



EQUITIES RESEARCH

## SUSTAINABILITY SPOTLIGHT

### THE VOICE FOR CHANGE

#### Executive summary

As the lead sponsor, BNP Paribas participated in the First Global Investor Forum on Climate Change on 13-14 June in Hong Kong, organised by Global Investor Coalition, a consortium of four international climate change investor groups: the Asia Investor Group on Climate Change (AIGCC), the Investor Group on Climate Change (IGCC), the Institutional Investors Group on Climate Change (IIGCC) and the Investor Network on Climate Risk (INCR). The four groups combined represent over USD20t in assets under management globally, comprising leading asset owners, asset managers and various service providers.

Speakers at the conference highlighted the need for comprehensive plans to counter extreme events and increased climatic resilience. They also highlighted our central themes for the sustainability of the rapid pace of urbanisation, coupled with climate change. The increasing risk posed by more frequent natural hazards and the human and economic capital at risk has caused investors to focus on the challenges that urbanization poses for sustainability.

Our conclusions from the event are:

- 1 Across the entire financial value chain, from policymakers in government to corporate business leaders and investors, the sense of urgency about the realities of a changing climate has never been more intense. These realities translate into new challenges for global environmental risk management, and also into political, economic, and social risks to portfolios. These risks are immediate and can no longer be ignored.
- 2 After much discussion over carbon trading, other financial instruments and market-based mechanisms, and their function in the long term sustainability of the environment, their effectiveness and efficiency remain uncertain. While we believe that financial instruments will ultimately have a role, holistic environmental social governance has become a core issue across all investment vehicles and asset classes, and needs to be integrated across all disciplines of investment research and analysis.

Interacting with the entire financial value chain at the forum, we saw the downstream cascading of the principles of responsible investment as well as environmental social governance issues coming to the fore. Asset owners are clearly requiring asset managers do far more than merely conform to environmental social governance principles within their requests for proposals. This phenomenon alone will, in the near term, impact the market as a whole, shrinking the relevant universe for allocation as companies or asset classes might get excluded on SRI parameters.



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20 JUNE 2013

# CONTENTS

Changing risk-reward ratios	3
■ Agreeing to agree	4
Urgent realities of a changing climate	6
Immediate impact on businesses, and their response	9
Impact on technology and response	12
The future for market-based mechanisms	14
■ The carbon trading market	16
■ The European Union Emissions Trading System	17
Technology and economic disparities	21
Multi-metier urgency	23

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## Changing risk-reward ratios

BNP Paribas was a sponsor of the First Global Investor Forum on Climate Change in Hong Kong (13-14 June, 2013) and our equity research team had the opportunity to attend and participate in the forum. For BNP Paribas – as *The bank for a changing world* – the importance of climate change, the most profound challenge in change management facing all humanity, cannot be understated. For BNP Paribas, researching, analysing and reporting on climate change is much more than an expression of our commitment toward the environment and our effort to bring down emissions. It is also an intrinsic responsibility toward the sustainability of our species and society. We state this to clarify our position, because so much of our research team's work in analysing issues of sustainability (to date) has been focused on business and commercial sustainability, especially across environmental risks related to supply chains and the continuity of businesses as ongoing concerns. We have been highlighting these commercial challenges because we believed that the investment community has been far too focused on sustainability for altruistic corporate social responsibility and has not accorded enough attention to how serious sustainability is to the fundamental durability of businesses and their supply chains.

### EXHIBIT 1: 7:00, morning of the First Global Investor Forum on Climate Change in Hong Kong



Source: BNP Paribas

As financial analysts, it is easy to become alarmist about the degree of environmental or social change necessary to align companies and policymakers on a sustainably secure path that does not also curtail growth and development. In Asia, in the context of rapid economic growth, industrialisation, urbanisation and technology penetration, the importance of longer-term sustainability is more pressing, but also easier to miss given the dynamics toward risk-reward in emerging-market investment. For analysts, it has been important to make a distinction between issues facing humanity from a global dimension and those that directly impact investment through domestic growth and change. With BNP Paribas' focus on emerging and developing markets, sustainable development is core to our equity research strategy on several levels. As BNP Paribas' Head of Emerging Market Strategy Martial Godet regularly highlights, there is a significant difference between global cycles and domestic growth. In a forum including stakeholders across the investment value chain, it became apparent that within the schema of sustainability, responsibility is not just aspirational, but is a hands-on commitment that dictates money manager's mandates.

Having the entire investment value chain from policymakers, corporate senior management, asset owners, and asset managers to service providers present was an eye-opening experience for those of us who have been focused on industry or corporate equity level analysis of opportunities and risks. Across years of equity and industry sector research, it has always been invigorating to see interest being given to long-term sustainability (altruistic and commercial) by senior management or chief investment officers. However, meeting with asset owners and policymakers and understanding their perspectives was also enlightening. Holding this investor forum in Hong Kong, on the doorstep and at the gateway of the largest consumer and manufacturer of energy and raw materials globally brought a heightened acuity to the necessity of action for asset owners taking decade-long perspectives on investments. Over the two days of the forum, consensus on the urgency of issues that look at times decades away was heightened because of the changes in risk/reward models of portfolios due to the climate-change-related aspects.

## Agreeing to agree

In numerous past reports we have highlighted many of the regulatory initiatives being undertaken over the past year (*Sustainability Spotlight – Changing World*, 6 June 2013, *Sustainability Spotlight – Investing in an Age of Climate Volatility*, 20 March 2013). Pushing national greenhouse gas emission stances globally while “respecting the relative capacity of countries to deal with global warming” within the United Nations Framework Convention on Climate Change (UNFCCC) principle of “common but differentiated responsibilities” is important from the point of view of financial impact related to cap-and-trade and emissions markets. However, it is also important for core business sustainability. This growing sense of urgency over environmental risk and climate change has expanded the notion of “stakeholders” beyond consumers and environmental advocates, to politicians and those who develop corporate strategy, as well as the investment community. The organising principle that has arisen in the past year is that top-down legislation, as well as bottom-up consumer and corporate strategies, need to consider climate-change adaptation and mitigation for the sake of fundamental business needs. This is because the risk/reward ratios related to long-term sustainability are continuing to change at an alarming rate.

Perhaps somewhat tragically brought to the fore (through sea surges, flooding and droughts) this past year, is that society has experienced more extreme-weather catastrophes than in recent recorded history. No country, no company and no asset class has been left totally untouched, highlighting the imperative for everyone to face the realities of climate change. Because no one has been left immune, and the issues of environmental risk are now globally relevant, it becomes a matter of sheer self-interest. As we have highlighted, we are facing a confluence of issues and trends that far exceeds the changes happening at the macro-economic level (*Sustainability Spotlight – Changing World*, 6 June 2013). One of the panels even noted that, historically, it has been the case that humanity rallies behind an issue in the face of catastrophic events. The net positive from all this is that, for the first time, there is an agreement between policymakers, strategic management of corporations and the consumer on the street, that sustainability has become the most important question for humanity.

## EXHIBIT 2: Ravages of climate change even on clean tech and green tech



Sources: Stuart McMahon; Clickgreen

The above pictures, taken during a gale with wind speed of up to 165mph, come from a *Daily Mail* report of 9 December 2011 in the UK. It shows that even climate change mitigation technologies themselves are at risk from climate change. Although there is no proven causal relationship, environmental degradation might increase the frequency of such occurrences in future. The storm was so severe that the 300ft-high wind turbine burst into flames. The affected GBP2m wind turbine is from Ardrossan, North Ayrshire, Scotland, and, according to the *Daily Mail*, the reason for the flames was that the blades were locked because the National Grid would not have been able to manage the sudden power surge.

Even at the post-Copenhagen macro-political level, the one clear alignment across all nations has been the imperative to act upon climate change. Post-Copenhagen, at bare minimum, we have witnessed political leaders the world over push climate change to the forefront of policy initiatives and priorities. Throughout 2010 and 2011 we argued that the critical imperative had been the ability to come together on the magnitude of the issues surrounding climate change in the face of concerns over Euro sovereign debt, the US elections, etc. The success of Durban, South Africa (December 2011) was a consensus that even appeasement would have been better than a stall in momentum, despite the price that is already being paid in economic or human sacrifice. The US, lacking the fortitude to be vocal since the end of 2011 (*TMT In/Brief – What price too great?* 14 December 2011), has, through 2012, put the burden and the spotlight on the EU and developing nations. Post-Durban and Doha, the US was left in the invidious position of having a weakened position by not participating, and its position has come under scrutiny by media and stakeholders during international negotiations.

The issue of who pays for the past and who shall pay for the future, and at what cost to emerging market growth, remained a controversial theme and topic within the conference. Every policy initiative ultimately puts an investment portfolio at risk. Every initiative toward mitigation or adaptation ultimately carries economic and technological challenges and, to date, technologically there are no agreed-upon metrics, nor a framework for international coordination, that is robust enough to align nations towards commercial

mitigation opportunities. It is highly unlikely that emerging market economies will leapfrog carbon-intensive energy development and sustainability development in the near term without far more significant technology transfer and, at a bare minimum, collaboration and coordination with developed nations. Implementation policies that are not able to address these challenges as broad global issues will limit investments to sub-optimal strategic niche initiatives. The latter, while thematically interesting as domestic or indigenous growth opportunities, do not move the needle on climate change as a phenomenon, and could ultimately constrain broader mitigation policies and add to the challenges of carbon lock-in.

While much of the conference did discuss who pays for the past and who shall pay for the future, we still think this is the major pachyderm in the room. The emerging and developing markets remain the big question. While all investors implicitly discuss and understand the issues of development without carbon and the differentiated responsibilities, development requires improved access to modern energy complexes and sustainable resources. The relationship between emission mitigation and reducing climate damage vulnerabilities is an interconnection that is very difficult to unravel, and one that is exacerbated by the limited funds available. In the developing markets, immediate development needs consistently outweigh the threat of climatic change as emissions growth and economic growth can not be decoupled.

## Urgent realities of a changing climate

The conference opened with a welcome from Alexandra Boakes Tracy, in which she highlighted the role of the Association for Sustainable & Responsible Investment in Asia (ASrIA) and welcomed the leading financial institutions who have come together to address the risk associated with climate change and to understand the opportunity arising for green technologies. The scale of investment required to upgrade energy infrastructure in the region is enormous. For this reason, climate change in Asia is posing a considerable challenge for businesses, investors and governments alike. Analysis and action on climate change are quite new for many financial institutions in developing markets. To this end ASrIA established Asian Investor Group for Climate Change (AIGCC) in 2011. AIGCC is a group for collaboration, education, analysis, engagement and policy, albeit within an Asian context.

Alex also highlighted the recent findings from the IEA report (10 June 2013) on *Redrawing The Energy-Climate Map* which stressed the urgent need for action before 2020 to curb global greenhouse gas emissions if the world is to meet the target of the 2°C Scenario (2DS). Despite significant progress in the US, EU and China in slowing global carbon emissions, global carbon emission increased 1.4% in the last year and are on course for a temperature increase of up to 5.3 degrees Celsius by the end of this century. The IEA further highlighted the role of emerging Asia, especially China, in its report, as the region has witnessed unprecedented growth and severe resource constraints, which has led to severe environmental problems and the risk of extreme climate impact. In following up with the IEA they also expressed the urgency of the 2°C target and reiterated their position that beyond transforming the global energy complex, their research has determined that the 2DS will not even be close to achievable unless both CO<sub>2</sub> and greenhouse gas emissions in non-energy sectors are dramatically reduced. According to the IEA the challenges for reaching a 2°C target remain quite significant, and from an economic viewpoint may be even more complex because of energy economics. Based on a 2010 report from the IEA, more than 40% of the world's population still uses traditional biomass for cooking and heating, 20% of the world's population still does not have access to electricity, and in the three years since the report, the situation has not improved significantly. In their current analysis, unless initiatives are undertaken globally, current energy economics will not reach the 2°C target. Moreover it is very likely that we will see an increase in greenhouse gas emissions as emerging markets attempt to rectify the disparities of current energy economics. In our discussion, they highlighted concerns that current energy pathways present a scenario where halving global CO<sub>2</sub> emissions by 2050, even within the energy-related complex, is far from likely.

In a message from the United Nations to the investor forum, Secretary-General Ban Ki-Moon reiterated his longstanding position that climate change is a matter of the gravest urgency and that governments as well as investors need to refocus their attention because time is running out on what is becoming a global threat. Ban pointed out that greenhouse gas emissions are continuing to rise globally and are clearly a significant cause of climatic change. The Secretary-General also highlighted that it is incumbent on investors to support scientific and technological efforts in conjunction with the efforts that the United Nations has put in action to reduce emissions and strengthen humanity's resilience to climatic change. Ban Ki-Moon said that increasing energy-efficiency and clean energy technologies will help in providing sustainable energy for all and urged investors to form an alliance around sustainable change. The Secretary General pointed out that investors are working towards developing market places, business models and supporting energy entrepreneurs in developing countries. The UN will convene a high-level meeting of world leaders in 2014 to mobilise political will and initiate action in key areas including public and private funds to reach a binding climate change agreement by 2015. He also highlighted the critical role of institutional investors in influencing policy actions and that institutional investors play a key role in unlocking the potential of clean energy. Ban mentioned that he will involve leaders from governments, business, finance, science and civil society at the highest levels to exploit the strength of the UN system to mobilise political and business action plans to control GHG emissions over the next two years.

We believe that the most important message in Secretary-General Ban's comments is the need for cross-border and cross-sector technological collaboration. We have long highlighted the need for technology at multiple levels across energy-efficiency, intelligent networks integrated to the Internet of Things and management of environmental risks and urbanisation. We have highlighted that the significance of technology adoption and diffusion tends to reach very different levels of critical mass and use cases. We believe that technology transfer has a crucial role to play as there is a need to convert current technologies into cleaner, low-carbon and climate-resilient technologies through innovations that will help decouple economic growth from energy consumption. Given the rapid pace of urbanisation, it becomes critical to innovate with smart technologies and adopt efficient policies that will help cope with the urbanisation trend. In a pervasive computing era, the entire world's technology becomes interrelated and intermingled, creating not only massive opportunities for both adaptation and mitigation of climate change, but also massive challenges, if not properly designed. Many of Secretary-General Ban's comments remind us of how important these issues are, not only from an investment perspective but fundamentally to humanity and society at large.

In a separate message, Rachel Kyte, Vice President for Sustainable Development at the World Bank, highlighted that people, economies, and ecosystems are primarily impacted through water, so the world



needs to prioritise water security concerns. She cautioned that if proper measures are not undertaken, it may put hundreds of millions of people at greater risk of food and energy shortages. Climate change may worsen volatile water supplies, which may increase the frequency and intensity of water-related disasters such as floods, hurricanes and droughts. Even to provide food for 9b people requires an expected 60% increase in agricultural production and 15% additional water withdrawals. According to Rachel, the management and improvement of water resources is critical in achieving water security, which may ultimately solve the food shortage problem.

#### EXHIBIT 3: Ian Simm, Founder and Chief Executive of Impax Asset Management



Source: BNP Paribas

Ian Simm, Founder and Chief Executive of Impax Asset Management (a BNP Paribas Investment Partner), from the UK, highlighted that Asia (and the world) is facing “a once-in-a-planet opportunity” to demonstrate leadership in its policy and direction. Ian highlighted many myths about sustainable investment, the first being uncertainty and doubt. However, he also noted that professional investors are trained to make decisions under uncertainty. Within the broader theme of urgency, Ian pointed out that climate change is not just a long-term issue that investors or asset owners can wait upon. The impact on investment from climate change can come in the form of penalties from policies such as a carbon tax, or disruptive economics as a result of feed-in-tariffs for solar, etc. Ian’s point was that climate change already impacts companies across all sectors and geographies far beyond weather hazards and corporate reputational risk.

According to Ian, Asia is “the nexus, the nucleus, of the global climate change debate” because it is in a phase of wealth creation, urbanisation, and development that must take on environmental risk management for reasons above its fossil fuel deficit. China Internet Information Centre reported on 5 March 2013 that Shanghai’s environmental protection bureau had passed a law that would require local government bodies to stop using 30% of their vehicles on seriously polluted days, citing Zhang Quan, the bureau’s director. This implies that in Shanghai, high-polluting vehicles (i.e. emission standard below National-I for cars, and below National-III for trucks(diesel)), will not be allowed to enter the city. The trend of rising concerns on air pollution can be negative for the auto sector, as more cities limit the number of new vehicles, but it can also offer opportunities. Honda (7267 JP) is currently ramping up green technology R&D in China and preparing to raise capacity from 2015. China is encouraging R&D on energy saving across all brands, not just Honda or Nissan (7201 JP). Auto-makers’ R&D have increased significantly due to research into electric models, though there is no near-term revenue impact. Vehicular pollution is only one example of how climate and environment is having an immediate impact on corporate strategies, business risks and opportunities, and, ultimately, investor portfolios.

The argument that “grow now and clean up later” is damaging the environment beyond repair was also a clear tenet in discussions, to the point where one panellist exclaimed that he was concerned for “there being a planet at all in 50 years.” Financially, prevention of pollution, or rather, action against climate change agents at an early stage, may be more economical, even after discounting the future cost-benefit

scenario, as the cost of clean-up could be significantly higher at a later stage. However, many investors also highlighted that there remain opportunities in waste and adaptation technologies. Early intervention in green technologies or infrastructure to reduce carbon intensity is critical. According to a World Bank report, *Inclusive Green Growth: The Pathway to Sustainable Development*, the choice of technology, economic structure and lifestyle is more pertinent in developing countries, as they would build most of their infrastructure in the coming few decades. According to experts such as Nordhaus (1992), Wigley and others (1996), although green investments could be costly if the expected impact of climate change does not materialise, they could result in significant savings if the impact does materialise. Even though marginal costs are higher, early action should be taken in capital-intensive sectors such as infrastructure, urbanisation etc., according to Jaccard and Rivers (2007). Early action could also lower the cost of needed technologies as technologies become cheaper when adoption increases. However, the primary reason for early action should be the fact that some damage due to climate change could be irreversible. In such a scenario, it is critical to invest in environmental protection.



## Immediate impact on businesses, and their response

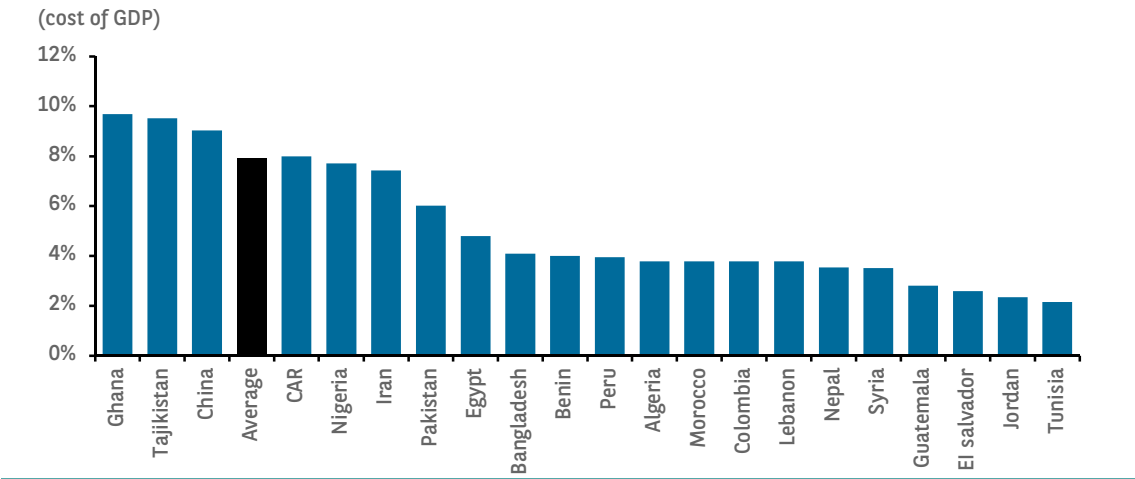
Climate change increases uncertainty in the business operating environment as it – like globalisation and technological change – affects the economic environment significantly. Risk premium increases with increasing uncertainty in the business environment, impeding global economic growth. Uncertainty arises not only from the direct effects of climate change (floods and storms, for example), but also from related regulatory changes that may increase tax costs and affect consumption patterns. Estimating the impact of increased uncertainty arising from climate change is a complex problem, making financial analysis of the impact of climate change even more complex. Across industries, even some of the most unlikely of companies have agreed to the severity and urgency of Climatic Change. BP (BP LN) forecasts that global CO<sub>2</sub> emissions from fossil fuels will be 26% higher in 2030 than in 2011 primarily due to increasing coal usage in fast-growing economies.

According to BP (website accessed on 12 June 2013), governments might have to make difficult choices to balance growth and energy security issues as more aggressive energy policy and technology deployment could lead to slower growth in CO<sub>2</sub> emissions than expected, with greenhouse gas (GHG) emissions from energy use falling after 2020. However, it believes that global warming may still exceed 2°C. BP also believes that measures such as putting a price on carbon – one applied economy-wide and that treats all carbon equally – will make energy-efficiency and conservation more attractive to businesses and individuals. Besides higher operating costs due to government policies and control, BP factors a carbon cost into its investment appraisals and engineering designs of some new projects. This helps the company to determine the real value of new investments as the cost of carbon emissions is expected to be much higher than current carbon prices.

BP's peer in the oil & gas sector Shell (RDSA LN) (website accessed on 12 June 2013) has also acknowledged the fact that CO<sub>2</sub> emissions are causing serious climate change. Shell also emphasises government action to initiate a global framework that puts a price on CO<sub>2</sub> emission, thus encouraging all to use technologies that help to reduce emissions. Shell has focused on four areas such as natural gas, biofuels, carbon capture and storage, and energy efficiency to contribute to a sustainable energy future. For instance, as most GHG emissions are energy-related and its surge poses additional risk to society and its ecosystems, Exxon Mobil (XOM US) is focusing on reducing GHG emissions by improving energy-efficiency in the short term and implementing existing emission-reducing technologies in the near and medium term, while trying to develop breakthrough technologies for the long term that can help in minimising GHG emissions. Clearly, with the energy complex, we are using examples that are more apparent, but the immediate impact of climate change on business is relevant to corporate strategy and any company's ability to deliver earnings.

Climate change is increasingly taking centre stage across the value chain and becoming a business issue as it can impact and affect labour and operations, physical assets, supply chains, distribution chains, consumers, and the communities on which companies depend. While direct impacts (such as property damage due to rising sea levels) are easier to envision, there are other indirect impacts (such as the impact from reduced water availability, or impact on worker productivity due to increasing temperature levels). Some will be due to extreme weather events (stronger storms), while others will be due to incremental climatic changes (rising ambient air temperatures). As climate change affects global temperature averages and extremes, water availability, extreme weather events, precipitation volumes, timing, and geographical patterns, the net effect of these changes is hard to model. The net effect of these climate changes is likely to be more negative (such as droughts causing reduced crop yields or crop failures), but can be positive in some instances (warmer springs, longer growing seasons) (*Sustainability Spotlight – Investing in an age of climate volatility*, 20 March, 2013).

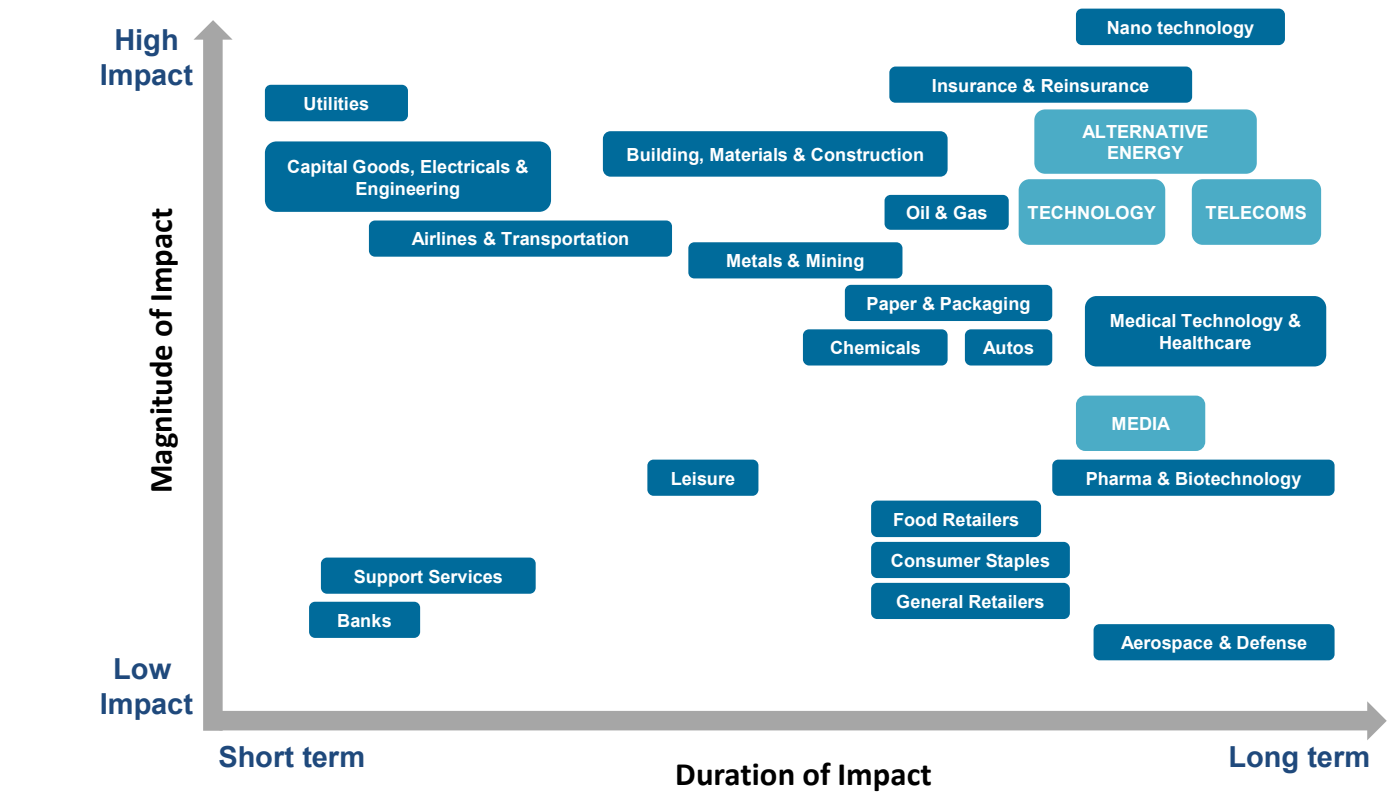
EXHIBIT 4: Impact of climate change on GDP of specific countries



Source: World Bank

*The Stern Review on the Economics of Climate Change* October 2006 estimates that climate change, under business-as-usual scenarios, could cost 5-20% of global GDP per annum, without proper adaptation and mitigation. Natural disasters are expected to have a much larger impact on developing and smaller economies than developed and mature economies as they are less equipped to withstand the initial shock, or to prevent further ripple effects on the macro economy. According to the World Bank report *Inclusive Green Growth – The Pathway to Sustainable Development* published in May 2012, environment degradation costs Ghana and Tajikistan 9%, while it costs developed economies such as Australia, Japan and the USA less than 2% of GDP. With increased globalization, economies are more interlinked. Thus, climate change in one country or industry can affect other countries or industries. Industries with complex supply chains face ripple effects for extended periods after a natural disaster. For instance, in 2011, floods in Thailand disrupted production facilities in the region and affected the global hard disk drive (HDD) market. Industries with long supply chains and distribution networks will be exposed, albeit indirectly, to climate change impacts through their constellation of suppliers and customers. Impacts of climate change on asset-heavy industries such as energy, agribusiness, oil and gas, metals and mining and forestry may affect prices of commodities, thus creating vulnerabilities downstream for other sectors that rely on those commodities (*Sustainability Spotlight – Environmental risk management*, 22 August, 2012).

EXHIBIT 5: Impact of climate change on specific sectors



Source: BNP Paribas

The financial sector will be impacted by climate change as the long-term effects of climate change affect the models of insurance companies and their revenues and profits. The insurance industry has been vocal about climate change for over a decade, and some insurers even refuse to provide insurance for businesses or individuals in vulnerable locations. Institutional investors are increasingly requiring disclosure about climate risks and considering their own exposure – CERES and Carbon Disclosure Project, as well as analysts have started to investigate climate sensitivity of investments for sectors that have a high short-term impact from climate change (*Sustainability Spotlight – Investing in an age of climate volatility*, 20 March, 2013). Climate change not only increases the operating costs for businesses as weather patterns change and sea levels rise globally, it can cause considerable damage to public and private infrastructure and assets. Incorporating climate risk and adaptation considerations into governance and risk management processes thus becomes imperative for financial institutions. The impact of climate change on asset values, business performance and risk is also likely to affect the investment and insurance portfolios of financial institutions. The global financial crisis has highlighted the importance of the financial sector as critical for both economic and political stability (*Sustainability Spotlight – Investing in an age of climate volatility*, 20 March, 2013).

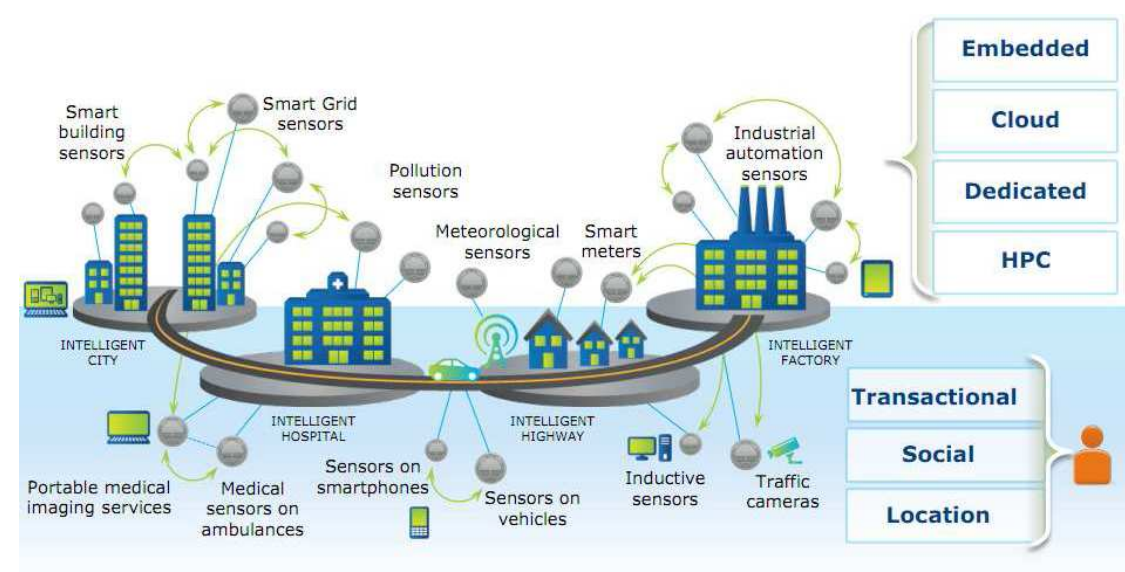
At the same time, the financial sector will play a critical role in combating climate change as it provides capital and influences businesses and consumers. The financial sector has several opportunities to benefit from climate change, which are not just limited to carbon trading. The financial industry is developing green loan products (that reward consumers and businesses for the adoption of green technology and for seeding new green business ventures) and green investment products that facilitate investment in sustainable assets (clean technology funds, green commerce). Financial institutions can help the mobilisation of funds through climate bonds, loans or equity investments, credit lines to local finance institutions, and work with policymakers in developing appropriate policy framework.

## Impact on technology and response

Urbanisation and the concomitant affluence will lead to a new level of energy-intensive consumption through appliances, computers and other gadgets. With the advent of connected devices, we are rapidly moving towards a digital society. If emerging economies reach half the affluence of the US in the medium term, we believe the overall energy demand may shock world energy markets. For instance, China's urbanisation (not including migrant workers) has doubled in the past 30 years, while China's coal consumption has risen from just under 20% of global consumption to 50%. The rise of urbanisation and megacities puts extreme pressure on natural resources, which may impact the climate adversely. According to FIG's *Rapid Urbanization and Mega Cities* published in January 2010, the 20 largest cities of the world consume 80% of energy and urban areas produce 80% of GHG emissions, highlighting that urbanisation is contributing significantly to climate change. Also, increasing global competition, coupled with growth of emerging nations and markets, brings to the fore economic and political policy issues arising from anthropogenic influence and unchecked climate change (*Sustainability Spotlight – Harmonizing urban elegance*, 1 February 2013).

We believe that the TMT universe is on the brink of a new era on the back of a paradigm shift in computing. The world is moving from mobile computing to pervasive computing. We have highlighted many times that sensors will play a critical role in the medium term to efficiently utilise resources of megacities – from water and power to transportation and communication systems. Sensors could become the next big thing in technology as everyday objects start having true contextual awareness and start tracking physical attributes such as light, heat, pressure and motion. This would not only help in efficient resource utilisation, but also control climate change. For instance, traffic sensors and cameras can flash warning messages for diversions according to weather conditions and unexpected events such as accidents and heavy traffic. They can help in efficient utilisation of fossil fuel. Pollution sensors can identify pollution levels and help authorities control CO2 emissions at manufacturing facilities. At a physical level, the Internet of Things (IoT) in smart megacities alleviates certain challenges and obstacles in maintaining levels of service within an urban environment. In the long run, we believe the IoT will help in keeping track of the available limited resources using information generated through the proliferation of infinite sensors, allowing the world to manage and protect the environment (*TMT In/Sight – Harmonizing Computing*, 15 April 2013).

### EXHIBIT 6: Proliferation of sensors



Source: Intel

ICT, particularly, the IoT, can make business and government operations less human-resource-intensive, in our view. Elimination of human intervention will reduce the carbon footprint of these operations significantly by eliminating the need for physical travel. According to the report *Smart 2020* by the Climate Group in 2008, apt implementation of ICT could drive a 15% reduction in emissions by 2020 based on a BAU estimate, translating into cost savings of approximately EUR600b. Therefore, in addition to benefits accrued by various sectors in terms of increased reach and improved efficiency, ICT helps to reduce the environmental impact of cities and has a positive effect on climate change (*Sustainability Spotlight – Harmonizing urban elegance*, 1 February 2013).

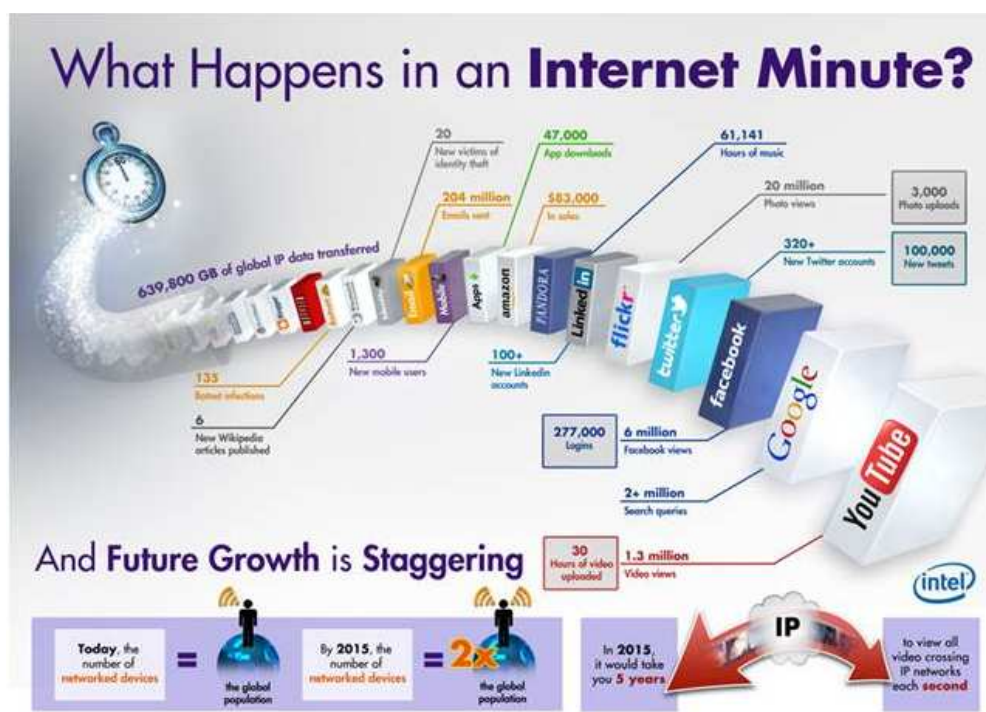
Along with migration to pervasive computing, energy consumption patterns are changing. Over the past few decades of computing, not only has energy consumption (led by computing and connectivity) increased steadily and perhaps even dramatically, but also it has become predominantly based on electricity (*TMT In/Sight – Competitive climate change*, 26 May 2010). We believe energy consumption will rise steeply as more and more smart devices get connected and the IoT becomes common. Moreover, computing efficiency

of the entire value chain becomes far more relevant given the levels of unstructured (big) data generated by the proliferation of sensors and the IoT.

We have highlighted that the IoT will lead to a sharp increase in energy consumption, both at the consumer level and infrastructure level. According to a BBC report on 12 January 2009, US physicist Dr Wissner-Gross's study showed that two Google searches on a PC generated 14g of CO<sub>2</sub> emissions through the value chain, roughly equivalent to the emissions of boiling an electric kettle of water. As pervasive computing gains momentum as a megatrend in step with the development of megacities worldwide, the related increase in unstructured data and the ensuing escalation in consumption of energy will pose serious challenges to society and bring to the fore power management solutions from ICs through to power supply systems (*TMT In/Brief – Energetically browsing and searching*, 12 June, 2013).

The IoT and sensors will amass huge unstructured data daily to turn all the available information into actionable items, significantly impacting IT companies. On 5 March 2013, Intel published an infographic that describes the events that take place in 60 seconds on the Internet, highlighting the staggering pace at which digital content is created and consumed in today's hyper-connected society. According to the infographic, in just a single minute on the web, 204m emails are sent, USD83,000 worth of goods are bought on Amazon, 20m photos are viewed on Flickr, 6m views are recorded on Facebook, over 30 hours of videos are uploaded, 1.3m videos are viewed on YouTube and over 2m searches are performed on Google. All these activities amount to the creation and consumption of about 640TB of data per minute.

EXHIBIT 7: Every Internet minute counts, amassing huge unstructured data



Source: Intel

We reiterate that data centre growth will accelerate with increasing data generation and consumption (especially unstructured data) due to higher penetration of smartphones and tablets (*TMT In/Brief – Green Apples to Data*, 12 March, 2013). The exponential growth of data over the past few years, coupled with the interest generated by RIO +20 for the environment, has put data centres under renewed scrutiny given their environmental impact. We reiterate our view that data centres have also become focal points for environmental impact in terms of energy consumption and carbon footprint. The pressures of environmental, social and governance (ESG) issues have taken designing and running data centres to new levels of technological complexity. Technologies that drive energy-efficiency encompass not only traditional IT hardware infrastructure, but also technologies from semiconductors through to cooling systems (*TMT In/Sight – Processing Paradigm Shift*, 29 August 2012).

We have also highlighted that the increasing prevalence of cloud computing has a positive impact on sustainability. Compared with traditional data centres, cloud computing has led to better utilisation of computing resources as resources are shared in the cloud computing environment, resulting in significant savings in energy, money and carbon emissions across the value chain. According to market intelligence firm Cleantech, the movement of traditional data centres to cloud computing will reduce worldwide data centre energy costs by 38% (by 2020) compared with a Business-as-Usual (BAU) scenario (*Sustainability Spotlight – Clouding the environment*, 27 July 2012).

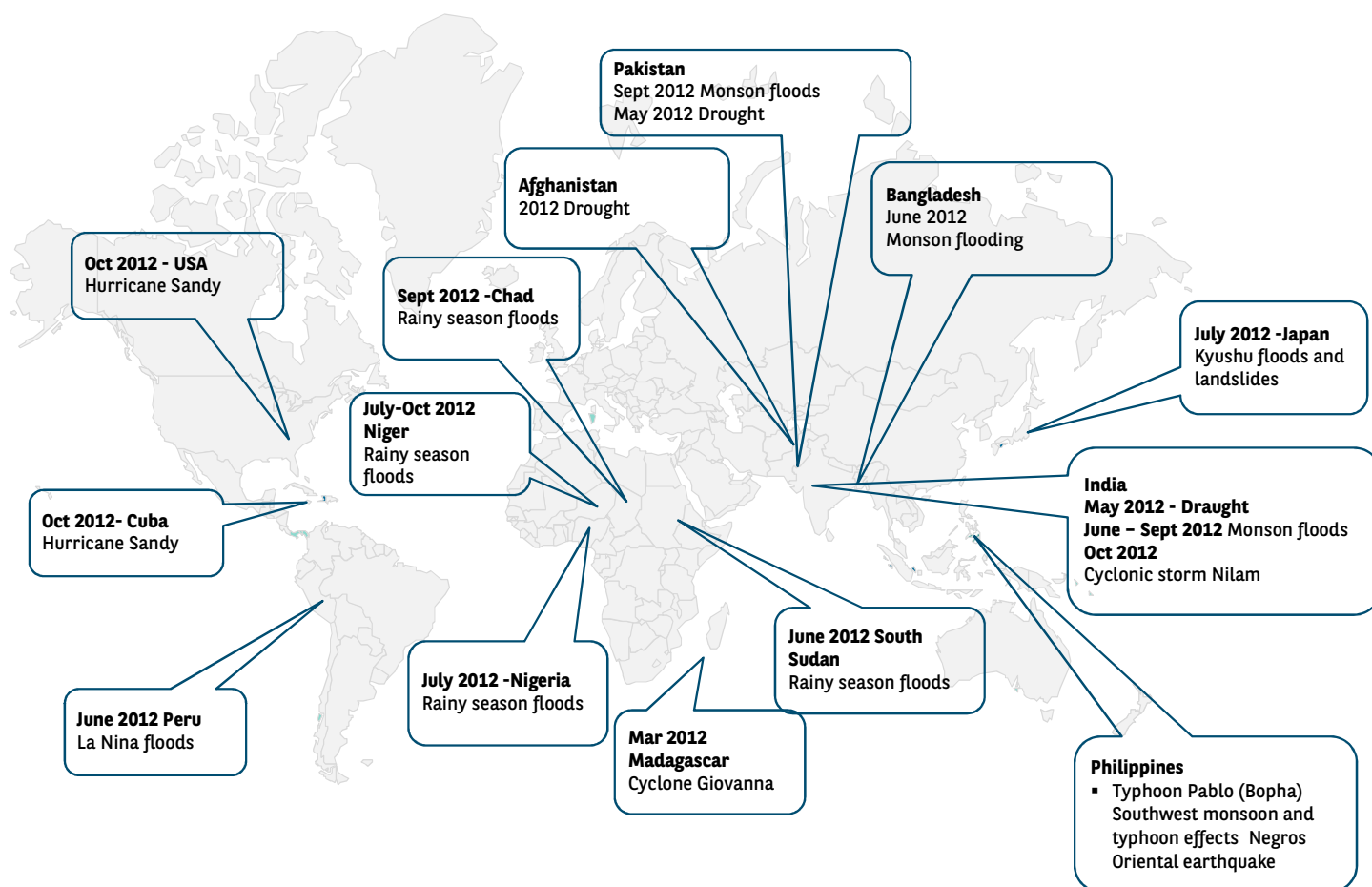


## The future for market-based mechanisms

We continually argue that the growing controversies (and even occasional conflicts) around climate change will drive the issue's importance for investors and highlight the need to consider ESG as a parameter for sustainable investment (*TMT InBrief – What price too great?* 14 December 2011). Throughout the investor forum, market-based mechanisms as financial instruments were discussed by service providers through to asset owners. Whether trading markets were the most relevant, and, indeed, whether they were ever, a social good was a topic of discussion.

The effects of climate change are worsening as the pace of climate change is accelerating. According to a *USA Today* report from 10 October 2012 quoting a Munch Re study, climate change is driving the increase in natural disasters since 1980 and the trend will continue. Besides the increasing frequency of climate change-related natural disasters, there is further evidence to show that climate change has accelerated, and its effects are far-reaching. In 2012, climate change-related data set new records and confirmed this thesis. While the Arctic region recorded the lowest summer ice coverage (*National Snow and Ice Data Centre, Arctic Sea Ice News & Analysis*, 1 May 2013), Australia, on the opposite side of the planet, recorded the highest ever temperature (Australian Bureau of Meteorology, Climate change and variability, 1 May 2013). If nothing is done to mitigate the current levels of greenhouse gas (GHG) emissions, the average global temperature could increase by 3.5-4°C by 2100 (*Climate Action Tracker*, 20 March 2013), which would have severe implications for the global economy and an unpredictable impact on human life and ecosystems (*Turn down the heat – Why a 4°C warmer world must be avoided*, World Bank, November 2012).

EXHIBIT 8: Natural disasters in 2012



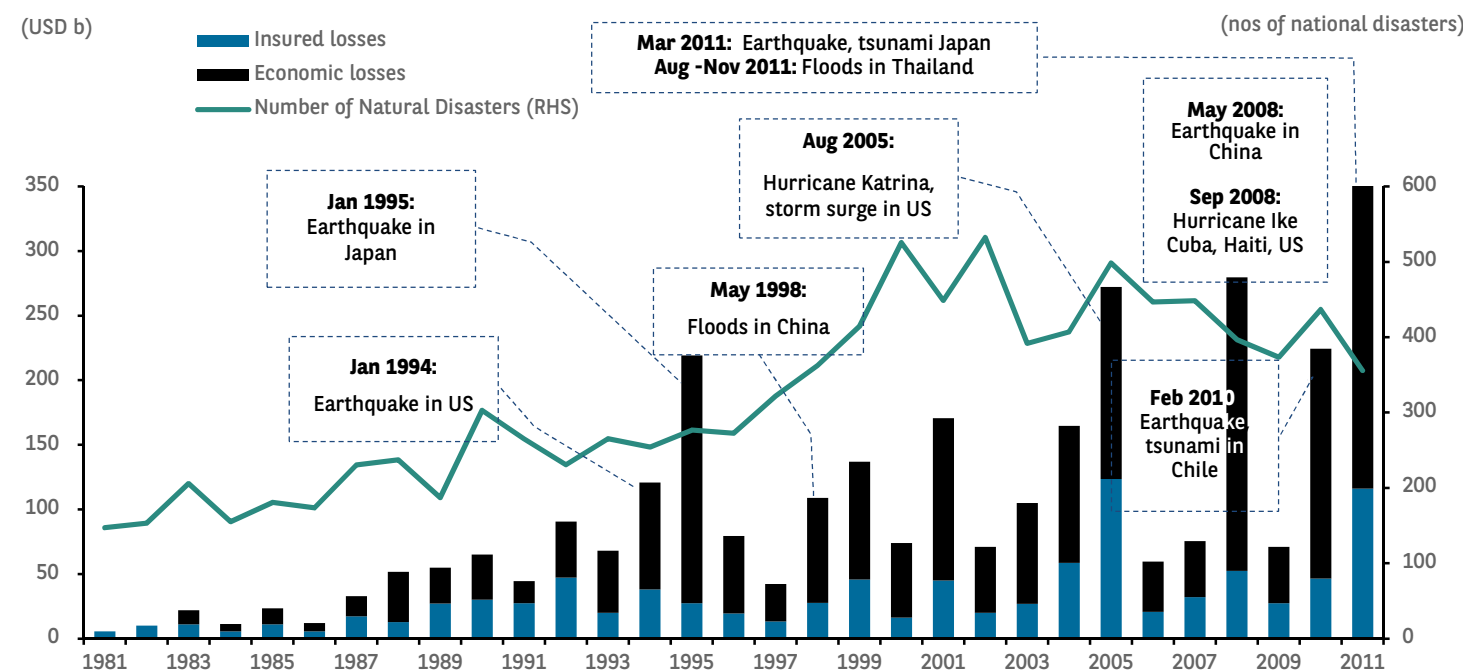
Source: Guardian, UK

However, at the global level, there is agreement among major parties on the threat of climate change. At the 15th Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC) in 2009, various parties recognised the 'scientific view that the increase in global temperature should be below 2°C. To achieve the 2-degree scenario (2DS), GHG emissions have to be around 44 gigatons of carbon dioxide equivalent (GtCO<sub>2</sub>e) in 2020, but given the slow pace of regulatory and market action, they could reach 52-57 GtCO<sub>2</sub>e, leaving a gap of 8-13 GtCO<sub>2</sub>e (*United Nations Environment Programme (UNEP), Emissions Gap Report 2012*, November 2012). The obstacle to action is no longer disagreement on the urgency or immediacy of the imperative, but rather the same issue of how, where and who pays. For



investors following themes of global issues versus local or domestic growth, these issues can have direct impacts on portfolio performance.

#### EXHIBIT 9: Number of natural disasters and resulting economic and insured losses

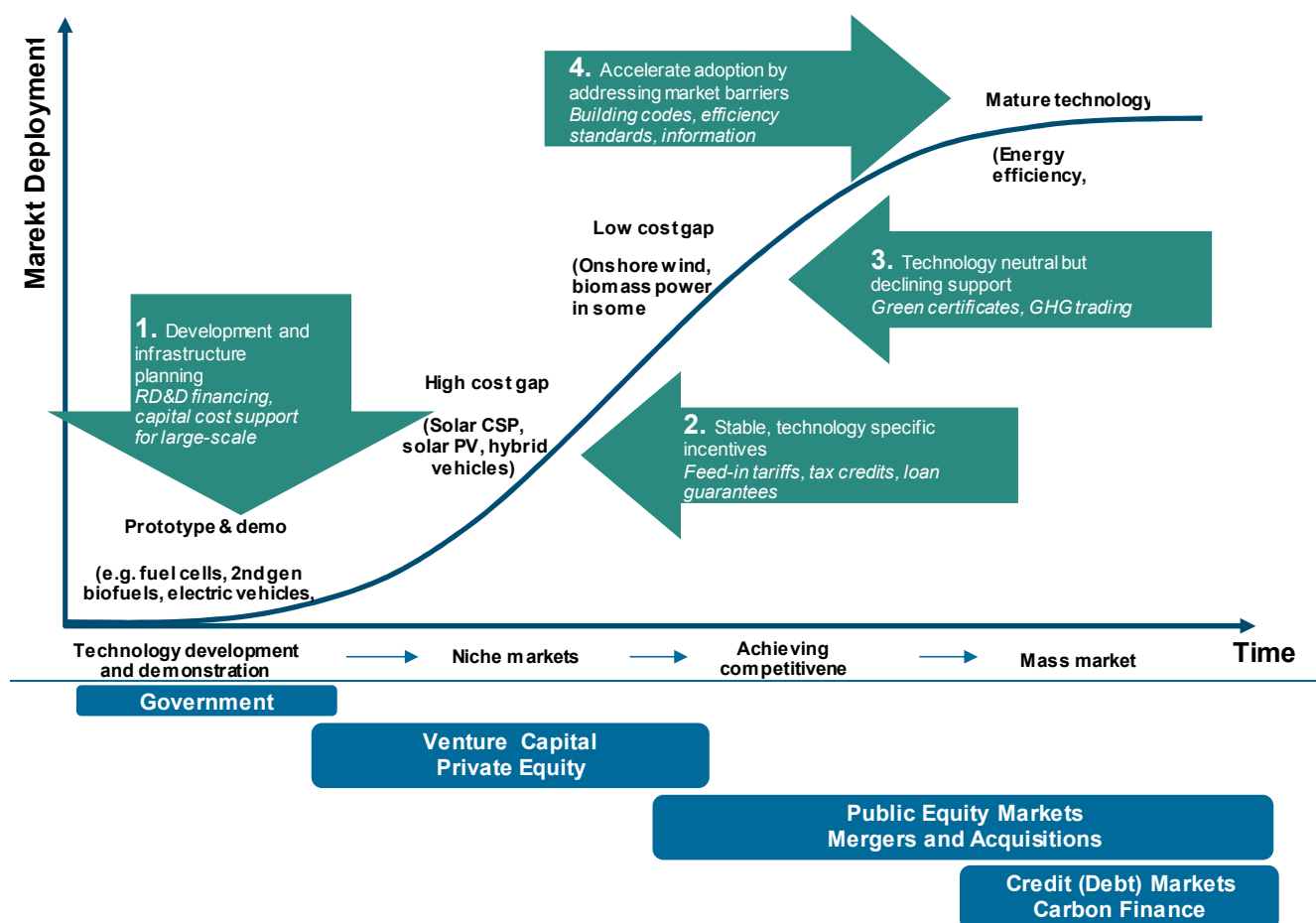


Sources: EM\_DAT; Swiss Re

The same challenge (“who pays for the past and who shall pay for the future”) remains the core issue even within market-based mechanisms because meaningful emissions reductions are ultimately only achievable if policies and regulations incentivize a global low-carbon transition. The challenge is that environmental risk and vulnerability to climate change, at least in economic terms, is no longer limited to emerging or developing markets. Today, with the mismanaged debt and financial crises of the developed world juxtaposed with the growth momentum of emerging nations, almost anyone globally would agree to a global focus on sustainability. The impact on investment can ripple across emerging markets as well as backlashing dramatically at developed market investments. While natural disasters tend to have a far greater impact on developing markets and domestic growth, the supply chain and financial impact demonstrates how nothing happens in isolation anymore.

The role of finance in bridging the GHG emission gap is critical, and the interaction of the private sector and the public sector crucial. In 2011, global climate finance activity amounted to USD364b, with USD217b-243b of funds coming from the private sector, USD16b-23b of inflows from the public sector and USD110b-220b from public and private intermediaries (*The Landscape of Climate Finance 2012, Climate Policy Initiative, December 2012*). The role of public sector finance is important as it acts as a catalyst for private investment by creating an incentive framework that lowers investment costs by reducing risks, thus enabling the private sector to raise finances at scale and seek out least-cost options for climate mitigation and adaptation activities. Developing countries have driven low-carbon investment through the creation of a market for project-based emission reductions. Carbon markets act as a catalyst for financial and investment flows towards climate-smart development by complementing and leveraging other resources.

EXHIBIT 10: Low carbon mechanisms (market and non-market)



Sources: BNP Paribas

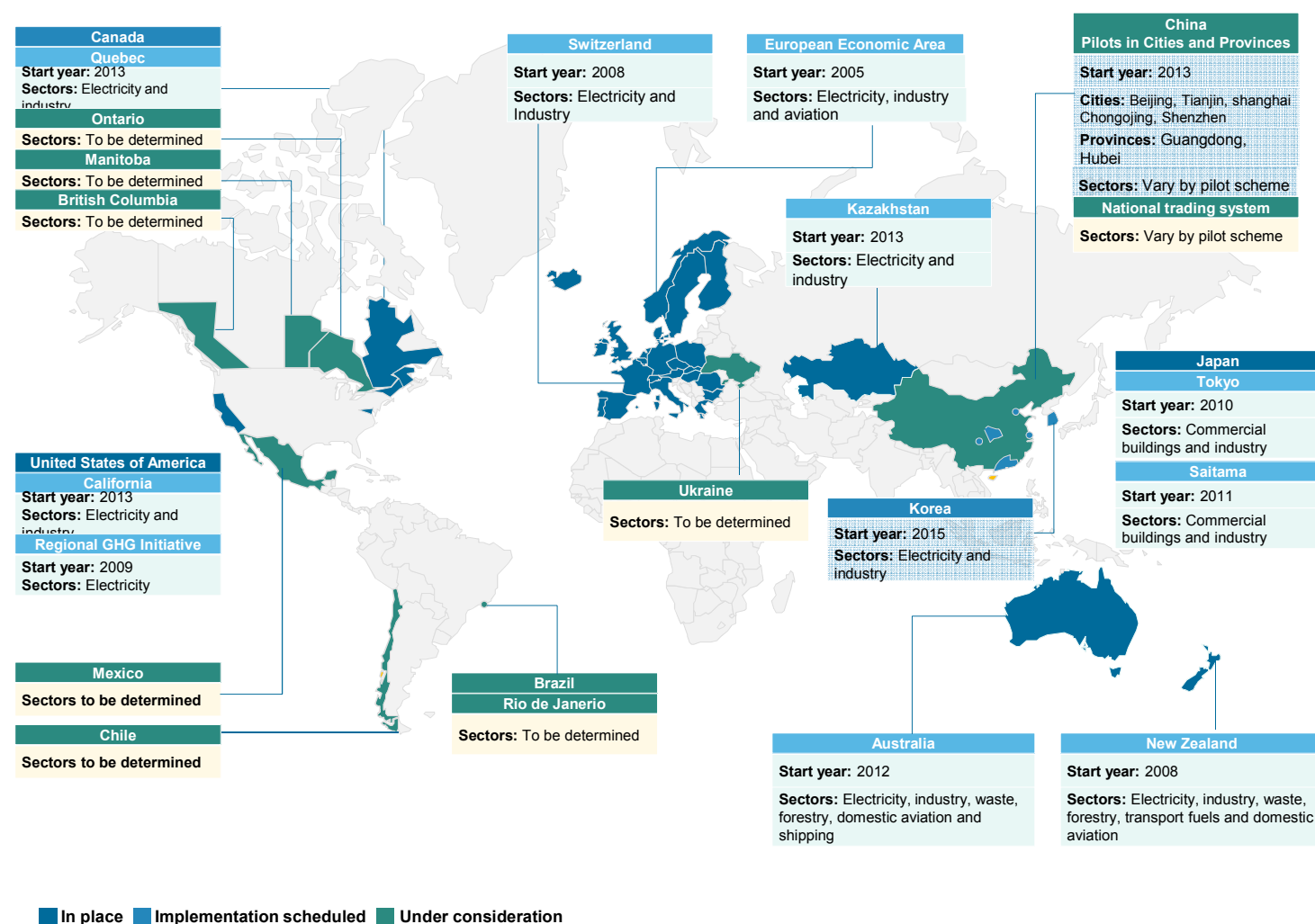
Carbon pricing initiatives put a direct price on GHG emissions via carbon market mechanisms (e.g. emissions trading schemes, offsets and new market mechanisms) as well as non-market initiatives (e.g. results-based financing) and carbon taxes. Such initiatives are being increasingly implemented not only at the international level but also at the regional, national and sub-national levels. A variety of policies implemented at the national level can also indirectly reduce GHG emissions through the setting of an indirect carbon price via implementation of energy-efficiency standards, energy-efficiency certificate trading, fuel taxation, removal of fossil fuel subsidies and support for renewable energy. Any of these policy initiatives at any level can have an immediate and very direct impact on corporate earnings.

The 18th COP to the UNFCCC held in November-December 2012 at Doha resulted in the Doha Climate Gateway that sets the path for negotiations on a global agreement on climate change by 2015. The Climate Gateway also sets a timetable and milestones for the Durban Platform, which foresees the adoption of an international agreement in 2015 to be implemented in 2020. The Doha agenda also included further mechanisms covering carbon markets and direct financing, which include the New Market-based Mechanism (NMM), the Framework for Various Approaches (FVA), Reducing Emissions from Deforestation, Forest Degradation and sustainable forest management (REDD+) as well as Nationally Appropriate Mitigation Actions (NAMAs). However, uncertainty is expected to continue until there is international agreement regarding the new market mechanisms, which is not expected before 2015, and thus makes implementation of these mechanisms impossible before 2020. Moreover, based on recent track records, beyond the precipitous price drops of carbon, whether these mechanism detract from the core issues and discussions remains an open issue.

### The carbon trading market

Putting a price tag on carbon through a larger economic or financial prescriptive market place offers an investment vehicle or mechanism, but, in many ways, does not ensure emission stabilisation beyond addressing negative externalities within policy. The demand for international credits over 2013-2020 is expected to be around 1,600 metric tons of carbon dioxide equivalent (MTCO<sub>2</sub>e), according to estimates compiled by the World Bank. The EU's Emission Trading Scheme (ETS) and the Effort Sharing Decision make the EU the major market with an estimated 1,400 MTCO<sub>2</sub>e of demand. About 250 MTCO<sub>2</sub>e of demand will come from other such schemes in North America, Australia, New Zealand and Japan.

EXHIBIT 11: Map of existing, emerging, and potential emission trading schemes



Source: IEA

The supply estimates of Certified Emission Reductions (CERs) and Emission Reduction Units (ERUs) are higher than 1,900 MtCO<sub>2</sub>e over 2013-2020, which is still considerably lower than the 2012 estimate of 2,700 MtCO<sub>2</sub>e (*State and trends of the carbon market 2012*, World Bank, May 2012) even though there is a higher number of projects. These estimates are uncertain, since it will take time to see the full effect of price decrease on supply, and there is large potential for a resurgence in supply if the issue of demand is addressed. Both supply and demand figures for international credits are influenced by developments at the international, national and regional and sub-national levels.

### The European Union Emissions Trading System

Introduced in 2005, the EU emissions trading system (ETS) forms the core of the EU's policies aimed at combating climate change through the cost-effective reduction of industrial greenhouse gas emissions. As of January 2013, the EU ETS covers more than 11,000 factories, power stations, airlines and other industrial plants in 31 countries (EU-27 states as well as Croatia, Iceland, Norway and Liechtenstein).

The EU ETS's central principle is 'cap and trade', whereby the total amount of GHG emissions by factories, power plants and other installations in the system are 'capped', or limited, with the cap being gradually reduced over time to achieve the desired targets. Under the EU ETS, the 2020 emissions target for the sectors covered is 21% lower than in 2005. Companies reducing emissions can keep the extra allowances to cover future needs or sell them to another company that is in requirement of allowances. The trading system allows companies and installations to buy or sell emission allowances. The system also allows purchase of limited amounts of international credits from emission-saving projects around the world. Companies must surrender allowances for every tonne of CO<sub>2</sub> (or the equivalent amount of N<sub>2</sub>O or PFCs) annually, and the failure to do so results in the imposition of heavy fines. The setting of a price on carbon attaches a financial value to each extra tonne of carbon emissions generated/saved, and hence effectively translates to the bottom line for the company, impacting its share price, and thus putting climate change on the agenda of company boards and their financial departments.

Trading allowances and credits allow companies to develop a cost-effective strategy for their carbon emissions. Companies can choose to invest in low-carbon technology and/or shift to less carbon-intensive energy sources. They can trade allowances or credits that they generate in the market. By allowing the purchase of international credits, the EU ETS also drives investment in clean technologies and low-carbon solutions in developing countries. Akin to currency or material resource trading risks for participants, all of these instruments and mechanisms have an immediate and direct impact on financial performance.

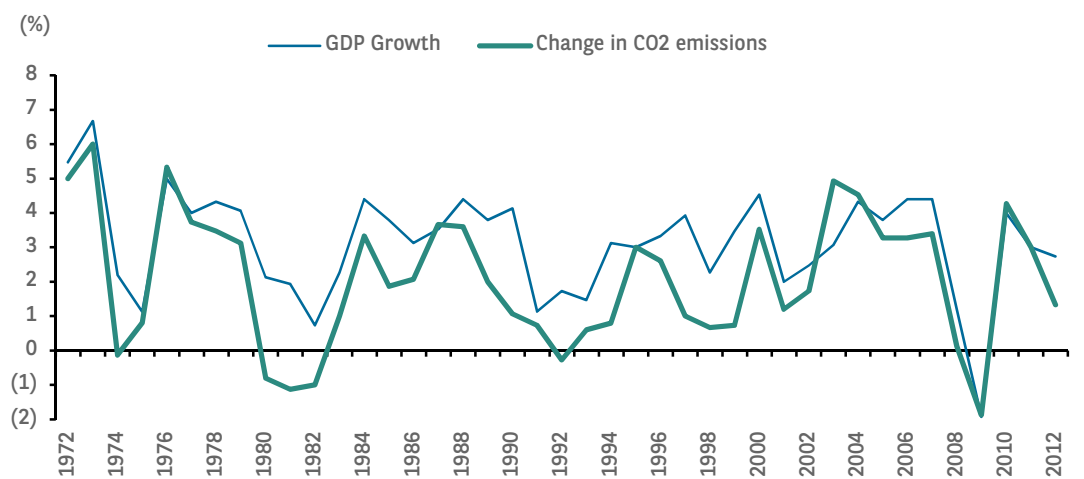
The EU ETS covers emissions of: 1) carbon dioxide (CO<sub>2</sub>) from power plants, a wide range of energy-intensive industry sectors and commercial airlines; 2) nitrous oxide from the production of certain acids; and 3) perfluorocarbons (PFCs) from aluminium production. The EU ETS covers around 45% of total greenhouse gas emissions from the 27 EU countries. In the initial phases of deployment of the ETS, emission allowances were given away for free by governments. However, in the third phase of the ETS (2013-2020), auctioning will be the main mechanism of allocating allowances, with free allocation being phased out completely by 2027. Auctioning is a more transparent mechanism of resource allocation and puts the cost on the polluter, rather than the government. Given the significant weight of power generation in the EU ETS, more than 40% of allowances in the system will be auctioned in 2013 and this share will rise progressively in following years.

The EU legislation calls for at least half of auctioning revenues and all revenues from auctioning allowances to the aviation sector to be used in combating climate change in Europe or other countries. Germany is spending a large part of its auctioning revenues on climate change projects in emerging economies and is becoming an important externality for emerging market green growth. A funding programme known as NER300 utilises revenues from the sale of 300m allowances (5% of the total available over 2013-2020) to co-finance the construction and operation of large-scale demonstration projects in innovative renewable energy technologies and carbon capture and storage (CCS).

International credits can reduce emissions amounting to 1.7BtCO<sub>2</sub>e between 2008 and 2020, representing almost 50% of the EU emission reductions in this period. However, at the end of 2011, less than a third of that limit had been utilised. The trading system allows any entity with an account in the EU registry to buy or sell allowances, and for trading to be done directly between buyers and sellers, through several organised exchanges or active intermediaries in the carbon market. According to a Thomson Reuters Point Carbon press release from 11 February 2013, 10.7GtCO<sub>2</sub>e was traded globally in 2012, an increase of 28% from 8.4GtCO<sub>2</sub>e in 2011 and 7GtCO<sub>2</sub>e in 2010. However, the total market value declined for the first time since the launch of EU ETS in 2005, from EUR96b in 2011 to EUR62b in 2012, falling by 35%. In Europe, price dropped heavily on account of EU ETS allowances being over-allocated to 2020. The EU ETS is the largest carbon market, with 70% of global carbon market volume and 88% of the value, and price drops in Europe were transmitted across markets, resulting in the average global carbon price dropping by 49% to EUR5.82/t in 2012, down from EUR11.45/t in 2011 and EUR13.09/t in 2010.

However, the Joint Implementation (JI) market and the North American market saw growth in both volume and value, driven by trade in California. Trading volume saw a growth of 469% in 2012, reaching 574m Emission Reduction Units (ERUs), up from 101m in 2011. In the North American markets, trading volume grew to 130MtCO<sub>2</sub>e in 2012, up from 100MtCO<sub>2</sub>e in 2011, with the total market value growing from EUR221m to EUR575m as California accounted for the major share and remained immune to value-destruction in the EU as California's emission trading system is not linked to other markets. The discussions between markets also raises questions over whether linkages between markets is necessary, technologically feasible and relevant.

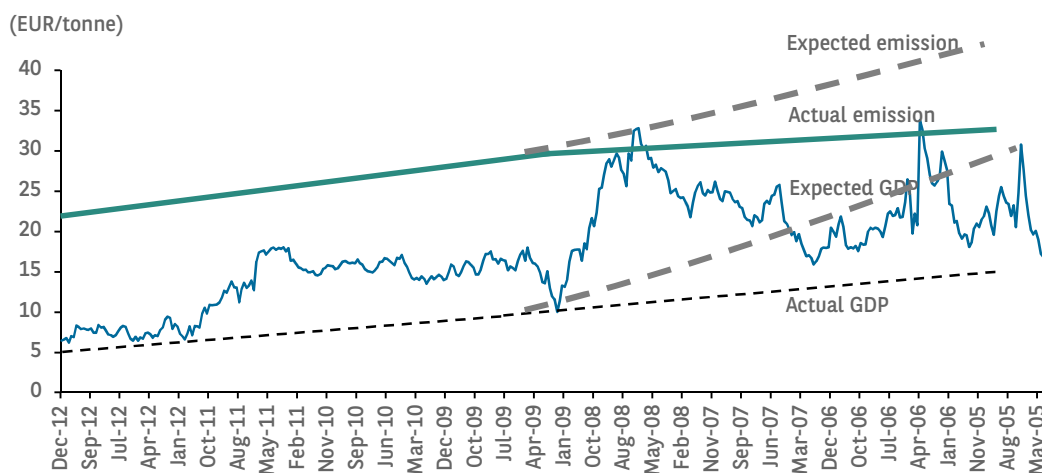
#### EXHIBIT 12: Growth in global GDP and in energy-related CO<sub>2</sub> emissions



Source: IEA

Exhibit 12 demonstrates that CO<sub>2</sub> emissions have always increased, except during the 1970s oil price crises and recent financial crises resulting in global recession, Energy-related CO<sub>2</sub> emissions (which account for 90% of total emissions) are directly linked to growth of the global economy. According to IEA's report *Redrawing the energy climate map* published on 10 June 2013, China and India's CO<sub>2</sub> and GDP have shown a higher correlation while OECD Europe and US's CO<sub>2</sub> emissions diverged from their GDP. Even though the GDPs of OECD Europe and the US have more than doubled in the last 40 years, CO<sub>2</sub> emissions have increased by only 2% and 18% respectively. Though developing countries emit far less of CO<sub>2</sub> per capita compared to developed countries, developing economies such as China and India's emissions are rapidly increasing. According to IEA, China's per capita emissions have tripled since 1990 while India's emissions more than doubled. Even after a drastic cut in per capita emissions by countries such as the US and Russia, their existing CO<sub>2</sub> emissions still remain much higher than the global average.

#### EXHIBIT 13: The drop in CER post financial crisis



Sources: Bloomberg; BNP Paribas

The basic premise for the pricing of carbon allowances before the financial crisis was that global GDP would increase at a steady pace and carbon emission would increase proportionately. However due to the global financial crisis, the economies did not grow as envisaged, slowing down the growth of emissions. As the carbon emissions didn't increase as expected, the demand for carbon allowances failed to sustain the pre-crisis levels and this resulted in CER prices for December 2012 falling to EUR6 in 2012 from above EUR32 in mid-2008. This has weakened confidence in the investment case for a low-carbon economy and carbon trading. However, many of the investor forum participants argued that the price of the underlying commodity is not an indicator of the value of the exchange.

Dr. Richard L. Sandor is the founder of the Chicago Climate Exchange (CCX) - the world's first exchange to facilitate the reduction and trading of all six greenhouse gases. According to Dr. Sandor, there are currently 55,000 contracts in open interest in Renewable Energy Certificates (REC) and the first solar REC was traded on the International Commodity Exchange (ICE) in New Jersey. Even among US states, California accounts for 50% of total trade volume, is a trend-setter for environmental policies, and would play a critical role in setting the path for the national expansion of the programme. Emissions trading schemes are also under operation in Australia, California, Quebec and Kazakhstan, with South Korea also expected to roll out such a scheme and pilot systems in cities and provinces in China. The World Bank's Partnership for Market Readiness is helping 16 developing and emerging economies develop their policy readiness and carbon markets. California and Quebec will be linked in January 2014, and Australia will be linked to the EU ETS by 2018.

Carbon prices in the EU ETS have declined from over EUR20/tonne in October 2008 to around EUR3.5/tonne in May 2013, which has caused investment in low-carbon technologies to slow down as well. The European Commission expects the surplus (due to a combination of the effects of the economic crisis and a large influx of international credits of allowances) to reach 2GtCO<sub>2</sub>CO<sub>2</sub>e by 2020. UNFCCC is also negotiating to develop new market mechanisms to target emission reduction and is expected to be in place to support the new 2015 agreement.

According to Dr. Sandor, the CER price is not the right measure to ascertain the success of EU ETS as it is only a signal that generates behaviour. The EU carbon emission was expected to decline by 8% according to its own mandates, but achieved a 17% reduction since the inception of the mechanism. Dr. Sandor is in disagreement with the popular belief that the higher-than-expected reduction in carbon emissions is due to the economic slowdown, and highlighted that the GDP of the EU is higher than pre-recession levels and emission reductions have been achieved because of efficiency schemes, renewable energy, and changes in fuel-mix in power plants. However, Dr. Sandor remarked that high prices of CERs change behaviour and the current price is not high enough to generate further reductions in CO<sub>2</sub> emissions, which could be addressed by tightening the reduction targets.

## EXHIBIT 14: Carbon Tax Regulations

Country	Name	Description	Applies to	Rate
Australia	Carbon Pricing Mechanism (a fixed price scheme)			AUD23/t CO <sub>2</sub> with 2.5% annual increase
British Columbia	Revenue Neutral Carbon Tax Starting year: 2008	The purpose of this tax is to put a price on carbon emissions to encourage less use of fossil fuels and reduce GHG emissions. Revenue neutral means that the revenue is recycled back into the economy through various tax reductions	All consumers of fossil fuels. No exemptions are given	CND30/t CO <sub>2</sub> . Tax rate from 2012
Denmark	CO <sub>2</sub> Afgiftsloven (CO <sub>2</sub> tax act) Starting date: 1992	The purpose of this tax is to reduce GHG emissions. Complementary policy measure to the EU ETS	Households, services and transport fuels except gasoline/petroleum pay in full Industry only pays for the share of heat used for spatial heating  Operators covered by the EU ETS are partly exempt from these taxes and will only be taxed at the minimum rate as specified in the EU Energy Taxation Directive  Energy-intensive industries are largely exempt if they enter a voluntary agreement on energy efficiency	Equivalent to around DKK150/t CO <sub>2</sub> Tax rate from 2010, varies per fuel type.  Annual increase of 1.8% in 2008-2015
Finland	Hiilidioksidivero (CO <sub>2</sub> tax) Starting date: 1990	The purpose of this tax is to reduce GHG emissions. Complementary policy measure to the EU ETS	All consumers of fossil fuels.  Certain industries or certain fuel use are (partially) exempt from the carbon tax. Fuels for electricity production, commercial aviation and commercial yachting are exempt as well.	For liquid traffic fuels equivalent to EUR60/t CO <sub>2</sub> For heating traffic fuels equivalent to EUR30/t CO <sub>2</sub>  For coal and natural gas equivalent to EUR30/t CO <sub>2</sub>
Ireland	Natural Gas Carbon Tax (NGCT) Starting date: 2010  Mineral Oil Tax: Carbon Charge (MOTCC) Starting date: 2010  Solid Fuel Carbon Tax Starting date: 2013	The purpose of this tax is to reduce GHG emissions. Complementary policy measure to the EU ETS	All consumers of fossil fuels in the Republic of Ireland  Operators covered by the EU ETS are partly exempt from these taxes and will only be taxed at the minimum rate as specified in the EU Energy Tax Directive	For natural gas and mineral oil equivalent to EUR20/t CO <sub>2</sub> .  For solid fuels equivalent to EUR10/t CO <sub>2</sub>
Japan	Tax for Climate Change Mitigation Starting date: 2012	The goal of this tax is to put an economy-wide and fair burden for the use of all fossil fuels depending on environmental load (CO <sub>2</sub> emissions factor) to strengthen climate change mitigation	All consumers of fossil fuels. Exemptions and tax returns apply for certain parts of the agriculture, transport and industry sectors	Equivalent to JPY289/t CO <sub>2</sub>
Norway	Tax for Climate Change Mitigation Starting date: 2012	The purpose of this tax is to reduce GHG emissions. The highest tax rate applies to the production of gas and oil offshore in order to encourage the use of electricity generated onshore instead of electricity generated on the petroleum platforms	All consumers of mineral oil, gasoline and natural gas  Offshore production and distribution of oil and gas. Both the EU ETS and the CO <sub>2</sub> tax is imposed on this industry  Operators not in the offshore petroleum business and covered by the EU ETS and certain other industries are (partially) exempt from the carbon tax to preserve their competitive position	Rates in the range of NOK25-410/t CO <sub>2</sub>
South Africa	South African Carbon Tax Starting date: 2015	South Africa plans to introduce the carbon tax in January 2015 to reduce its GHG emissions and to provide the necessary credible long-term CO <sub>2</sub> price signal to stimulate behaviour changes towards low carbon alternatives. The implementation of gradual phasing out of overlapping taxes and CO <sub>2</sub> tax revenue recycling for complementary policies such as the proposed Energy Efficiency Savings Tax Incentive are under consideration	Comprehensive coverage of all economic sectors  In the first phase (2015-20) 60% of the actual emissions are temporarily exempt from the tax, with additional allowances for tax exemptions for emission-intensive and trade-exposed industries up to 90%, including the possibility to reduce carbon tax liabilities through an offset programme	Equivalent to ZAR120/t CO <sub>2</sub>  Annual increase of 10% in 2015-20
Sweden	Koldioxidskatt (CO <sub>2</sub> tax) Starting date: 1991	The purpose of this tax is to reduce GHG emissions. Complementary policy measure to the EU ETS	Households and services in full  Non-ETS industry and agriculture partially exempt  Operators covered by the EU ETS are partly exempt from these taxes and will only be taxed at the minimum rate as specified in the EU Energy Taxation Directive, except for heat production. ETS industry heat production partially exempt depending on heat generation from CHP/non-CHP	Equivalent to SEK1,050/t CO <sub>2</sub>
United Kingdom	Carbon Price Floor Starting date 2013	The Carbon Price Floor aims to reduce the volatility of EUA prices. This is done by adding a carbon price support rate as an additional levy on the electricity bill. The carbon price support rate is the difference between the EUA price and the annual Carbon Price Floor target (starting from GBP16/t CO <sub>2</sub> e in 2013, linearly increasing to GBP30/t CO <sub>2</sub> e by 2020), and is updated annually	Electricity generators	Equivalent to GBP4.94/t CO <sub>2</sub> . Changing each year depending on the EUA price

Source: World Bank: Mapping Carbon Pricing Initiatives, May 2013



## Technology and economic disparities

We do not subscribe to the notion that humanity will be able to reverse greenhouse gas concentrations in the atmosphere any time in the near future. Beyond the question of past anthropogenic impact and interference with climatic change as a planetary process within the context of humanity and society the question remains “who pays for the past and who shall pay for the future”. Not only is this relevant, but is actually poignant as an issue because without significant investment in research (public and private) on the development of low-carbon technologies, stabilization towards a global emissions peak (let alone a decline in the coming two decades) is statistically unlikely. According to EU Climate Change Expert Group’s report titled *The 2°C Target* published in 2008, atmospheric GHG emissions should exceed 450ppm CO<sub>2</sub> equivalence to have at least a 50% probability of maintaining a global mean temperature rise to 2°C or below compared to pre-industrial levels. Going by current trends, GHG emissions are expected to surpass 450 ppm. If Global GHG emissions peak by 2020 and halve by 2050 compared to 1950, the 2°C target can still be achieved. While being a challenge that humanity faces at a global level, emissions levels and trends are complicated by differing regional levels of economic or industrial development as well as geographic differences related to climate change itself.

Ultimately, even negotiations for low emission stabilisation targets are heavily tainted by perceptions of fairness between countries. We believe that technology transfer and adoption remain the most significant macro-level bottleneck. While we continue to look at a variety of thematic investment opportunities ranging from data centre management (*Sustainability Spotlight – Clouding the Environment*, 27 July 2012), energy optimisation at processing levels (*TMT InSight – Processing Paradigm Shift*, 29 August 2012), power management (*Solar Spotlight – Thin is More*, 12 October 2010), new production processes for cement or co-generation and thin film solar solutions (*Sustainability Spotlight – Our changing world*, 6 June 2013) that play into the structural theme of mitigation and adaptation, the macro-level challenge is still international transfer and development schemes.

**EXHIBIT 15:** Francois Perrin, Head of Greater China Equities, BNP Paribas Investment Partners, Hong Kong



Source: BNP Paribas

In the closing session, the discussion refocused on the international goal of limiting the longer-term increase of global temperatures to 2°C, and the urgency that this represents across the entire financial value chain. When asked about the implications of climate change on investment strategies, Dr. François Perrin, Head of Greater China equities for BNP Paribas Investment Partners replied that “climate change forces asset managers globally to refocus on fundamental research and analysis looking at corporate sustainability.”

When challenged by the moderator on the issue of China’s role in climate change and how China seems to have “dropped off the radar” in terms of its recent commitment, François pointed out that, “at the scale of a country like China, it takes time to build a plan and to execute that plan, and in fact China has invested far more than the United States, and the current addressable scale Chinese solar market will eclipse the European and United States markets combined.” However, on the ground in China, we have already felt (i.e., “breathed”) the effects of climate change and seen first-hand the fundamental value chain dysfunctions (*TMT InBrief – Dysfunctionally out of synch*, 14 November 2011), so we believe China fundamentally recognises the need to address the issues within climate change. China is the leader in solar investment, seeing investment of USD31b in 2012, according to research study *Who’s winning the clean energy race*

conducted by the PEW Charitable Trust in 2013. In 2012, investment in solar was more than investment in wind (USD23b). We expect the investments to continue in solar as China pursues its target of 10GW installation of both grid-connected and distributed photovoltaic. We highlighted back in 2010 that the Chinese government has recognized the need to escalate the priority of environmental issues domestically and globally (*TMT In|Brief – Chinese whirlwinds in climate change*, 6 December 2011) as they have realized how energy-consumption is inextricably entangled with not only carbon emissions but also economic growth and China's advent into the digitally interactive and interconnected knowledge based future (*TMT In|Brief – Sustaining The 3<sup>rd</sup> industrial revolution*, 3 January, 2012). China also ranked first in solar deployment as it added 3.2GW of solar generating capacity in 2012. According to NPD Solarbuzz, China will be the largest solar market for the medium term.

According to an NPD Solarbuzz press release from 2 May, 2013, the top-20 solar photovoltaic (PV) module suppliers accounted for almost 70% of global PV shipments in 1Q13, up from 58% in 1Q12. The solar PV industry continued to grow globally and tier-1 PV module manufacturers adopted aggressive strategies to increase market share, with the top Chinese PV module suppliers such as Yingli Green Energy (YGE US), Trina Solar (TSL US), Canadian Solar (CSIQ US), JinkoSolar (JKS US), and ReneSola (SOL US) being the most aggressive. Chinese solar PV module suppliers remained the dominant suppliers, with the top-10 Chinese manufacturers accounting for 41% of module shipments. China is seeing huge demand driven by policy incentives, accounting for more than 20% of global PV market demand, expected to be 0.9-3.6GW, according to an NPD Solarbuzz press release from 8 April 2013. In Europe, a majority of demand is expected to come from Germany, Italy, France, and the UK, which will account for over 65% of European PV demand, which is expected to be 2.7-3.2 GW over the next four quarters.

According to NPD Solarbuzz, the German market is expected to shrink considerably, with China accounting for a major share of global PV installations. Germany's market share is expected to halve in 2013 from 25% in 2012. European market demand is expected to decline by 26% y-y to 12GW in 2013, driven by reduction in subsidies and feed-in tariffs. Asia-Pacific is expected to drive demand in 2013, as new policies stimulate growth of 50% y-y to 11GW, with China, Japan, and India being the major markets. According to the NPD Solarbuzz, Middle East, Africa, Latin America, Southeast Asia, and other emerging regions will also impact global demand from 2014 onwards, as emerging regions are likely to account for 16% of total global demand, up from 8% in 2013. India could see a capacity increase from 3.7GW to 9GW, if the pending final version of Phase II of the National Solar Mission programme is executed. Japan has seen high-efficiency modules becoming the preferred technology due to space constraints. In China, domestically manufactured multi c-Si modules are satisfying ground-mounted requirements.

We fundamentally believe that there are both global issues as well as indigenous scientific and technological solutions to achieving domestic growth in conjunction with sustainable development. A thematic undercurrent running throughout the conference was an implicit need to be able to leverage the strength of scientific and technological capabilities in developed countries for emerging markets. The dire need to strategically transform our energy systems and stabilise greenhouse gas concentrations presents a challenge that transcends nations and industrial sectors. We believe that to achieve the necessary transitions will require far more than financial modeling of the scientific and technological capabilities of the developed nations of the world. For long-term sustainability there cannot be any international division of labour or knowledge in science and technology. The transfer of environmentally sound technologies to developing countries requires a cross-border, cross-sector integration where emerging markets as the primary users of environmental technologies also become the innovators, improvers, developers and adapters of the technologies themselves.

## Multi-metier urgency

In many discussions, a major theme was the urgent need to act on climate change before it becomes too late. The sense of urgency was visible across the value chain from asset owners or asset managers to service providers, of which we are a part. Service providers are often more focused on short-term profitability and opportunities. They analyse only profit drivers that decide margins in the next one or two fiscal years, if not quarters. As climate change has been seen as a 'future' problem, issues related to climate change and related regulatory changes have not been given top priority. However, we believe that there is a fundamental shift happening in the approach to climate change-related aspects in the context of investment research, across asset classes. As the frequency of natural disasters and the concomitant economic losses are rising, the impact of these disasters is increasing. We believe that environmental impact analysis has become a key performance indicator for fundamental business success, apart from occasional assessment of the cost of environmental contingencies on coverage companies.

Environmental risks are becoming a critical parameter for fundamental analysis across multiple asset classes. This is the culmination of several factors. The present globalised economy is much more complex than the traditional linear supply chain, so a suitably large event will reverberate across the value chain. For instance, the Thai floods in 2011 had a large impact on the entire tech sector, proving beyond doubt that 'nothing happens in isolation' anymore. Supply chains are facing greater vulnerability from the potential failure of a single node in a particular geography due to a natural disaster. The growing importance of environmental risk assessment is also driven by the greater attention that upstream asset owners give to the impact of climate change on their portfolios.

Climate change is increasingly becoming a part of the operational risks of day-to-day portfolio management activities. The growing consensus among regulatory authorities for the need of legislative action is impacting portfolios. As Francois Perrin said, climate change is a wake-up call to investors to focus on fundamental research and long-term business drivers. According to *The GLOBE Climate Legislation Study (third edition)*, 18 of the 33 countries studied by Globe International made substantial legislative progress in 2012, while 14 countries showed limited development. The report also highlights that several developing countries such as Brazil, India and Indonesia made significant progress in 2012, while most developed countries made limited progress. The increased regulatory action is a significant factor behind the sense of urgency among the entire investment community.

Climate change and sustainability are increasingly becoming critical success factors for businesses and the investor community alike. The issue of adaptation and response to the environmental changes is core to any medium-to-long-term strategy planning of companies. We believe that environmental risk management is at an inflection point due to an increase in the frequency of costly natural disasters as well as increased regulatory activities across geographies. According to Bill McGrew, Portfolio Manager, Global Equity Corporate Governance, California Public Employees' Retirement System, long-term value creation requires effective management of financial capital, human capital and physical capital (which includes the environment). The biggest challenge for investors is identifying ESG priorities, in our view. Environmentally, companies in industries that significantly contribute to emissions or that operate in energy-intensive industries such as power and transport are facing greater risks, due to stricter regulations and the concomitant cost escalation. However, we believe that climate change risk cannot be overlooked by any sector (including the financial services sector) as the consequences are so broad and unpredictable and have cross-border, cross-sector ramifications.

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