai.highlights.infrastructure.book.pdf>
- ⁵⁶ The concept of vertical farming is described in a December 9, 2010 article published in The Economist Technology Quarterly, available at http://www.economist.com/node/1764762?story_id=1764762&CFID=158122762&CFTOKEN=67298385
- ⁵⁷ See the Singapore Building and Construction Authority (BCA) for more information: www.bca.gov.sg/GreenMark/green_mark_buildings.html
- ⁵⁸ First State Investments, "First State Global Agribusiness Fund-Briefing Document," April 2010: <http://at.e-fundresearch.com/tmp/First%2BState%2BGlobal%2BAgribusiness%2BFund%2Bbriefing%2Bdocument.pdf>
- ⁵⁹ Deutsche Asset Management. DWS Global Agribusiness Fund: http://www.dollardex.com/sg/investUT/pfiles/DWS%20Global%20Agribusiness_Brochure.pdf
- ⁶⁰ Pacific Economic Cooperation Council, "Pacific Food System Outlook 2003-04: Where Demographics Will Take the Food System," 2003: http://www.pecc.org/resources/doc_view/637-pacific-food-system-outlook-climate-change-and-the-food-system
- ⁶¹ Agro-Ecological Investment Management (October 2009). "Climate Change and Investment in Ecological Agriculture: Outperformance and Opportunity": <http://www.agro-ecological.com/research-papers/climate-change-and-investment-in-ecological-agriculture.pdf>. See also Agro-Ecological Investment Management (2009): <http://www.agro-ecological.com/archive-files/agro-ecological-brochure-2009.pdf>
- ⁶² Water Science Technology, "Climate change mitigation for agriculture: water quality benefits and costs," 2008: <http://www.mfe.govt.nz/publications/climate/water-quality-benefits-and-costs/water-quality-benefits-and-costs.pdf>
- ⁶³ Pacific Economic Cooperation Council (2008). "Pacific Food System Outlook 2008-2009: Climate Change and the Food System": <http://www.pecc.org/food/papers/PFSO-2008.pdf>
- ⁶⁴ The IFC estimates in Indonesia the sector directly and indirectly employs between four and six million of the economically active rural population and supports up to 36 million rural population. See IFC. "What is the significance of palm oil?": http://www.ifc.org/ifcext/agribusiness.nsf/content/PalmOil?OpenDocument#_Section3
- ⁶⁵ The Economics of Ecosystems and Biodiversity (TEEB) study is a global initiative to highlight the economic benefits of biodiversity, to underscore the growing costs of biodiversity loss and ecosystem degradation, and to draw together expertise from the fields of science, economics and policy to enable practical actions moving forward. For more, visit: <http://www.teebweb.org/>
- ⁶⁶ The Jakarta Post (30 November 2010). "Expecting more from annual RSPO": <http://www.thejakartapost.com/news/2010/11/11/expecting-more-annual-rspo.html>
- ⁶⁷ Rainforest Action Network (11 November 2010). "Failures And Unanswered Questions At The RSPO": <http://understory.ran.org/2010/11/11/failures-and-unanswered-questions-at-the-roundtable-on-sustainable-palm-oil/>
- ⁶⁸ To learn more, visit ASrIA's Forestry Sector Investment Forum, held 17 May 2010 in Hong Kong: <http://www.asria.org/events/hongkong/forest/post>
- ⁶⁹ Carbon Trust, "Brand value at risk from climate change," February 2005: http://www.oliverwyman.com/ow/pdf_files/Brand_Value_at_risk.pdf
- ⁷⁰ See page 125/192 of McKinsey & Company (2009). "Pathways to a Low Carbon Economy: Version 2 of the Global Greenhouse Gas Abatement Cost Curve": <http://www.worldwildlife.org/climate/WWFBinaryitem11334.pdf>

⁷¹ Asian Development Bank (2009). "The Economics of Climate Change in Southeast Asia: A Regional Review": <http://www.adb.org/Documents/Books/Economics-Climate-Change-SEA/PDF/Economics-Climate-Change.pdf>

⁷² Confederation of Indian Industry (January 2008). "Building a Low-Carbon Indian Economy": <http://www.wbcsd.org/DocRoot/Imq1xRVlBlDvNNXcj1BX/buidinglowcarbonindianeconomy.pdf>

⁷³ See the IEA's World Energy Outlook 2009 Fact Sheet, www.worldenergyoutlook.org

⁷⁴ McKinsey Quarterly (March 2010). Counting the World's Unbanked. Available at http://www.mckinseyquarterly.com/Financial_Services/Counting_the_worlds_unbanked_2552

⁷⁵ See The Climate Group (May 2010). "Climate Change and Finance in India: Banking on the low carbon Indian economy": <http://www.theclimategroup.org/our-news/news/2010/5/14/finance-sector-illuminates-the-road-to-low-carbon-development-in-india/>

⁷⁶ Coal India Ltd. (2010). "Draft Red Herring Prospectus": <http://www.sebi.gov.in/dp/coaldhrp.pdf>. The assessments by the three rating providers are at: http://www.nseindia.com/content/ipo/GRADING_COALIND.zip

⁷⁷ Freshfields Bruckhaus Deringer (2005). A Legal Framework for the Integration of Environmental, Social and Governance Issues into Institutional Investment. Produced for the UNEP FI Asset Management Working Group. http://www.unepfi.org/fileadmin/documents/freshfields_legal_resp_20051123.pdf

⁷⁸ Asset Management Working Group of the United Nations Environment Programme Finance Initiative (July 2009). "Fiduciary responsibility: Legal and practical aspects of integrating environmental, social and governance issues into institutional investment": <http://www.unepfi.org/fileadmin/documents/fiduciaryII.pdf>

⁷⁹ In November 2010 the Climate Advocacy Fund (a joint initiative of the Climate Institute and Australian Ethical Investment, an ASrIA member) lodged a complaint with the Australian Securities and Investments Commission, after the boards of Paladin Energy and Aquila Resources refused to put Australia's first climate change resolutions to shareholders. See Sydney Morning Herald (November 2010). "Climate fund tests ASIC's powers on shareholders' rights": <http://www.smh.com.au/business/climate-fund-tests-asics-powers-on-shareholders-rights-20101124-187fj.html>. While diversification is a key driver for broad ownership, a crucial trade-off emerges: balance between diversification ("the more securities, the better") with the ability to have an effective corporate engagement process ("the fewer securities, the better").

⁸⁰ Since 2000 the Carbon Disclosure Project (CDP) has been developing the largest database of primary corporate climate change information in the world. Investors can learn more about the CDP process in Asia by visiting <http://portal.asria.org/CDP/>

⁸¹ The FTSE EO Energy Efficiency Index is up 53% over a five year span (as of 30 September 2010), compared with a 19% gain for the FTSE Global all Cap. See FTSE (3Q 2010). "FTSE Environmental Markets Performance Report": http://www.ftse.com/Indices/FTSE_Environmental_Markets_Index_Series/Downloads/FTSE_Environmental_Markets_Research_Report_Q3_2010.pdf. In 2010 Cemex, the world's third largest cement maker, estimates it will save US\$100 million as it shifts away from fossil fuels. For more, see Reuters (November 2010). "Cemex sees cost savings as it goes green": <http://www.reuters.com/article/idUSTRE6AN6ME20101124>

⁸² While the questions are from ASrIA research, the framework is adapted from Kevin Coyne and Jonathan Witter (2002). Harvard Business Review (September 2002), "Taking the Mystery out of Investor Behavior."

⁸³ See The Climate Group (May 2010). "Climate Change and Finance in India: Banking on the low carbon Indian economy": <http://www.theclimategroup.org/our-news/news/2010/5/14/finance-sector-illuminates-the-road-to-low-carbon-development-in-india/>

Appendix A – Definitions for 'Scope of Emissions'

(as provided by Reputex Analytics 2010)

Scope 1: Direct Carbon Intensity

- This metric refers to the carbon dioxide equivalent emissions of direct emissions of a business activity per million dollar (tCO₂-e/\$million revenue). Direct emissions include: fuel use, energy use, manufacturing process activity, mining activity and on-site waste disposal.

Scope 2: Indirect Carbon Intensity

- This metric refers to the carbon dioxide equivalent emissions associated with electricity purchase or consumption (or steam or heating/cooling) per million dollars revenue (tCO₂-e/\$ million revenue) for a particular business activity.

Scope 3 (Upstream): Supply Chain Carbon Intensity

- This metric refers to the carbon dioxide equivalent emissions per million dollars revenue (tCO₂-e/\$ million revenue) associated with the supply chain (e.g. raw materials, logistics) of the business activity

Scope 3 (Downstream): Use phase Carbon Intensity

- This metric refers to the carbon dioxide equivalent emissions per million dollars revenue (tCO₂-e/\$ million revenue) associated with the use phase of a product (e.g. downstream)

N₂O emissions of fertilizers when applied for agricultural purposes).

Direct Carbon Footprint (Scope 1)

This refers to the total direct carbon footprint of a company (tCO₂-e).

This direct carbon footprint includes:

- **Stationary combustion:** To produce electricity, steam, heat or power using equipment in a fixed location.
- **Mobile combustion:** Fuels used in transportation e.g. cars, trucks, marine, aviation; and emissions from non-road equipment such as equipment used in construction, agriculture and forestry.
- **Physical and chemical processes:** Other than fuel combustion (e.g. the manufacture of cement, aluminum, adipic acid, ammonia etc.

Fugitive sources: Releases for the production, processing, transmission, storage, and use of fuels and other substances that do not pass through a stack, chimney, vent exhaust pipe or other functionally-equivalent opening (such as releases of sulfur hexafluoride from electrical equipment; hydrofluorocarbon releases during the use of refrigeration and air condition equipment; and methane leakage from natural gas transport.

Appendix B – Key Readings on Low Carbon Investments in Asia

Below is a selection of key readings for investment professionals. These provide a solid introduction into the interaction between climate change and investments.

Some 250 references are available in the reference database that ASRIA has compiled over the duration of this project, available at <http://portal.asria.org/LCIA/res.php>

BNP Paribas (25 May 2010). "Thematic Strategy: Climate change, government support, and EM demand drive clean-energy growth."

McKinsey & Company (2009). "Pathways to a Low Carbon Economy: Version 2 of the Global Greenhouse Gas Abatement Cost Curve": <http://www.worldwildlife.org/climate/WWFBinaryitem11334.pdf>

Bank of America Merrill Lynch (18 September 2009). "Climate Change Disclosure and Analysis Becoming Important."

Association for Sustainable and Responsible Investment in Asia (September 2009). "Carbon Disclosure Project 2009-Asia ex Japan Report": <http://www.asria.org/publications>. 2010 edition is expected in September 2010.

BNP Paribas (26 May 2010). "Technology, Media & Telecoms: Competitive climate change."

Association of Asia Pacific Airlines (AAPA), "Climate Change and Transportation: Sustainable Aviation" Presentation at the Environmental Asia Conference 2010 Kuala Lumpur, Malaysia, 30-31 March 2010: http://www.aapairlines.org/resource_centre/AAPA_SP_Herdman_AviationEnvironment_KL_30Mar2010.pdf

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World Business Council for Sustainable Development (November 2008). "Power to Change: A business contribution to a low-carbon electricity future" and "Powering a Low-carbon Economy."

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Ed. Will Oulton and contributors with FTSE Group sponsorship (2009). "Investment Opportunities for a Low Carbon World."

The Economist (27 November 2010). "Global warming: How to live with climate change"

Proceedings of the National Academy of Sciences of the United States of America (9 April 2010). "Expert credibility in climate change": <http://www.pnas.org/content/early/2010/06/04/1003187107.full.pdf+html>



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