



Climate Change & the Financial Sector: An Agenda for Action

A publication of Allianz Group and WWF

FOREWORD

Climate change poses a major risk to the global economy: It affects the wealth of societies, the availability of resources, the price of energy and the value of companies.

At the same time, the need to revolutionize the way we use energy opens up a new universe of options for economic development and social benefits.

The financial industry has a two-fold responsibility. On the one hand, it needs to prepare itself for the negative effects that climate change may have on its business and on its customers. On the other hand, it can significantly help mitigate the economic risks and enter the low-carbon economy by providing appropriate products and services.

Allianz Group and the World Wide Fund for Nature (WWF) have joined forces to produce a report that will advance the debate in the financial community, and to propose solutions. The report identifies risks for the sector which are due to climate change, and develops actions that demonstrate how integrated financial services companies, such as Allianz Group, can turn these risks into opportunities. Implementing these actions will mean big steps forward in developing sound business for a living planet.

WWF and Allianz Group will work together to implement the actions of this report and to make bold steps to help solve this global problem. Allianz and WWF strongly believe that companies that are ready to seize these new opportunities will ultimately be able to reap significant economic benefits.

This cooperation between Allianz and WWF is the first milestone towards raising the awareness of climate change among the financial industry and towards a broader dialogue aimed at improving the management of environmental risks.

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Executive Summary

1. Climate change is real

Climates have always been changing. But this time there is one big difference: the changes are principally man-made. The issue has become urgent because the pace of change is accelerating. This report identifies actions for key stakeholders: Allianz Group, its clients, co-financiers and policymakers.

Europe is not only warming 40 percent faster than the world as a whole, but has already sustained severe damage from climate change. Storms in 1999 and floods in 2002 each cost 13 billion euros, while a heat wave in 2003 cost 10 billion euros. Although no precise estimate of all future costs can be made, a European Commission paper puts the future cost of all the potential cumulative global damage at 74 trillion euros at today's value if effective action is not taken.

Climate change will have a multitude of effects on human society and on nature if we fail to take clear actions to slow it down. While milder winters may seem an attractive proposition for Europeans, it is a prospect that deceives. Climate change will lead to increased heat stress, a rise in insect-borne diseases, and increases in rates of skin cancer and food poisoning. Globally, climate change already results in about 160,000 deaths a year, and this is likely to rise sharply because of increasing shortages of food and water.

The extraordinary heat wave in 2003 caused 27,000 deaths in Europe and disrupted agriculture, inland shipping, and electricity production. Huge swathes of forests covering a total of 5 percent of Portugal's surface area were destroyed in a loss put at one billion euros.

By the end of this century such a summer could be routine. Mediterranean agriculture might be in a state of collapse. Everywhere in Europe rainfall will be more intense. The number of major floods in Europe has already risen from one per year to 15 in recent decades. In the UK, the annual cost of flooding this century will rise to as much as 30 billion euros. Businesses are increasingly reporting reduced profitability because of unusual weather. Many European Union holiday destinations will suffer – in a region where travel and tourism generate about 4 percent of GDP.

2. Climate change policies are changing the economics

Governments are starting to introduce policies to tackle the causes and combat the effects of greenhouse gas emissions (GHG), and these policies will alter the economics of entire industries. They will affect company share prices, both positively and negatively. Examples from industry show that proactive strategies tackling CO₂ emissions reap economic benefits. And climate change might not be the only reason for taking such steps. Other benefits of climate change policy might include reducing dependence on energy imports, achieving more reliable energy price levels, ensuring clean air, and creating jobs. The growth of carbon markets associated with emissions entitlements offers revenue opportunities for developing countries and more efficient companies, and will need a range of services from the financial sector. International emissions trading could be worth between 50 and 800 billion euros in 2025.

Climate change policies will have an effect on a number of industry sectors. The most sensitive sectors are either energy-intensive, such as cement, aviation, metals or energy industries such as oil and gas, coal, power utilities; or provide energy-consuming products such as automobiles.

The driving force behind much of the current carbon market activity is the EU Emission Trading Scheme (ETS). Some of the early warnings of huge effects in certain sectors seem unlikely now, but the current market price has climbed to over 20 euros per tonne of CO₂ (May 30) which is not negligible.

There has been a steady flow of research reports looking into the issue of carbon constraints on corporate earnings since 2002. They demonstrate that there are clear differences in the present value of corporate earnings, across a range of possible future climate policy scenarios. This means that managements and investors cannot assume that there will be time to react to policy when it is approaching implementation.

A WWF study found that certain electricity companies could face costs of as much as 9 per-

cent of gross earnings, though costs may be passed on, while low-cost producers can extract larger margins. A Dresdner Kleinwort Wasserstein (DrKW) study concluded that 8 out of 18 cement companies were overvalued by up to 13 percent.

3. Financial sector's need for consistent, long-term policy frameworks

To combat the negative effects of climate change consensus exists that the global average temperature should not increase by more than 2 degrees Celsius and rather stay below this threshold. This will imply a cut in annual GHG emissions of 60 to 80 percent by 2050 globally, from the current level of almost 7 billion tonnes of carbon to under 2.5 billion. In line with these targets, individual EU member states have already announced national greenhouse gas reduction goals that support a path of deep and consistent reductions. For example, France proposes a 75 percent reduction by 2050, the UK a 60 percent cut by 2050, and Germany is considering a 40 percent cut by 2020. However, specific actions are rarely defined beyond a horizon of 2012, the conclusion of the first Kyoto commitment period.

Early action is needed to provide greater certainty for business, long-term investment and technological change. Inconsistent policies or no policies at all simply deter investment. Among the inconsistencies: the EU subsidized fossil fuels by 24 billion euros in 2004 compared to 5.3 billion euros for renewable energy sources; and international transport fuel is tax-exempt. The best strategy would involve a mix of actions on energy efficiency, including conservation measures, renewable energy and switching to low CO₂ fuel and gases. Perhaps half of the potential growth in emissions could be saved by greater energy efficiency.

4. New risks and new demands for financial services companies

The financial services industry needs to adapt its internal processes and policies and its products and services to meet the challenges its clients face as well as to safeguard its own viability. To enable financial services companies to play a responsible role in mitigating climate change they require a reliable, transparent and international co-ordinated policy framework as well as long term, appropriated CO₂-reduction goals. That gives certainty for investment decisions and provides business opportunities for clients.

In order to adapt their own operations to the new challenge, financial services companies should include climate change risk in their internal governance procedures, in line with the existing financial corporate risk identification, controlling and reporting structures and best practice in reporting requirements.

INSURANCE

Climate change and climate policy affect insurers through the risks they accept from clients. Since climate experts predict changes in the intensity and distribution of extreme weather events (especially water-related and storms), and because of the resultant risk of catastrophic property claims, insurers are likely to regard climate change as a threat rather than an opportunity. The high number of tropical storms worldwide pushed insured weather losses in 2004 to a record 32 billion euros. While the incidence of tropical storms is not conclusively linked to climate change, their increased frequency is part of a pattern of higher activity.

Projections for the UK from the Association of British Insurers suggest that by 2050 the annual cost of weather claims will double to 3.3 billion euros, while an extreme year might cost 20 billion euros. In Germany the total exposure to flood damage in one event might be 15 billion euros. Climate change is increasing the potential for property damage at a rate of between 2 and 4 percent a year. Because insurance pricing relies on

historical data, this could lead to an underpricing of weather risks by as much as 30 percent due to the time lag between the historic data that is used to set prices, and the future period in which claims will occur. In Allianz's global industrial insurance business for example, around 35 to 40 percent of insured losses are already due to natural catastrophes – mainly floods and storms – so this could materially affect the overall profitability of insurers. Other effects are expected to include claims for loss of sales, heat stress among clients or staff, damage to vehicles, travel delays, and pollution from floods.

But climate change will also bring more demand for conventional risk transfer and open opportunities in new areas such as emission reduction projects.

Insurers' Agenda for Action:

- Gather information on future climate risks and thereby better predict and underwrite climate-associated risks.
- Control their exposure to natural catastrophes and other climate-related risks by developing adequate risk assessment tools such as flood zoning and establishing expertise for natural catastrophes.
- Upgrade risk assessment methodologies such as identifying potential new liabilities from carbon emission or using environmental due diligence screening of a company.
- Develop risk management expertise regarding low carbon technologies jointly with industrial clients to develop new products supportive of low carbon technology.

BANKING

Banks play an important role in climate-related financing and investment, credit risk management, and the development of new climate risk hedging products. On the downside, they face credit risks because policies to cut emissions can create costs for carbon intensive sectors and companies. Price volatility in carbon markets (CO₂, oil, gas, coal) and climate-related commodities leads to uncertainty in financial projections. For

example, the price of CO₂ varied between 5 and 20 euros per tonne in the two years to June 2005. But climate change also creates opportunities. According to the World Energy Council, the renewable energy market could be worth 1.4 trillion euros by 2020. The global carbon market in 2010 could be worth up to 200 billion euros, estimates Point Carbon. Exploiting the Kyoto Mechanisms could enhance project returns by up to 15 percentage points e.g. in methane reduction projects. Weather derivatives offer potential to banks: the total notional value of this market rose to 3.5 billion euros in 2003/04. Emission trading creates new relationships between corporates: cross-border, cross-commodity, cross-product, and that in an increasingly international context. Significant new investments will be required internationally in high value added technologies for both large and small scale aspects for each project. A key challenge here is to marry long-term investment horizons with short-term regulatory change.

Banks' Agenda for Action:

Banks taking leadership on climate change issues will therefore need to

- Review and optimize their own carbon risk management and (further) develop assessment tools applied to carbon risks and carbon risk reduction strategies (e.g. by using carbon related economic analysis for sectors or companies and/or by developing climate change related risk matrixes).
- Define clear risk requirements for clients regarding carbon risk reduction and market strategies (e.g. by discussing rating requirements with clients).
- Foster the development of carbon risk hedging products e.g. derivatives.
- Facilitate finance for public programmes that foster the introduction of low carbon technologies.

ASSET MANAGEMENT

Climate change is one of the most financially significant environmental issues facing investors today. It distinguishes itself in the fact that it has implications for a number of sectors that are exposed to policy-driven strategies to mitigate climate change. Therefore, understanding to what extent and how climate change will impact or enhance the value of investments is crucial if shareholder value is to remain protected. Although there is increasing evidence to suggest that climate change considerations are starting to permeate into investor thinking, it is an issue that as yet still lacks incorporation into mainstream investment considerations. Barriers exist in the lack of understanding of the implications and uncertainty around climate change policy and regulation which remain complex.

Furthermore, the availability of comparable and consistent data on companies' emissions levels, as well as tools to assess risks and opportunities remain limited. Looking at the asset management chain of responsibility – institutional investors, consultants, fund managers, financial analysts and companies – each face different challenges. But what is clear is that each one of them can take specific action, primarily to develop understanding and respective tools regarding the financial implications of climate change.

Specifically, fund managers and financial analysts should:

- Evaluate their client portfolios for climate change risks and opportunities in order to be able to respond to changes in climate change policy and legislation.
- Engage with company management to understand how climate change is impacting their business and what strategies they are employing to minimize its risks or maximize opportunities from it; educate clients about the benefits and processes being used to incorporate extra-financial issues in the management of their assets.
- Request and reward external research providers e.g. brokers to produce consistent, quality, long-

term research, which incorporates extra-financial issues such as climate change and integrate such issues into their mainstream analysis and investment decisions also by utilizing the help of their in-house or external SRI expertise.

5. Financing low-carbon energy

The solution to climate change is essentially to convert the world's economies to low-carbon technologies, through both alternative energies and more efficient energy conversion. Low-carbon energies can be a contribution to the mitigation of GHG emissions and a business opportunity for project developers and investors.

The future outlook for the low-carbon energy market is promising. According to the International Energy Agency investment in cleaner energy at present is USD 20 billion a year, mainly to solar and wind power, expected to grow to USD 100 billion globally within 10 years. Investment in renewables and clean energy technology rose 150 percent between the years 2000 to 2004, across a wide range of applications (efficiency, windpower, fuel cells, etc.).

The growing market opens increasing opportunities for financial services providers.

However, renewable energy technologies, given their innovative character, often face a number of additional barriers compared to other projects, e.g. technical problems or higher upfront costs. Therefore it is necessary to develop specific expertise and financial involvement in low-carbon energies and to diversify the risks of such energy projects.

6. Addressing climate change is crucial for the financial sector

Climate change will increase costs for the financial sector if no action is taken. Banks and investors in particular need a clear regulatory framework on climate policy which they can adapt and base their investment and lending decisions on, while insurers face the prospect of heavy losses.

Integrated financial organisations need to be aware that climate change could result in a compounding of risk across the entire business spectrum, diluting some of the benefits of diversification. For example, an insurer is exposed to property losses from extreme events, but so too is a property investor, and also a banker providing services to the property management sector. Furthermore, if the insurer seeks to reduce his risk by withdrawing cover, other stakeholders (investors, bankers etc.) are left with greater, uninsured risks.

Therefore, integrated financial organizations need to develop pro-active strategies to manage the increasing risks due to climate change.

Introduction

Human-induced climate change has rapidly become an important factor for the financial sector in its insurance, banking and investment activities. For centuries the financial sector has been involved in the management of climate variability through its provision of credit for seasonal cycles of agriculture, selection of suitable investment opportunities, and insurance against natural disasters, and has gained an invaluable fund of experience in that area. However, now the changes are not random, and the rate of change is accelerating. The details of the future climate are still unclear, and in fact they depend critically upon the way we manage our business and social affairs and use the land. It is clear that planning for the future properly, means anticipating different weather patterns and different economic structures from today's. The risks faced by clients will be different, and the returns on their present and future investments will change from the customary ones. The challenges will spring from a number of directions – physical changes in the environment, regulatory moves to limit greenhouse gas emissions, legal challenges to inadequate governance, reputational fallout from the corporate position on climate change, and competitive pressures as production costs shift and products are substituted in response to the new economics of a carbon-constrained world.

In matters that affect them and their clients, financial companies have a duty also to join the debate to ensure that the outcome is efficient. Because of their involvement in every strand of the economy, and their dependence in the long-term on sustainable economic development, integrated global financial companies like Allianz need to take a broad, objective view. This is par-

ticularly valuable, since their views ought to reflect the best outcome for society as a whole.

The position as assessed by this report is that there is already enough information to see that “business as usual” is not an option – the undeniable costs of prevention are less than the potential damage that could result. Nor is there time to wait while knowledge about the climate change process is improved, and energy technologies are refined – early reductions in greenhouse gas emissions avoid the need for much sharper cuts later. The main sections of the report discuss these points in more detail. Section 1 The Direct Cost of Climate Change assesses the evidence about the economic costs of climate change. Section 2 The Economic Implications of Climate Change Policies considers the business effects of policies and measures intended to reduce the growth in greenhouse gases. Section 3 The Necessary Path then discusses what the best option for climate change policy is in the light of the costs and benefits of sustainable development. In section 4 Financial Services: New Risks, New Opportunities we look at the implications of climate impacts and policies for the financial sector in its three main branches: insurance, banking and asset management. Section 5 Financing Low-Carbon Energy gives a more specific discussion of the concrete options to facilitate market penetration for sustainable technological solutions. Finally, section 6 Recommendations identifies the key messages, and action points for the principal stakeholders including Allianz Group, its clients, and policy-makers. Naturally, the specific mix of actions needs to be seen in the context of each financial market, but there are strong common elements throughout.

1

The Direct Cost of Climate Change

Climate change will touch almost every aspect of life. Here is an assessment of financial impacts – first, globally; with some emphasis on two key impact areas health and water; and, secondly, relating to Europe.

1.1 The Global Perspective

Climate change will alter weather patterns and make the sea rise. The overwhelming scientific consensus is not only that the change will be considerable, but also that change has already taken place because of greenhouse gas emissions. The most recent comprehensive global perspective is the 2001 IPCC Report¹, which warned that climate change could reach dangerous levels this century. The next IPCC report is due in 2007, but already it seems clear that, in the light of recent research, the risk will be revised upwards from the 2001 assessment (see Section 4 Financial Services: New Risks, New Opportunities).

Climate change will increase the unreliability of water supplies – both in quantity and quality. It will decrease agricultural yields in the tropics. It will cause a rise in sea levels and thus threaten to displace tens of millions of people from coastal settlements. It will cause extreme temperature

stress and cause shifts in the location of some diseases. And it will result in insurance losses from extreme events.

Putting a cost on climate change presents massive problems. Climate changes impacts are wide-ranging, cannot be modelled in detail, and trying to place a value on damage in the distant future poses problems that border on the philosophical.² In spite of these difficulties, an EU Commission paper puts the potential cumulative global damage at 74 trillion euros at today's value if action is not taken to prevent climate change. This amount is equivalent to a cost of 80–140 euros per tonne for CO₂, compared to the current market level of around 19 euros per tonne. More important, aggregating costs and benefits is misleading because gains for some are taken to cancel out losses for others.³ Tropical countries may be particularly exposed. Coral decay caused by temperature rises and acidification could cost over 200 million euros a year in the Caribbean. The cost of Hurricane "Ivan" that hit Grenada in 2004 amounted to twice the country's GDP.⁴ The adverse outlook for water, crops and sea-level rise in developing countries mean that more people will be harmed by climate change than benefit from it.

In the short term, the rich north would benefit because of warmer winters while the poor would

Country type	Temperature rise	Effect
Developing	Any	Generally net economic loss, increasing as temperature rises
Developed	Up to 2 degrees Celsius	Net economic gain
	From 2 to 3 degrees Celsius	Mixed or neutral
	Over 3 degrees Celsius	Net loss

Table 1
Macro-Economic Effect of Climate Change
Source: IPCC, 2001

become poorer. But even the wealthier nations would eventually have difficulties if climate change were to gather momentum, as shown in shown in Table 1. Even short term, problems in developing countries might destabilize the world economy. There are two reasons. First, an increasing proportion of industrial and service activity is located there, so that disruption would affect the whole supply chain. This has not yet been factored into the projections. Second, an increase in inequality could trigger criminal and civil disorder on a large scale.

These considerations are underlined by the possibility that climate change may accelerate due to chain-reaction effects as certain thresholds in the climate system are exceeded (see Box 1), leading to influxes of “climate refugees”.

The cost of natural disasters can be crippling for developing nations. The World Bank has inadvertently become the world’s third largest reinsurer after Munich Re and Swiss Re because it

has to divert so much of its development funds into disaster relief. Rich countries are vulnerable too, but they have the resources to cope. Japan for example has two million people living below high-water level, and assets of 400 billion euros in that zone. Climate change will double that exposure by 2100.

Among the concerns that Japan needs to deal with are heat waves. Each increase of 1 degree Celsius in air temperature reduces the efficiency of nuclear power plant by between 1 and 2 percent but at the same time increases demand by 5000 megawatts (MW).⁵

Water shortages are set to increase even in a stable climate simply because of economic development. Industry is greedy for water. 5 billion people will have inadequate access to drinkable water by 2025. Consumption is also increasing in countries where populations are growing and becoming wealthier. Climate change will worsen this in Central Asia, the Mediterranean region, south-

Box 1

Rapid Climate Change

Climate change projections depict a gradual increase in temperature and precipitation. However, prehistoric data shows that at least eight times in the past 11,000 years there has been an abrupt onset of a radical new state.⁶ Ice-cores show that the average temperature in Greenland shifted by 10 degrees Celsius in 5 years, and that annual snowfall halved within 3 years. One of the key triggers appears to be the failure of the Gulf Stream or thermohaline current (THC). Shutdown of THC could result in catastrophic changes in ice cover or vegetation, dramatic shifts in the water cycle, and a sharp drop in temperature for the North Atlantic and all those regions which border the

Atlantic (East Coast USA and Canada, Western Europe).

A study commissioned by the Pentagon⁷ concluded that “disruption and conflict will be endemic features of life” if abrupt climate change occurs, and that “many countries’ needs will exceed their carrying capacity” with consequent large population movements. Contrary to the Hollywood blockbuster “The Day after Tomorrow”, the possibility of this event occurring before 2100 is very small,⁸ and general planetary warming would cushion the effect to some extent.⁹ However, there are already signs of change in the North Atlantic: weaker currents,¹⁰ and changing temperature.¹¹

It is more likely that climate change could accelerate due to natural feedback mechanisms, such as the disappearance of tropical rainforests, the thawing of tundra, and the shrinking of ice-cover; all of which would speed up global warming by increasing the level of greenhouse gases, or the absorption of heat by oceans. Already the official UK climate models at the Hadley Centre are indicating such possibilities in some of their projections.¹² The changes would compound themselves, because natural systems (e.g. forests and rivers) might start to fail due to the high rate of change, and the risk of unstable weather patterns would also be much higher.

ern Africa and Australia by 2025, adding another 500 million to the water-deprived. Around the world, the land surface hit by drought has risen from 15 percent to 30 percent in 30 years.¹³ Many reservoirs in Australia are at only half capacity. A 2002 drought there cut farm output by 30 percent, lowered GDP by 1.6 percent, and cut 70,000 jobs.¹⁴ In Africa, the Maghreb faces a rainfall decline of up to 40 percent by the 2050s. This in turn carries the risk that refugees will be driven away by drought and start heading for the EU.¹⁵ In places like Peru, California and India, the loss of glacier water will cause problems for hydropower, agriculture, and consumers, and lead to an ultimate conflict over resources.¹⁶ In southern Africa, as much as 8 percent of GDP could be lost because of hydropower shortages.

Paradoxically, the flood risk will increase even in drought-prone regions because climate change concentrates precipitation. Warm air can carry greater amounts of moisture than cold air. When it rains, the run-off will be faster because of sun-baked surfaces. Rapid urbanization of low-lying coastal areas means not only an increase in population densities but also increasing levels of assets being placed at risk. The risk of urban flooding will increase due to outdated drainage and other infrastructure deficits. Individual country studies such as in Egypt, Poland, and Vietnam have estimated that the costs of rising sea levels will be in the tens of billions of euros. Although science remains unable to provide definitive information about future storms, it is notable that 2004 was a record year for both hurricanes in the USA and typhoons in Japan.¹⁷ The storms lasted longer than usual and reached further north than normal. In addition, Brazil was struck by its first-ever hurricane-like storm.

Temperature increases of up to around 2.5 degrees Celsius can have positive effects on food production. For example, milder winters prolong growing seasons in higher latitudes.¹⁸ The effect is less in the tropics because of the existing high temperatures.

Overall, the effects of climate change on human health will be adverse, particularly for the

poor because of their vulnerability to flooding and to heat stress combined with greater humidity and air pollution. Diseases like malaria will spread. Climate change already causes about 160,000 deaths a year because of hunger, poor water quality, respiratory problems, and drowning. This will be greatly worsened by shortages of food and persisting difficulties in obtaining clean water.¹⁹

1.2 The European Perspective

The facts make it clear that action needs to be taken urgently. A European Environment Agency report in 2004 said Europe is warming 40 percent faster than the world as a whole.²⁰ Across Europe the negative effects will be greatest in the south and east.²¹ Hot summers will double in frequency by 2020 (in Spain, they will occur five times as often) and increase tenfold by 2080. Cold winters will halve in frequency by 2020 and be non-existent by 2080. Summers will be drier in southern Europe and winters will be wetter in northern Europe.

Severe damage is already evident. Storms in 1999 cost 13 billion euros, floods in 2002 13 billion euros, and a heat wave in 2003 10 billion euros. A total of 14 climate-related incidents since 1987 have cost over 75 billion euros, while the annual cost of climate disasters in the EU region has doubled to 8 billion euros in 20 years.²² By 2070 rivers in southern Europe will be carrying half the water they do now while those in the north will be carrying half as much again. Even in regions that become drier, rainfall will be more concentrated. The risks of flooding will rise. An analysis of catastrophe damages suggests that a 1 percent increase in precipitation is associated with losses of up to 2.8 percent.²³ Already the number of major floods in Europe has risen from one per year between 1900 and 1974 to 15 a year between 1993 and 2001.²⁴

In the UK, floods cost 1.5 billion euros a year. By 2070, this could be twenty times as much.

10 percent of UK property with a value of 300 billion euros (5 million people in 2 million homes) is at risk from flooding. The Thames Barrier can be improved but the limits to protecting London are expected to be reached in the 23rd century – or about 150 years from now. This is because in practical terms, flood defences can only be raised another 2 meters.²⁵ Good emergency warning systems mean that deaths from flooding are relatively low.

The extraordinary 2003 heat wave caused 27,000 deaths in Europe and massive social disruption.²⁶ Agriculture and inland shipping were badly hit, power supply was affected as nuclear power plants had to be shut down. This was said to be the hottest heat wave in a thousand years. While it is possible that the heat was part of a natural fluctuation in weather patterns, some specialists believe the probability that human influence caused the heat wave to be at least 75 percent. The probability of similar heat waves is projected to increase a hundredfold over the next decades.²⁷ The upshot might threaten the very existence of agriculture in Southern Europe. An insight into the potential for destruction came in 2003, when forests covering a total of 5 percent of Portugal's surface area were destroyed in a loss put at one billion euros.²⁸ Any benefits in the north from an extended growing season and CO₂ fertilization may be cancelled by pests, weeds, and drought. Warmer winters will benefit health in Europe, but the negative consequences will include increases in the incidence of heat stress, tick-borne diseases, skin cancer, and food poisoning.²⁹

The burden of the changes will be uneven. Some economic sectors such as the construction industry might benefit from climate change³⁰. Others, such as manufacturing, are climate-neutral. But still others, such as insurance, water and travel and tourism, are vulnerable. Often the immediate physical effect will be dictated by geography but the impacts are not limited to the direct physical results. Increasingly, businesses report unusual weather affecting profitability. Travel and tourism generate about 4 percent of GDP in the EU. Preliminary calculations with the

Mieczkowski Tourism Climatic Index indicate that many more locations will become unattractive than will gain from climate change. For example, Seville could become too hot for comfort by 2020. Elsewhere, lower Alpine ski runs are already relying on artificial snow. Traditional activities like winemaking in France and Spain may become non-viable in some regions. Golfing at traditional coastal sites might be so badly hit by the weather as to be placed in jeopardy.³¹

Farming accounts for 1.7 percent of the EU's GDP (more in accession countries) and employs 4.2 percent of the workforce. A temperature increase of up to about 2 degrees Celsius might result in increased yields. However there will be problem years and problem areas. The 2003 heat wave caused losses of between 30 and 40 percent of the grain crop, while 4.5 million chickens died in France. Bad harvests in Russia are expected to double by 2020 because of drought, with some regions likely to face a decline in yields of up to 40 percent by the 2070s.³² Forestry productivity in northern Europe has already increased by 10 percent, but water shortages and heat stress in the south will cause drought, wildfire, erosion and desertification.

For economic activity, what matters is not necessarily changes in average temperatures or rainfall but changes in climate extremes. For example, models suggest that temperatures of average summers in Prague will rise by 3 degrees Celsius, but that the heat wave temperatures could rise by 10 degrees Celsius. Similarly, the incidence of heavy rain there will increase by 20 percent at the same time as overall rainfall declines by 20 percent.³³ Such patterns are already emerging elsewhere.

Table 2 presents data from UK rainfall and temperature statistics, which reach back further than any other source available. Extremely warm months are occurring almost three times the statistically predictable levels; a change that began suddenly in the 1990s. Since then, cold months have almost vanished. This period has seen a number of severe storms, and also an increase in soil subsidence. There is no clear sign of a trend

towards either “wet” or “dry” months, but the current decade has been hit by severe flooding. A sector which is clearly exposed to extreme conditions is the insurance industry, but this is ameliorated by the fact that, outside the UK, the risk is often borne formally or informally by the state or by the victims themselves.

Conclusions

1. Potential losses from climate warming are incalculable in detail, but a European Commission paper estimates a global figure of 74 trillion euros if effective action is not taken.
2. Rises in sea level will threaten to displace entire coastal communities and destroy their assets with severe disruption to adjacent regions and the finance sector.
3. Poor countries will be the first to be hit by climate change, but this will set off a reaction in the supply chain that will eventually affect wealthier countries.
4. Widespread drought and shortages of water will lead to problems for agriculture, hydro power and, ultimately, to a conflict over resources.
5. In Europe, where warming is happening faster than elsewhere, flooding is already costing huge amounts, with worse to come.
6. Health systems will need to come to terms with increases in certain diseases such as skin cancer as climates warm.
7. Insurance companies were the first financial sector companies affected by the impacts of climate change. Today the impacts extend to literally all branches of the sector.

Type/decade	1960's	70's	80's	90's	2000's
Hot	10	17	18	34	33
Cold	5	7	8	3	0
Wet	14	11	19	15	26
Dry	10	15	10	15	2

Table 2
Number of Abnormal Weather Months per Decade in UK
 Expected level is 12 per decade. Threshold for abnormal is the 10-percent level. Data from the Hadley Centre website. 2000's prorated to observed period.

2

The Economic Implications of Climate Change Policies

*The problems of climate change have their origins in the greenhouse gases created from economic activity.*³⁴ Because these emissions were once considered as harmless by-products, their side-effects were not included in the cost of production. Even as economic progress was giving millions of people higher standards of living, climate change remained a nebulous concept that would take place sometime in the future and not a visible, immediate issue.

This means that deliberate intervention is needed to alter behavior patterns.³⁵ In 1992, the countries of the world met under the auspices of the United Nations and agreed on the United Nations Framework Convention on Climate Change (UNFCCC). The key aim of this is to avoid dangerous climate change while permitting economic development. The primary objective is to reduce emissions from economic activity, and the second is to lessen the impact of unavoidable climatic changes. Under the UNFCCC, strategies to control greenhouse gas emissions and limit damage from climatic extremes are known as policies and measures respectively for *mitigation* and *adaptation*. Mitigation policies draw the most attention, because they affect the whole economy and often feature unfamiliar regulations. Adaptation is directed only at vulnerable activities, and may simply be an extension of current measures. The key instrument is the Kyoto Protocol (see Box 2).

2.1 Mitigation Policy

Mitigating the effects of climate change is not as expensive as many people think. Often there are significant, immediate benefits such as clean air and new jobs.

Carbon emissions could be cut by between 20 percent and 40 percent by 2020 using current technology, estimates the Intergovernmental Panel on Climate Change. It says half that reduction would cost nothing extra while the rest would be subject to a modest cost of around ten euros per tonne of CO₂.³⁶

Efficient lighting can cut lighting bills by between 50 and 75 percent with a payback in one to three years.³⁷ BP claims to have saved 500 million euros over three years by introducing voluntary internal carbon constraints, encouraging its workforce and management to seek both greater efficiency and new sources of revenue from by-products.³⁸ Similar stories come from other members of The Climate Group, an association of companies, cities and regional administrations devoted to spreading good practice in the area of climate change.

But climate change might not be the only reason for taking such steps. Other reasons might be reducing dependence on energy imports, achieving more reliable energy price levels, ensuring clean air, or creating jobs (45,000 new jobs were created in wind power industry in seven years).³⁹

Another benefit of mitigation is the incentive to innovate. The development of wind-powered electricity is a prime example. Ultimately, supplies of conventional gas and oil need to be replaced anyway. Similarly, the growth of carbon

markets associated with emissions entitlements offers revenue opportunities for developing countries and more efficient companies, and will need a range of services from the finance sector. International emissions trading could be worth between 50 and 800 billion euros in 2025.⁴⁹

Policy is only beginning to take into account climate change as an economic factor. Policy innovations include price guarantees for renewable energy, quotas for non-fossil fuels, energy-efficiency standards, compulsory and voluntary limits on emissions, and emissions trading schemes (cap-and-trade schemes, see Box 3).

The EU has in fact a wide range of policy initiatives in place or in prospect to fight climate change, and will have to develop further ones.

Outside the EU, various sub-federal initiatives are being implemented, notably in the United States, Canada, and Australia.

2.2 Effects on the Corporate Sector

Carbon constraints will mean different things for different sectors. Studies show, for example, that the effects on corporate earnings for the motor industry worldwide would vary considerably. Earnings for some manufacturers would increase while others would decline.

Other reports indicate that earnings globally in the oil and gas industries would be neutral in some cases and down in others, and that the variation would be less than in the motor industry. The gas sector stands to benefit from changes. Metals and mining – especially aluminum and steel – would be vulnerable. Electricity and water utilities would generally be able to minimize financial impacts by passing costs on to the consumer, although one study did suggest that coal-based utilities were in some cases unprepared while some utilities were not always in a position to pass on costs. The option of passing on those costs depends on the price sensitivity of demand,

Box 2

The Kyoto Protocol

The 1997 Kyoto Protocol was the first substantive agreement to mitigate global warming under the United Nations Framework Convention on Climate Change (UNFCCC). “Annex 1” (38 developed countries) agreed to reduce their emissions of six greenhouse gases by a total of 5.2 percent between 2008–2012 from 1990 levels. The six gases include carbon dioxide (CO₂), methane, nitrous oxide, and three fluorocarbons. Other countries agreed to adopt positive measures, but without any binding targets. A share of the Annex 1 obligations to reduce the emissions can be achieved via three flexible mechanisms: Interna-

tional Emissions Trading (IET), Joint Implementation (JI) and the Clean Development Mechanism (CDM). Under IET, industrialized countries can trade part of their emissions budget known as Assigned Amount Units (AAUs). In principle, this trading regime applies to nation states, although the participation of companies is not explicitly excluded. JI and CDM are project-based mechanisms, since new emission certificates are generated via specific emission reduction projects. Under JI, an industrialized country invests in an emission reduction project in another industrialized country and receives

credits for achieved emission reductions – so called Emissions Reduction Units (ERUs). Under the CDM, an industrialized country invests in a project in a developing country and obtains credits for emission reductions called Certified Emissions Reduction Unit (CERs). The Kyoto Protocol entered into force on February 16, 2005, but was somewhat diminished in impact by the non-ratification of key parties, including the United States and Australia.

In addition to the Articles on mitigation, there are also important ones on adaptation, particularly for developing nations, and awareness-raising.

Box 3

EU Emissions Trading Scheme (EU ETS)

The EU ETS is a so-called “cap-and-trade” scheme regulating industrial CO₂ emissions in the EU 25. The scheme started in January 2005. The first phase runs from 2005–2007, the second phase runs from 2008–2012, coinciding with the first Kyoto Protocol commitment period. About half of EU CO₂ emissions are covered by the scheme. It is targeted at large individual energy-using installations in defined economic sectors: mainly energy production, metals, construction materials, and paper. As a market-based mechanism the ETS ensures emissions are reduced most cost-efficiently, the cap giving effective control over total emission amounts.

Each EU country has to develop a National Allocation Plan (NAP) outlining the total number of emissions allowances (EUAs) allocated (free of charge) to the

individual installations covered by the scheme. According to the European Commission, the allocation of allowances should be in line with the member states’ Kyoto commitments. At the end of each year, each site must surrender sufficient allowances to cover their CO₂ emissions for that year. Failure to do so will result in fines – 40 euros per tonne of CO₂ in the first period, and 100 euros in 2008–2012. In addition, the deficit must be compensated for in the following year.

Companies can meet their targets by implementing measures to reduce CO₂ emissions or by buying surplus allowances from other firms i.e. trading. The so-called “linking directive” from 2004 allows emissions credits from JI/CDM projects under the Kyoto Protocol to be used within the EU ETS.

as well as market regulation and market inefficiencies. Even more challenging for utilities is to make investment decisions to replace or upgrade existing infrastructure today while at the same time accommodating the long-term outlook of decreasing future emission allocations.

The driving force behind much of the current carbon market activity is the EU ETS (see Box 3). Although it started on January 1, 2005, it is still evolving as emissions allocations had not all been approved by that date. Some of the early warnings of huge effects in certain sectors seem unlikely

now, but the current market price has climbed to over 20 euros per tonne of CO₂ (May 30) which is not negligible. The International Energy Agency believes the effect of the EU ETS on international competitiveness of whole economies is marginal, as eligible companies receive “free” entitlements for most of their emissions. Nevertheless, sensitive sectors are the energy-intensive industries (cement, metals), or those which produce energy (oil and gas, coal, power utilities). Rising power prices combined with rising oil and CO₂ prices are likely to negatively impact energy intensive industries located in Europe, in particular when the rate of growth in Chinese demand is slowing.

There has been a steady flow of research reports looking into the issue of carbon constraints on corporate earnings since 2002. Naturally the earlier findings were somewhat speculative, because the status of the Kyoto Protocol was uncertain, and the EU ETS was not well-defined. The fact that the studies come from different sources (banks, investment brokers, policy analysts, energy industry institutes etc) and are broadly in agreement means that one can use them to frame strategies.

In some cases the analysis is simply qualitative, but it may still be useful given the great uncertainties in policy implementation, and the fact that climate change is only one influence on corporate performance.

Most of the results below relate to the EU ETS specifically. However the first three are broader, and contain an important general message. They demonstrate that there are non-trivial systematic differences in the present value of corporate earnings, across a range of possible future climate policy scenarios. This means that managements and investors cannot assume that there will be time to react to policy when it is approaching implementation, because there are strategic structural factors such as access to resources and technology, or customer mix, which take longer to shift. A second point that recurs is that some sectors face several environmental challenges, and that tackling greenhouse gas emissions may interact with some of those other problems.

A study of the general effect of climate policy on the *automobile industry* across the world by The World Resources Institute (WRI) concluded that the effect of carbon constraints on the corporate earnings of individual companies ranged from an increase of 9 percent to a decline of -10 percent, reflecting factors such as the likely compliance costs to match potential emissions controls on vehicles and the manufacturer's customer mix. Most interestingly, the study examined a range of scenarios and concluded that a company such as Toyota which had a strong R&D program on technologies that might replace the internal combustion engine would have a distinct advantage in every scenario.⁴¹

A second study in the same general, non-EU series by WRI looked at the *oil and gas* sector globally, again using a scenario approach to issues such as the Kyoto Protocol and found systematic differences, but over a smaller range, from marginally positive to a decline of -5 percent in earnings.⁴² Curiously, Exxon Mobil, which has campaigned against early action on climate change, was not as vulnerable to mitigation policy as some other petrocarbon companies.

ABN/AMRO carried out a multi-sector study, which identified *metals and mining* as the most affected industry, particularly aluminum and steel.⁴³ On the other hand gas (the cleanest fossil fuel, and an easy substitute for coal) and platinum (for fuel cells) will benefit. The analysts felt that electricity and water companies would be relatively unaffected because costs could be passed on to customers. Car manufacturers might face potential brand issues (along the lines of the campaign "what car would Jesus drive?"). Cement companies in Annex 1 countries might be forced to focus on special-purpose products because of external competition. The study named individual companies in each sector as winners or losers but the selection was different from other analysts and not quantified.⁴⁴

Turning now specifically to EU ETS, in an early study of the *power sector* DrKW rightly felt that emissions regulation was inevitable. If a tough allocation of permits was adopted the effect on

wholesale electricity prices might be as much as a 70 percent increase. Initially, it looked as if the National Allocation Plans (NAPs) would be too loose, but then they were tightened by the European Commission. In fact, DrKW had already foreseen two years ago consistently high prices for CO₂ of above 15 euros per tonne. UBS adopted a four-scenario approach to look at company prospects. It found that coal-based utilities (such as RWE) faced an uncertain future, with a spread of 70 percent in valuations. By contrast, the British utility SSE was stable with positive upside in all four scenarios, because it would receive a windfall benefit (free emission allowances). The sector would become less "commodity-like" with premiums for "green electricity", and merger and acquisition activity might be stimulated. The effects would ripple along the value chain to fuel suppliers, and heavy consumers.⁴⁵ Power companies do have a range of options to respond with the exact choice of which would depend on the carbon price, and factors like vertical integration, availability and use of renewables, and diversification intentions.⁴⁶ WWF commissioned a study of utilities which found that companies in phase 1 of the ETS were unprepared. Some could be affected by up to 10 percent of earnings because it was not always able to pass on costs. Accepting the considerable uncertainty on NAPs, companies could still plan responses such as switching from coal to gas. Wholesale electricity prices in the UK might rise by over 5 percent, the report said, but this now seems unlikely.⁴⁷ Other environmental issues that interact with climate change here are acid rain, water quality (outflow from cooling), and landscape aesthetics.

The effect of emissions trading on the energy sector should soon be clearly visible as an important factor in investment decisions regarding generation assets, i.e. technology and fuel choice.

Cement currently accounts for 5 percent of global CO₂ emissions. These emissions are growing at 4 percent per year. CO₂ emission reductions in this sector can be achieved by a number of strategies. However, to achieve deeper long-term cuts new ways to reduce the CO₂ impact of the

cement sector will have to be developed. Uncertainty over the allocation of emissions permits does not provide the necessary incentives for the industry.⁴⁸ Other construction materials (such as glass and clay) have strong local pricing power, which enables energy costs to be absorbed, or cannot be transported long distances. A DrKW study of the impact of EU ETS reduced target share prices on eight out of 18 companies in the cement sector by up to 13 percent and altered investment recommendations on several.⁴⁹ This is broadly confirmed by McKinsey, whose experts note that while on average the effect may not be great, the impacts will vary greatly between companies depending on individual circumstances, and also what other mitigation measures are in hand in firms' primary areas.⁵⁰

Some energy-intensive sectors – like the *aviation sector* – are not within the ambit of the EU ETS so far. However, the sector is growing so rapidly, at about 5 percent per year, and its impact is so large (possibly 10 billion euros in terms of climate damage) that it cannot be ignored by policy makers much longer. Potentially 15 percent of total human-induced climate change may be due to the aviation sector by 2050.⁵¹ Both a fuel tax solution and the inclusion of the aviation sector in emissions trading are currently being discussed on the political level – the airlines themselves (e.g. Lufthansa and British Airways) prefer emissions trading.⁵² Due to the large impact of the sector on climate change, climate policy regulations for the sector could have considerable consequences for the cost calculations of the airlines. DrKW estimates that corporate profits could be reduced by 10–15 percent by an EU-wide fuel tax.⁵³

The related sector of *travel and tourism* generates about 4 percent of GDP in the EU, and, mainly because of “sun, sea and sand” tourism, accounts for about 0.75 percent of global greenhouse gas emissions from Northern to Southern Europe.⁵⁴ As shown in section 2 The Economic Implications of Climate Change Policies, this industry is vulnerable to direct climate impacts, so it faces a doubled exposure to climate change if the cost of travel rises because of higher energy

prices. It has been ignored in investment studies, probably because its market capitalization is small. But the social impacts could be very large – it is a high employment sector, and also ranks high in consumer awareness.

Finally Nikko and Citigroup note a number of opportunities in power technology as climate change policies begin to show effect. Energy efficiency technologies as well as renewable energies will likely provide increased opportunities for financiers.

2.3 Effects on the Consumer Sector

Consumers will be affected by emissions regulations indirectly through the cost of goods and services⁵⁵, and also through increasing emphasis on energy efficiency in household and transport use.

In the EU, the price effect of industrial sector regulation will generally be small, at least until the second phase of the Emissions Trading Scheme. The effect on high-street prices will be minimal; many non-energy factors in production process will be little affected. Although the impact is likely to be greater between 2008 and 2012, when the Kyoto Protocol targets have to be met, governments are likely to be careful about taking direct action that might hit the consumer sector such as introducing steep increases in energy prices or raising taxes.

Increasing emphasis will be placed on energy efficiency, and the setting of energy performance standards for all major types of equipment (cars, domestic appliances) as well as real estate (see Box 4). Though the capital cost of more efficient equipment may be higher, the “whole-life” cost may be less once energy savings and reduced maintenance are allowed. Voluntary standards run the risk that consumers will opt for “cheaper” equipment, ignoring the savings that come later.

Once consumer hardware becomes generally more energy efficient, policies leading to energy

EU Energy Performance of Buildings Directive

European Member States will have to implement the Energy Performance of Buildings Directive (EPBD) by January 4, 2006 at the latest. It is intended to bring about a major uplift in the efficiency of energy consumption in building stock, which accounts for 40 percent of EU final energy demand. There are four key measures: introduction of a sound methodology to calculate energy performance;

application of minimum standards to new buildings and larger old buildings at the time of major renovation; certification of buildings' performance when built, sold, or rented; and regular inspection of heating and cooling systems. Only industrial and historic buildings are excluded, and any buildings frequented by the public will have to display a certificate of energy efficiency.

price increases will gain more widespread acceptance. The value of older equipment and property will decline in relative terms as their running costs increase. For consumer goods which are quickly replaced, it would be ideal if this entire process could take place within the time frame of the Kyoto Protocol – that is, by 2012. For property, the situation is more complicated because demographic trends and ownership patterns vary markedly across the EU, as does the replacement rate of domestic property stock. (Currently only about 0.1 percent of the UK housing stock is demolished every year).

A key element in getting consumers to play a part in emissions reduction is education. One consequence of higher efficiency is the “rebound” effect. Instead of accepting the savings from reduced consumption, consumers change their behavior to raise consumption back to previous levels. They increase home heating or drive farther or faster. Consumers need to learn to be energy-wise, to monitor consumption and to consider whole-life costs. For people with less disposable income such as the elderly or single parents, even small cost increases from climate policy may be burdensome, and policymakers will need to consider this.

Conclusions

1. Managements and investors should not assume they will have time to react to policy when it is approaching implementation. Proactive engagement with policymakers to plan ahead for business changes is required.
2. Climate change mitigation measures are often inexpensive, and the savings and side benefits may accrue quickly.
3. Governments need to bring in unambiguous policies so investors are not deterred. Companies need clear signals and directions from policymakers about future climate change related regulations.
4. Carbon constraints will have different effects on the earnings of companies, both from sector to sector and within sectors.
5. Some measures to combat climate change will have significant side-benefits as well, such as reducing reliance on imports, stable energy prices, cleaner air, employment and innovation.

3

The Necessary Path

Since the last report of the International Panel on Climate Change in 2001 much new evidence has arrived showing that the risk of climate change is considerably worse than previously thought. The sensitivity of the climate system has been underestimated (see Box 5). New factors like acidification of the ocean have been identified⁵⁶. The disappearance of polar icecaps^{57, 58} and tropical forests⁵⁹ is almost inevitable, unless we act soon.

3.1 Avoiding Dangerous Climate Change

Climate has to be measured in many ways for an accurate picture, but the key statistic is the average temperature. The Earth's temperature takes a long time to respond to changes in the atmosphere, because the land and water are so massive. Waiting until the temperature has stabilized is therefore not an option, because damaging impacts may arrive before equilibrium is reached. The alternative is to select a level of greenhouse gases in the atmosphere that seems likely to just avoid causing a "dangerous" equilibrium temperature and aim to remain below that. Atmospheric levels of concentration in gas are measured in parts per million by volume of carbon dioxide equivalent or ppmv cde. There is growing international consensus that global average temperature should not increase by more than 2 degrees Celsius and rather stay below this.

Box 5

The High Sensitivity of the Climate System

Recent observations of the atmosphere show that pollution has been dimming the sun's radiation and so slowing down the pace of climate change, perhaps by as much as half. Unfortunately, it also has serious immediate effects on plant growth, human health, and rainfall, so it cannot be allowed to continue. If it is elim-

inated it will effectively double the rate of global warming.^{60, 61} A second source of concern is that because of their huge size, very few variations can be tested on climate change computer models (General Circulation Models, or GCM's). The standard projection given for climate change is a temperature range by 2100 of 1.4 to

5.8 degrees Celsius. A recent novel experiment took advantage of the spare capacity on domestic personal computers to try out thousands of plausible variations and found that the range was extended at the top end to 11.9 degrees Celsius, which would be catastrophic.⁶²

Because of these factors the European Heads of State stated that the global average temperature increase should not exceed 2 degrees Celsius.⁶³ Earlier, the European Environment Ministers⁶⁴ stated that this temperature stabilization would mean require staying well below a GHG level of 550 ppmv cde, which is double the natural level of CO₂. This implies a cut in annual GHG emissions of 60 to 80 percent by 2050 globally, from the current level of almost 7 billion tonnes of carbon to under 2.5 billion. In line with these targets, individual member states have already announced national greenhouse gas reduction targets that support a path of deep and consistent reductions. For example, France is aiming at a 75 percent reduction by 2050, UK a 60 percent cut by 2050, and Germany 40 percent by 2020. However, the most recent evidence on climate change processes reduces the safe level of GHG's by about a quarter. Therefore, to limit the rise in temperature to under 2 degrees Celsius with high confidence means aiming for 450 ppmv cde, not 550.⁶⁵

By 2004 the GHG level was already over 400 ppmv cde and rising at 2 ppmv each year⁶⁶. It is clear that urgent action is needed to address the divergence between what we are doing and what we need to do and that using less energy, or using carbon-light technologies will be needed to compensate for this. In fact, because we are not maintaining a stable level of emissions but increasing them, it will require double the effort to achieve a safe concentration of greenhouse gases in the atmosphere. Therefore deeper and faster reductions of greenhouse gases will be necessary. For governments, "waiting for more scientific certainty does not appear to be sound".⁶⁷ Delaying action by 20 years could mean reducing emissions very rapidly later (three to seven times faster to meet the same target). On the other hand, early action overcomes the inertia of the climate and socio-economic systems, and provides greater certainty to business for long-term investment and technological change. To take an analogy from physics, the static friction that prevents movement is much greater than the kinetic friction that opposes a moving body.

3.2 What is Good Policy?

*A key issue is finding policies that work. Because there are many barriers to change (such as the long-life of capital stock, fear of risk, problems of scale, transition from laboratory to marketplace), to inspire confidence and innovation policies must be "loud, long and legal".*⁶⁸ That is, they must be unambiguous, well-signalled in advance, and enforced reliably. Cinergy, a major coal-dependent utility in the USA, has publicly called for emissions regulation by the federal government, because there is a proliferation of sub-federal initiatives, but more importantly because investing in cleaner technology is expensive and cannot be justified economically without a change in operating regulations.⁶⁹

At present, businesses are faced with mixed signals on energy technology. EU-15 subsidized fossil fuels by 24 billion euros in 2004, compared to 5.3 billion for renewables. International transport fuel is tax-exempt, yet air transport is the fastest-growing source of emissions.

Absence of policy is in fact worse than unfavorable policy, since the risk of policy change deters any investment. Long-term policy planning can have a strong payback in economic terms. Providing 10 years warning of a fiscal tax can reduce the "cost" by one-third as efficient processes can be implemented beforehand. Costs will be lower if new technology is introduced as part of the business cycle. Much of EU power capacity needs to be replaced within the next 20 years (at a cost of 1.2 trillion euros), which raises serious issues for those countries and companies in particular that currently operate on the basis of a fossil-fuel heavy generation portfolio or electricity sector. If the restructuring can be accomplished with low-carbon technology, new plants will not have to be retired early. Developing countries like China and India are expanding rapidly, with huge investments in new infrastructure and buildings. Both situations offer a golden chance to introduce climate-friendly solutions in the course of economic expansion or replacement.

Creating new energy technologies can be costly and risky. Generally this means that it does not suit investor's requirements. The private sector operates on a short duration-high risk to long duration-low risk front. Unfortunately, this is the reverse of technological development, where the longer the gestation, the higher the risk. This means that governments need to provide support for lengthy programs to reduce the risk profile. Yet globally, government energy R&D has fallen from a peak of over 10 billion euros in 1980 to under 6 billion in 2001, and most of the spending was concentrated on nuclear power. Some countries also heavily subsidize fossil fuels at the expense of funds available for new technologies. Policy changes are creating a perception of greater risk for investors in the energy sector due to increased uncertainty about fossil fuel economics. This can be countered to some extent by reducing the uncertainty in renewables, but in such a dynamic situation it seems inevitable that investors will have less appetite to participate in the energy sector until policies have crystallized and new business models have emerged and stabilized.

A second area of concern for the private sector is the so-called "valley of death" for innovators. To get from pure research to the marketplace, innovations have to pass through a number of stages, from basic R&D to demonstration, to niche market and then full commercial production. Governments are often prepared to support the initial phases of innovation, but are reluctant to "pick winners" – that is, to support manufacturers in the wind-up to full-scale production and marketing, between the demonstration to niche market phases of development. Since this is a "cash-burn" situation, when the costs are still high and the revenue is insignificant, it is unattractive for investors. Nevertheless major American institutional investors have announced a target of investing 400 million euros into clean technology including renewable energy in the near future, and have set up the organizational structures to achieve this with external advisors. Allianz's private equity arm Allianz Capital Partners has

entered renewable technologies. So far, Allianz has bought the wind power gearbox manufacturer Hansen Transmissions for 132 million euros. More major investments will follow.

A crucial issue is how climate change will be tackled internationally. There are many possibilities. The finance sector would like to know now what goals for emissions will be set for after 2012, when the first Kyoto Protocol commitment period ends and what instruments will be used to achieve them. Financial companies see emissions trading systems as having great potential in emissions reduction efficiency with a range of business opportunities. This requires transparency and reliability in rules and regulation, based on a clear downward path for reduction targets to achieve the required CO₂ target levels.

The sector would also like to see developing countries involved in a way that utilizes market mechanisms such as emissions trading.

Conclusions

1. To avoid dangerous climate change, very large cuts in greenhouse gas emissions are required, of the order of 60 to 80 percent by 2050.
2. This means a big shift in energy policy now. Governments need to bring in unambiguous long-term policies so investors are not deterred by the increased riskiness of energy projects.
3. Climate change mitigation measures are not always expensive, and the gains are not always only in the long-term.
4. Carbon constraints will have different effects on the earnings of companies, both from sector to sector and within sectors.
5. Some measures to combat climate change might be introduced for other reasons as well, such as reducing reliance on energy imports or to avoid energy price volatility.

4 Financial Services: New Risks, New Opportunities

Climate change is creating new risks but also new opportunities for all sectors of society from changing weather conditions to greenhouse gas abatement measures. The financial services industry needs to adapt its internal processes, policies, products and services to meet the challenges its clients face as well as to safeguard its own viability. This survey looks at each of the three branches of financial services – insurance, banking, and asset management – as well as issues that affect institutions in all three.

4.1 Insurance

Climate change and climate policy affect insurers through the risks they accept from clients. Since climate experts predict changes in the intensity and distribution of extreme weather events (especially water-related and storms), and because of the resulting risk of catastrophic property claims, insurers are likely to regard climate change as a threat rather than an opportunity.

Insurers need to adapt to climate change by assessing how changing weather patterns will influence their clients' exposure. They must adapt their risk assessment and review their underwriting (pricing, contract conditions and risk acceptance procedures) with a view to their specific risk exposure (line of business, geography, etc.), and business opportunities as well as the type of customer (private, commercial, industrial) they are focussed on (see Table 3).

Beyond this core business activity, mitigation offers some interesting new opportunities for insurance. In some cases, insurers may be able to

assist clients that are involved in renewable energy or energy efficiency technologies. In this way the insurance industry can offset its short-term risks arising from polluting and inefficient technologies and also decrease its long-term risk arising from extreme events.

4.1.1 Adapting to Climate Change

IMPACT ON INSURANCE

Adapting to climate change is a huge challenge for insurance. Insured weather losses from property damage in 2004 hit a record 32 billion euros because of severe storms in Japan and USA.⁷⁰ Such storms, their frequency, location, timing and intensity are a strong indication of climate change. Their occurrence is also part of a strong upward trend in catastrophe costs in other locations like Europe⁷¹ and Australia.⁷² A study by the Association of British insurers has found that climate change is increasing the potential of property damage at a rate of 2 to 4 percent a year. Since insurance pricing relies on historical data, this could lead to an underpricing of weather risks by as much as 30 percent.⁷³

- In Allianz's global industrial insurance business, for example, around 35 to 40 percent of insured losses are due to natural catastrophes. More than three quarters of these losses are from storms and floods, so the overall effect of ignoring a trend would be serious. Potentially, climate change will make storms worse because a warmer atmosphere will contain more energy and transport more rain.

Here, research in co-operation with modelling centers is necessary to better identify regional

impacts of climate change. On balance, climate change in Europe may prolong human life because of milder winters, but it could also bring increased burdens for health insurers and pension funds. Other effects are expected to include claims for loss of sales, heat stress to clients or staff, damage to vehicles, travel delays, and pollution as a result of floods.

How insurers react to trends or scientific evidence varies greatly between the lines of insurance. For industrial and large commercial clients, contracts are renewed every year and the portfolio can be totally altered, taking into account

the number of contracts in regions particularly exposed to risk of climate change. Trend assessments can help to investigate the vulnerability of different industrial sectors. However, extreme events occur in bursts, so that there are quiet periods that lead to a form of inertia and scientists are reluctant to commit themselves on individual events, so market and regulatory forces may be the decisive factors. Finally, to be able to react at all, insurers need to survive the first onslaught – several insurers in Florida did not survive Hurricane Andrew.

Table 3
Important Climate
Change-Related Risks
and Opportunities
for Insurers
 Adapted from ABI 2004

Insurance class/ line of business	Risks (from climate impacts, policy implementation, or policy failure)	Opportunities (from proactive policy or climate impacts)
Property	<ul style="list-style-type: none"> ● Unprecedented accumulation of extreme events threaten solvency/liquidity ● Getting cover may become harder ● Lack of capital/reinsurance ● Inaccurate risk pricing ● Misinformed response from public sector ● More costly repair-work 	<ul style="list-style-type: none"> ● More demand for insurance and alternative risk transfer ● Risk differentials can be priced ● Insurance of “Kyoto” projects ● Administration of disaster recovery ● Prototype equipment can be insured
Casualty	<ul style="list-style-type: none"> ● Unexpected claims for duty of care ● Product failures in new conditions ● Disruption to transport (extreme events) 	<ul style="list-style-type: none"> ● Cover for professional services to carbon markets ● “Green” transport products such as low-mileage motor policies
Life/health/ savings	<ul style="list-style-type: none"> ● Episodic impacts on human health ● Underestimating human life expectancy due to warmer winter in northern hemisphere ● Reduced disposable income due to disasters 	<ul style="list-style-type: none"> ● More demand for health cover ● Growing wealth in developing markets due to technology transfer
Other underwriting	<ul style="list-style-type: none"> ● Increased losses from business interruption, e.g. due to failure of public utilities ● Disruption to leisure events ● Increased losses in agro-business ● Novel technology in energy sector 	<ul style="list-style-type: none"> ● Alternative risk transfer (catastrophe bonds etc.) ● R&D risks for low carbon technology ● Consulting/advisory services ● Insurance for emissions trading ● Trade risks for technology exports ● Carbon becomes an insurable asset

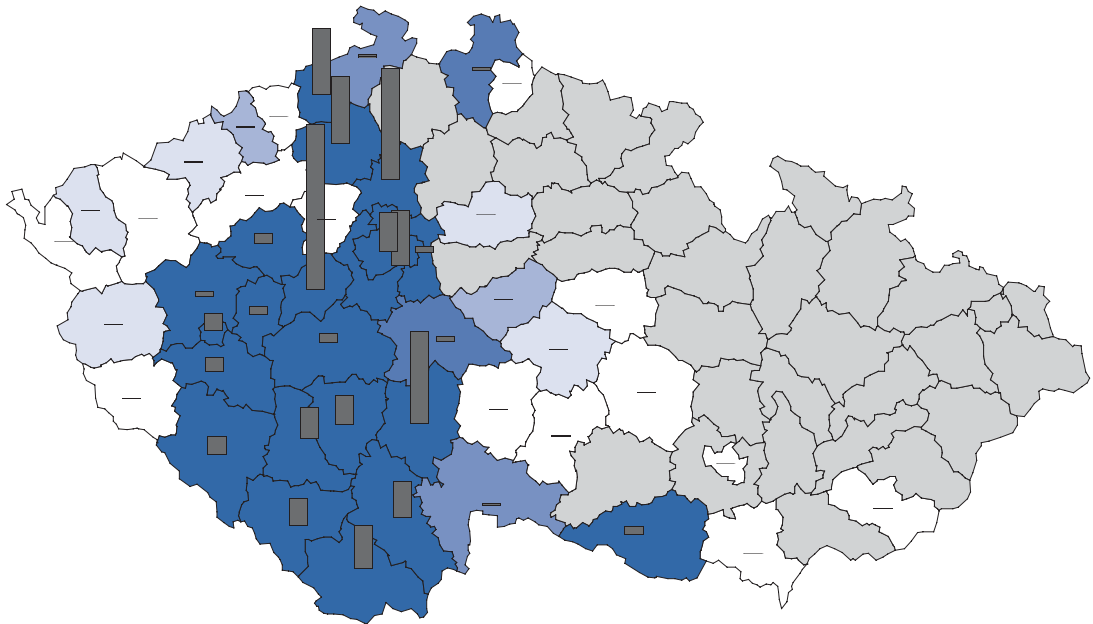
For private and small commercial clients (mass markets), however, policies are not regularly reviewed. In fact, these policies generate the bulk of claims, for example during the Elbe flood of summer 2002 in central Europe. Changing the strategy in mass markets is much more difficult compared to industrial clients, due to regulatory and other pressure, which leaves insurance companies with a substantial climate related residual risk in mass markets.

4.1.2 Insurance Solutions to Tackle Climate Change Business Risks – European Examples

Insurance practices vary greatly across Europe. The following pages give an overview of how the issue is being tackled in Allianz’s major European markets.

- In *Britain*, where much analysis has been carried out, cover against weather perils is wide-spread. Projections suggest that climate change will double the annual cost of British weather claims to 3.3 billion euros by 2050, while an extreme year might cost 20 billion euros. Research suggests that the underlying weather risk is rising at 2 to 4 percent a year, which could lead to an underestimate in pricing of as much as 30 percent because of the time lag between the historic data used to set prices and future claims.⁷⁴ A particular issue in the UK is flood insurance. The industry is introducing a competitive risk-based pricing structure to replace the old uniform tariff. This requires cutting-edge analysis with geographical information systems and catastrophe models.
 - Norwich Union has developed its own risk maps by using aerial surveys and is now selling them to other insurers. As a result it was found that 10 percent of property to a total value of 300 billion euros is at an immediate risk of flooding.
 - The industry is also working with the government and other stakeholders to control the risk through land-use planning, infrastructure design, and funding for maintenance.
- In *Ireland*, which has a similar insurance system to the UK, insurers are hampered by the absence of a public post-code for real estate. Allianz Ireland has therefore “geo-coded” the bulk of its risks itself in order to apply a risk-related underwriting approach. An important resource for carrying this out has been the 15-man internal risk survey force, which provides local knowledge about flood hazards for example. The government has just released its first assessment of future climate impacts in Ireland,⁷⁵ and this will help insurers to improve their planning.
- In much of *Germany* flood insurance is available for private and industrial customers. Allianz and other insurers supported the development of a zoning system based on the calculation of probability of flooding using geological data to allow risk-adequate priced insurance. Research commissioned by Allianz and other German insurers indicated that the total exposure to flood damage in one event might be 15 billion euros.⁷⁶ This reflects the fact that flood defences in some regions are rather weak (only good against a 30-year flood in former East Germany, for example).
- The *Czech Republic* was hit hard by floods in both 1997 and 2002. Unlike in 1997, little reinsurance cover was available in 2002 because of low reinsurance capacity after the World Trade Center attack in 2001 and the concurrent stock-market crash. It was clear that risk management was worth investing money in. At the same time public geo-data was obtained to construct risk maps by combining internal insurance data and public data (see Figure 1). By working directly on model development itself, Allianz has side-stepped the “black-box” syndrome associated with proprietary models previously used. These models allow individual properties to be underwritten more precisely. However historical data is not sufficient and it is impossible to check the programmed logic of proprietary models which makes it difficult to assess how effectively they will cope with novel circumstances. The company is now exploring the

Figure 1
Geographical Information Systems and Flood Risk – Czech Republic
 Source: V Bohdanecky, Allianz



potential costs of various flood scenarios by applying its data to hydrological models.

- Geological and hydrometeorological hazards generate important economic losses and social damages in *Spain*. The country is especially sensitive to the impact that desertification could have in certain areas of Spain, such as the center and the south, and the possible consequences of a sea level rise in the coastal zones. Overall, floods produce the most important losses, having reached in the last decades an annual average of losses of around 0.1 percent of the gross domestic product. Projections made by the Geological Survey of Spain estimate losses due to floods will total 25.7 billion euros over the next 30 years. In this context, it is remarkable that the Spanish Consorcio⁷⁷ coverage has provided a reliable protection against these climatic events in the past. Last year the Consorcio introduced important modifications, giving much wider coverage in order to insure all major climatic event scenarios.
- In *Italy* Allianz's Italian subsidiary RAS adopts a territorial area approach to implementing underwriting rules and principles. The publicly available data on flood hazards is still not adequate for a thorough risk assessment, so insurers are cautious in this area. Improvements in river banks, beds and maintenance programmes in general are under way, but due

to failure in the past in enforcing regulations on land development, property in certain areas remains exposed. Insurance cover for climate change related events is mostly restricted to the commercial lines sectors. The price-driven small and medium enterprise market tends to generate an adverse risk selection. As a consequence, the offer of coverage and the development of a diversified weather risk portfolio are limited. Storm and atmospheric events coverage, however, is widespread. Apart from flood events recorded in the north of Italy in 1994 and 2000, the market was hit last winter by heavy snow falls. The peak loss was 2.5 million euros, due to a collapsed roof, which highlighted the importance of building codes and the quality of construction.

- Elsewhere in Europe, the public sector often prefers to operate a "solidarity" system of cross-subsidy for weather risks, through disaster relief or public insurance. For example, in *France*, there is a well-established public "cat-nat" reinsurance system which uses the private sector for administration. However, one aspect that causes some problem is that a disaster has to be "declared" by the local prefect to trigger the cover which can lead to anomalies. After severe droughts in the period 1989–2002 which caused three billion euro worth of damage to buildings, a "double trigger" method was established,

based on water table and soil typology to give an objective way of defining drought-hit areas. Yet, this method has its limitations; as it was not able to cope with the drought of 2003 which caused over one billion euros of damage in a single year. It was not preceded by a dry winter, which was a criterion to provide coverage. The methodology is therefore being reassessed.⁷⁸

The expected increases in losses from climate change as described above will result in greater demands for public and private insurance mechanisms to provide compensation to victims, particularly in flood-prone areas such as coasts, river catchments, and steep valleys.⁷⁹ This will be counter-productive unless appropriate attention is given to risk management, which is where the insurance industry could play a valuable role. Insurers need to focus their attention on solvency management by assessing their exposure to catastrophe scenarios and arranging reinsurance.

- For example, Allianz Group set up two big catastrophe (“Cat”) programs to optimize its use of reinsurance and to increase the group protection against “worst case” natural perils:
 1. “Super Cat” covers medium-sized events in Europe and Australia up to return periods of 250 years by pooling the potential losses of the Allianz entities.

2. The “Mega Cat” program reinsures the top natural peril scenarios of Allianz Group up to return periods of more than 1,000 years. Both tools make extensive use of the good geographical diversification of the different Allianz entities. Depending on the scenario, these two covers provide “NatCat” protection of more than 1.5 billion euros, so that even more intense events due to climate change should be covered.

The regulatory boundaries of insurance make some risk transfer solutions complicated.⁸⁰ For example, new risk transfer tools like weather derivatives are not regulated as insurance products, and there is a basic presumption that catastrophe risk can be accounted for on a one-year basis, although it is closer to the multi-year nature of life and pensions business.

4.1.3 Insurers’ Risks and Opportunities in Mitigating Climate Change

New technologies are ultimately more efficient and represent better risks. Therefore there is a natural interest for insurance companies to

Box 6

Upgrading Technology to Protect the Environment

Supplementary to any compensation for lost assets, insurance policies can provide financial resources to cover costs incurred for clearance and demolition, expenses involved in damage limitation, outgoings for decontamination and removal of soil, and professional disposal. If a commercial client of Allianz in Germany decides to include the eco-package in its property insurance, any additional costs involved in order to upgrade facilities and protect the

environment as a result of replacing lost or damaged items covered by the insurance will be proportionately reimbursed. For example, the owner of a building that has burnt down can replace the original single glazing with energy-saving multiple-pane insulation glazing when the structure is rebuilt. The additional costs incurred will be reimbursed up to an agreed limit under the terms of the eco-package.

Insurance Solutions for Clean Development Mechanism (CDM) Projects in Practice: Carbon Delivery Guarantee

Various researches have been conducted by the financial sector to develop insurance instruments for the greenhouse gas market as a whole and CDM projects in particular. There is obvious demand from project developers, investors and buyers of CERs for risk-mitigating tools for CDM projects. Austrian Garant Insurance, French Global Sustainable Development Project (GSDP) and Swiss Re Greenhouse Gas Risk Solutions are trying to meet this demand with the

launch of the first carbon delivery guarantee insurance. A carbon delivery guarantee is an insurance product where the re-insurer/insurer acts as guarantor for future CER delivery, and financial compensation is paid in case CERs are not delivered according to agreed terms and conditions. The carbon delivery guarantee is shaped to meet the CER buyer's demand for risk mitigation. One of the first carbon delivery guarantees was applied to CERs generated by a reduction project

in South America, which utilizes an innovative proprietary filter technology. In total, the project consists of 1,000,000 tons of CERs. The seller will deliver CERs annually from 2005 to 2007 and the carbon delivery guarantee is based on a purchase price of USD 5 per CER. The insurance covers carbon delivery guarantee, political risk insurance (incl. host industry insolvency, seller insolvency, political and country risk) and business interruption.

Box 7

Source: UNEP FI 2004: CEO Briefing on Carbon Finance Solutions, Geneva

benchmark new technologies and thereby steer technical innovation to effective implementation through risk-assessment techniques as well as consider concessionary conditions for environmentally-friendly technologies.

Thus GHG mitigation provides some interesting new opportunities for the insurance industry. It can influence and leverage the emergence of new technologies in several ways. One area is property and engineering insurance. Usually after an insurance loss in an old industrial plant, the insurer only has to pay for the installation of the technology that had been in use at the time of loss. Yet, if an upgrade of old facilities is possible, insurance could support this technological innovation, although it is a more expensive option. Allianz is applying this possibility in many cases today (see Box 6).

However, as with every profit-risk ratio, every new technology also has unrecognized or unfamiliar risks – for example offshore wind park installations will entail cable laying, high stress components, and salt corrosion, all of which can

potentially increase the risk of such an installation. Absence of insurance is a powerful blocker to finance for projects in this area – some experts believe the volume of projects might rise by 300 percent if insurance cover were available.⁸¹ This rise is expected despite the fact that insurance cover would make up as much as 11 percent of operating costs of offshore wind parks.⁸²

- Allianz has paid 33 million euros in the last ten years in claims related to on-shore wind turbines. This led the company to initiate close collaboration between wind turbine producers, energy suppliers and certifiers to improve the technology and maintenance practices so that insurance could become available later.
- In the field of geothermal energy, Munich Re has similarly played a major role in developing insurance cover for exploration risk.
- Loss of revenue for renewable energy producers is another potential field for new covers, for example, for wind generators if the wind speed is too high or too low.

Climate policy has created opportunities to develop new carbon products (see Box 7).

- Gerling Insurance Group is providing services for carbon markets. A reliable database on GHG emissions will be fundamental for operators and investors. Gerling offers the verification and certification of data for projects that aim to offset carbon emissions.

Legal action has been taken by shareholder groups to test companies' responsibility for greenhouse gas emissions or disclosure of relevant information (see Box 8). It is unlikely that insurance policies provide any scope of cover through risk transfer from the original emitters. This is an area which will warrant careful monitoring in the light of the way that other claims for environmental or health damage have developed – such as for asbestos claims.

- Swiss Re already reviews corporate responses to the Carbon Disclosure Project (see Box 10) for clients requiring Directors and Officers insurance, to assess corporate carbon emission strategies and to see if further inquiries are needed.

Another area still to be explored is the valuation of carbon assets and liabilities, setting an

appropriate price for the risk of loss, and adjusting the loss when it happens. A variety of novel risk transfer tools have been proposed to tackle the complicated issues of innovative technology (catastrophe bonds, weather derivatives, contingent capital, double trigger structures, finite insurance, captives).⁸³ Again there are legislative difficulties for insurers because some of these are not classified as insurance products, and so they will require alternative non-insurance solutions.

Conclusions

1. Climate change poses an economic risk to insurers.
2. Major insurers are developing new techniques for assessing the ground-level risk of extreme weather and are adjusting their underwriting.
3. New insurance products can support climate-friendly technology but insurance companies focus mainly on the adaptational aspects of climate change induced risks.

Box 8

Liability for Climate Change?

Businesses that emit large amounts of greenhouse gases could be held liable for the damage that is caused by climate change, and so might providers of financial services to such companies. The Alliance of Small Island States, and more recently the Climate Justice Network, have suggested that compensation should be paid for impacts such as communities affected by sea level rise. In 2002 Friends of the Earth, Greenpeace and others launched a suit against two federal agencies, the Export-Import Bank and the Overseas Private Investment Corporation, for providing financial support “illegally” of over USD 32 billion to fossil

fuel export projects without assessing their contribution to climate change in the USA. More directly, on 21 July 2004 eight states and a number of NGOs in the USA filed against five major electricity utilities that are collectively responsible for 10 percent of USA's emissions for creating a public or private nuisance by discharging carbon dioxide into the atmosphere, contributing to climate change. In this case the plaintiffs are not seeking damages, but simply an injunction compelling the companies to reduce their emissions by set amounts over a specified timetable.

4.1.4 Recommendations

Insurers should:

- Gather information on future climate risks and thereby better predict and underwrite climate-associated risks.
- Control their exposure to natural catastrophes and other climate-related risks by developing adequate risk assessment tools such as flood zoning and establishing expertise for natural catastrophes.
- Upgrade risk assessment methodologies such as identifying potential new liabilities from carbon emission or using environmental due diligence screening of a company.
- Develop risk management expertise regarding low carbon technologies jointly with industrial clients to develop new products supportive of low carbon technology (such as multiperil cover for renewable technologies, loss of revenue cover for renewable technologies, eco-package for Allianz Property/Commercial Clients).

4.2 The Banking Sector

Banks can play an important role in society's adjustments to climate change. They do this through financing and investment decisions, credit risk management policies and lending practices, and the development of risk-mitigation products. Climate change policies pose new risks and offer new opportunities to banks. The most striking ones are outlined in Table 4.

4.2.1 Climate Change-Related Risks

The biggest risk to banks is credit risk. This is related to new climate change mitigation policies (*legal/policy risks*). Policies to reduce greenhouse gas (GHG) emissions – most importantly the Kyoto Protocol and the EU Emissions Trading Scheme (EU ETS) – transfer new liabilities and therefore *business risks*, e.g. via tradable emission certificates, to the economy. These policies

Table 4
Important Climate
Change-Related Risks
and Opportunities
for Banks

Banking class	Examples of risks	Examples of opportunities
Corporate banking and project financing	<ul style="list-style-type: none"> ● Reduction in competitiveness of GHG-intensive business clients due to higher mitigation costs ● Higher costs for consumers of energy due to new mitigation policies ● Price volatility on carbon markets and carbon-related products ● Reputational risks due to investments in controversial energies projects (e.g. large dams, nuclear power) 	<ul style="list-style-type: none"> ● Risk management services for clients affected by the EU ETS ● Carbon trust services (administration and custody of client's emission allowances account) ● Carbon project finance services (JI/CDM)
Investment banking and asset management	<ul style="list-style-type: none"> ● Investment in immature technologies ● Additional costs due to changes in weather patterns e.g. in the utilities sector 	<ul style="list-style-type: none"> ● Trading services in the EU ETS ● Offering weather derivatives ● Set up of carbon fund and fund custody
Retail banking	<ul style="list-style-type: none"> ● Direct losses due to drought, precipitation, soil erosion, flood ● Policy change, e.g. termination of subsidies for renewable energies 	<ul style="list-style-type: none"> ● Microfinance for climate-friendly activities ● Advisory service in the field of loans for small sized renewable energy projects

influence the credit quality of GHG-intensive borrowers and therefore the risks of banks. The EU ETS is directly targeted at company level and creates direct costs of compliance on related sectors and indirect costs on all consumers of energy and electricity. In particular the energy sector, which accounts for 63 percent of the EU emissions market (see Figure 2), is affected.

- As a consequence of the EU ETS, Point Carbon predicts higher electricity prices across the EU with additional costs of between 260 to 600 million euros/per year for the sectors affected.
- DrKW Research concludes that cement companies with large exposures to EU countries could be affected by the EU ETS with estimated extra costs for individual companies of up to 15 percent.

Looking at the current developments in the international climate policy arena, it is likely that the EU ETS and the Kyoto Protocol only mark the beginning of a more rigorous future global climate policy regime. This, of course, has implications for banks in their important role as loan providers, equity investors, and project financiers. Besides those credit risks, banks face *operational risks* from inappropriate internal risk assessment processes and a consequential mis-assessment of such carbon-related impacts, e.g. bank's internal failures in the climate due diligence for investments or loans lead to decreased margins. On top of this, the related operational risks for the bank's clients, for example, sub-optimal carbon risk management, can result in financial sanctions which also impair the client's liquidity and therefore the bank's competitiveness and creditworthiness. Within the EU ETS 40 euros per ton must be paid for excess emissions from 2005 to 2007, from 2008 the sanctions are 100 euros/ton. In addition to the financial sanctions, the amount of the deficit in allowances is carried over to the following year, which creates additional price and volumetric risks for the affected companies.

Market risks are significant for banks and their clients. The main ones are volatile carbon certificate prices, volatile carbon-related commodity

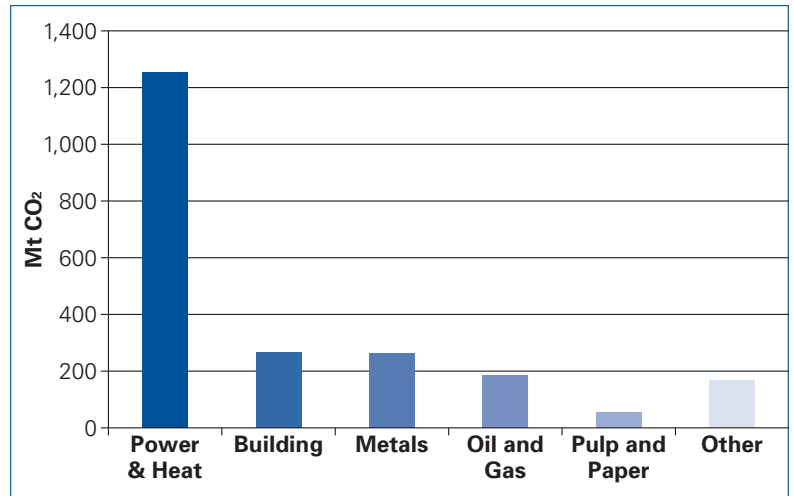


Figure 2
EU Allowance Allocation by Sector in the EU ETS
 Source: 3C GmbH

prices (e.g. coal, gas, oil) and the insufficient availability of EUAs at the market. These price and volumetric risks lead to decreased corporate planning reliability – both for banks and their clients. The price for EUAs moved between 5 to 20 euros/ton between March 2003 and May 2005, displaying extremely high volatility and therefore high uncertainties in the EU ETS.

- DrKW Research in 2003 has been estimating 15 euros/ton as a likely price for EUAs for the period 2005–2007 and foresees even higher prices for the period from 2008–2012, in case the reduction constraint tightens for the companies affected by the EU ETS.

In addition, changes in fuel prices as well as movements in EUA prices will influence the so-called “merit order” of energy generation. Banks must have the expertise to monitor and understand the impact of emissions trading on clients’ business.

The more frequent the occurrence of extreme weather events such as flooding and storms, the higher the *direct climate change related risk* of physical damage to corporate assets and real estate.

- The U.S. Department of Commerce estimates that nearly one-third of the U.S. economy, or USD 3,800 billion, is at risk due to the weather.

Changes in weather patterns lead to high uncertainty especially in the utility sector, but possibly also to increased energy costs for the corpo-

rate buildings of banks themselves. Weather is – next to economic business activity – the main influence on power and heat production and therefore also on CO₂ emissions.

Non-compliance with mitigation policies is likely to be expensive for some companies. For example, companies that do not comply with the EU ETS will be put on a publicly available blacklist. These companies might become *reputational risks* (and therefore credit risks). The year 2004 also saw the first lawsuit in the US accusing companies of liability for global warming. A number of states and environmental organizations have begun litigation charging five of the nation's largest power companies with being a "public nuisance" by emitting CO₂.

Investments in controversial forms of renewable and conventional energies or related project-financing activities (e.g. large dams, nuclear) could bring reputational risks. The so-called Equator Principles have been adopted since 2003 by more than 20 major banks to mitigate such risks. The Equator Principles are a voluntary set of guidelines for managing environmental and social issues in project finance lending, developed by leading financial institutions. They are based on the environmental and social standards of the International Finance Corporation (IFC), and apply globally to development projects in all industry sectors with a capital cost of USD 50 million or more.

The existence of these risks mean banks need to develop *carbon risk management* tools for their loan and investment due diligence.

- Dresdner Bank has incorporated a set of emission trading related questions in its credit rating process and conducts thorough investment research in view of the consequences of the EU ETS for the affected industry sectors.
- UBS Investment Bank, the investment banking arm of the financial institution UBS AG, has launched a program to integrate environmental and sustainability criteria into the bank's overall assessment of investment risk and opportunity.
- Other banks like Bank of America intend to develop new metrics to demonstrate the "carbon intensity" of their client portfolios.

- In its Public Environmental Policy Statement from 2005, JP Morgan announced it would restrict its lending and underwriting practices for industrial projects that are likely to have an adverse environmental impact. The bank also plans to calculate in loan reviews the financial cost of greenhouse gas emissions, such as the risk of a company losing business to a competitor with lower emissions and plans to include climate risk aspects in regular company analyses.

4.2.2 New Opportunities

Climate change not only creates new risks, costs and liabilities for banks, it also generates economic opportunities such as investments in renewable energy technologies, energy efficiency projects, emissions trading and weather markets, and climate change related microfinance.

EMISSIONS TRADING

The entry into force of the Kyoto Protocol in February 2005 and the start of the EU ETS in January 2005 have created an international emissions trading market incorporating various opportunities for banks.

- Point Carbon estimates the volume of the international carbon market in 2010 between 4.6 to 200 billion euros. The wide spread shows not only the remaining uncertainties but also the opportunities. For 2005, the market-size forecast is 2.5 billion euros.

Figure 3 shows EU emissions market trading volumes in the first half of 2005.

- Emissions trading offers new client service opportunities for banks. First, there are financial opportunities. Since the establishment of the EUA spot-market in early 2005, various banks have entered the market, providing further liquidity.
- Dresdner Bank, Barclays Capital and Fortis Bank have set up their own emissions trading desks to provide trading services for clients and to trade on their own account.

- Westpac has set up an Environmental Markets Group focussing closely on emissions trading.

Emissions trading is also an interesting option for project financiers, since the internal rate of return (IRR) of emission reduction projects can be enhanced through the project-based mechanisms JI and CDM.

- According to the World Bank, the Internal Rate of Return (IRR) increase through JI and CDM at USD 4/ton CO₂ is between 0.5 and 2.5 percent in hydro, wind and geothermal projects and between 5 and 15 percent in methane reduction projects at landfills.

Because administering JI and CDM projects is very complex and time consuming, these two mechanisms are still economically risky. But because they are, in principle, promising, various financial institutions have started to lobby for both to be designed more efficiently.

- For the Financial Initiative of the United Nations Environment Program (UNEP FI) (with members such as Dresdner Bank, UBS, Abbey, Bank of America), the current interpretation of an emission reduction project's "investment additionality" is the crucial bottleneck in the CDM process which deters private financial institutions from getting involved in such projects.

- According to Environmental Finance, Swiss cement company Holcim has cancelled three CDM projects due to the regulatory problems of the mechanism.

WEATHER DERIVATIVES

Weather derivatives help mitigate weather-related risks. Initially, the use of weather-hedging products was confined to North American energy companies. However, major financial institutions (e.g. Société Générale, Axa, DrKW) have also become players in the weather market.

The market for weather derivatives is gathering momentum again, despite the loss of confidence that this market experienced following the insolvency of Enron, which was the former market leader in weather derivatives.

According to PricewaterhouseCoopers, the total notional value of the weather market has

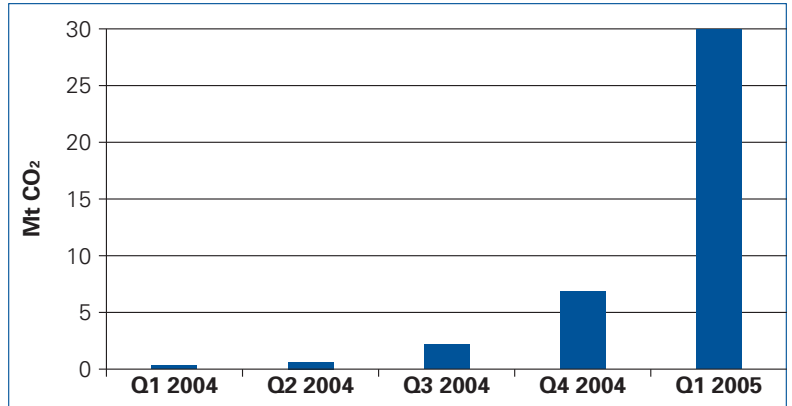


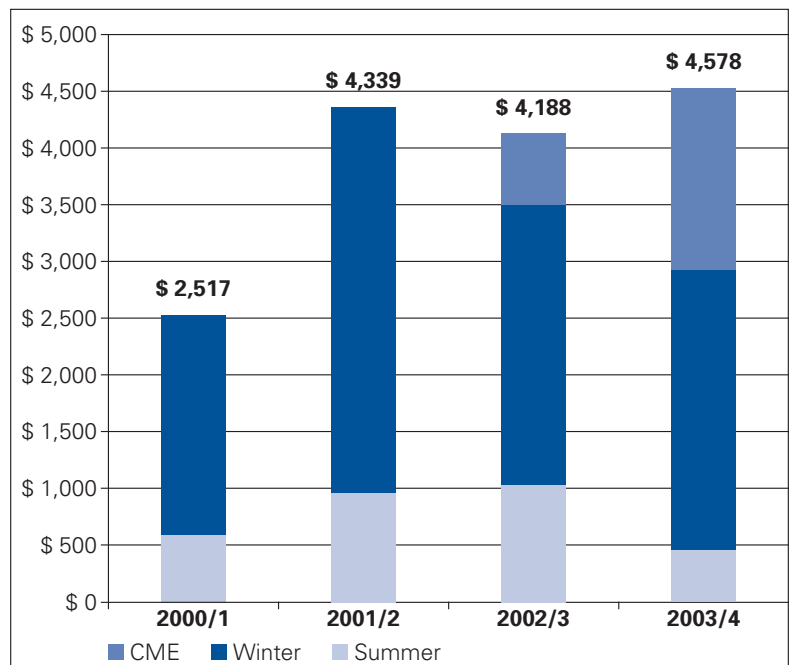
Figure 3
Traded Volumes on the EUA Market since Q1 2004
Source: Point Carbon

increased from USD 2,517 million in 2000/2001 to USD 4,578 million in 2003/2004 (see Figure 4).

- In June 2001 DrKW became the first German bank to make a temperature-related transaction with a regional energy utility.

Against the background of the interdependency of weather changes, carbon prices and carbon-related commodity prices, weather derivatives provide – in particular for companies affected by the EU ETS – an attractive instrument to mitigate the related risks.

Figure 4
Size of the Weather Market (in millions USD)
Source: PricewaterhouseCoopers



STRUCTURED FINANCE

Adapting corporate investment strategies to the new energy environment as outlined in this document also brings interesting opportunities for banks. The range of major facilities needing finance sector support include renewables, and low-carbon technologies. All of those require the financial involvement of banks. The associated long-term risks also need to be understood.

MICROFINANCE

Climate change-related microfinance offers innovative business opportunities for banks. Microfinance means providing poor families with small loans (micro-credits) to help them develop tiny enterprises. Over time, microfinance has come to include a broader range of services such as insurance or savings. Typical clients are low-income

persons without access to formal financial institutions. Microfinance money is often used for climate protection projects such as installing solar power.

Data from the Micro Banking Bulletin reports that 63 of the world's top Micro Finance Institutions – often NGOs or credit unions – had an average rate of return, after adjusting for inflation and taking out any subsidies that programs might have received, of about 2.5 percent of total assets. This compares favorably with returns in the commercial banking sector.

- An increasing number of private financial institutions like Société Générale, Citibank in India or ABN Amro are recognizing the benefits of serving poorer clients.

Box 9

Export Credit Agencies

Export Credit Agencies (ECAs) sit between banks and insurance. Firstly, with a mandate to facilitate exports from their respective countries, ECAs can play an important role in climate protection projects e.g. by facilitating the financing of renewable energy products and services. Secondly, they provide mainly short-term credit and specialized types of insurance e.g. against political events. Often operating as an arm of government, they follow strict guidelines laid down by the OECD to avoid unfair competition. With their ability to take a wider view following their “guardian authorities”, they could play an important role in financing mitigation projects such as renewable energy in developing countries. Four areas of action were identified by an ECA/UNEP Working Party on renewable energy:

1. Changes to international agreements to allow greater local content in projects and longer repayment periods.
2. New products/processes e.g. “bundling” small projects for economies of scale, factoring in emissions allowances, adopting “non-recourse” project finance structures, and measuring the carbon intensity of credit portfolios.
3. Strategy: greater attention to working with other ECAs and multilateral development banks, more flexibility within the existing OECD rules for small businesses, and outreach campaigns to target business sectors.
4. Experiment: giving responsibility to a team to consult widely and pilot ideas.

Because ECAs are closely related to the public sector, practices are scrutinized by NGOs and have resulted in legal actions for alleged breach of environmental care in funding fossil fuel projects (see Box 6). A new twist to this is calling for disclosure of information on finance activities related to environmental issues e.g. energy exploitation, under the Aarhus Convention or further national regulations. Against this background, the German Government is facing action from Germanwatch, related to the German Environmental Information Disclosure Law (Deutsches Umweltinformationsgesetz). Euler Hermes, an Allianz subsidiary and a German ECA, is acting as ECA Federal Export Credit Guarantees and is a potential party to the action.

Conclusions

1. Leading international banks now include climate change as a factor in the credit and investment rating process, in their overall risk management and in due diligence for project financing.
2. The examples of Dresdner Bank, Barclays Capital, Fortis and ABN Amro show that when climate change policies are well-articulated, they provide positive opportunities for banks to widen the scope of their services to clients that have become subject to those regulations.

4.2.3 Recommendations

Specifically banks should:

- Review and optimize their own carbon risk management and (further) develop assessment tools applied to carbon risks and carbon risk reduction strategies (e.g. by using carbon-related economic analyses for sectors or companies and/or by developing climate change related risk matrixes).
- Define clear risk requirements for clients regarding carbon risk reduction and market strategies (e.g. by discussing rating requirements with clients).
- Offer carbon risk advisory services for clients.
- Define clear requirements for rating agencies on carbon risk in corporate and sector ratings.
- Foster the development of carbon risk hedging products e.g. derivatives.
- Facilitate finance for public programs that foster the introduction of low carbon technologies.
- Improve the opportunities of JI/CDM project development to generate CO₂-reduction certificates for optimizing the cash flow of project financing.
- In respect of their own operations and on a voluntary basis, adapt frameworks such as the Global Reporting Initiative (GRI) or guidelines more specifically based on the emissions inventory of the GHG protocol as an accounting and reporting standard.

4.3 Asset Management

*The extent of the impact from climate change will vary sector by sector (see Table 5). What is clear, however, is that overall it will have a significant direct impact on the global economy, financial markets and ultimately shareholder value.*⁸⁴ Climate change has received ever greater attention, as Tony Blair, the UK prime minister, has placed climate change, along with Africa, at the top of the agenda for the UK's chairmanship of the Group of Eight industrialized nations and the European Union this year. Therefore, understanding to what extent and by which causal connections climate change will impact or enhance the value of investments is crucial if shareholder value is to remain protected.

To varying degrees, companies have begun to look at climate change risk and its impacts on their businesses, but the level of sophistication varies from company to company. The financial markets and investors are starting to recognize the potential opportunities arising from climate change, for example, the launch of and investment in various carbon or environmental technology funds.

- Allianz Group subsidiary AGF has invested, together with Fortis Bank, 60 million euros in the European Carbon Fund launched by the French financial institution CDC IXIS. Currently, they are looking to invest more than 1 billion euros in Carbon Funds.

Institutional investors are also acknowledging that climate change can have a material impact on their investments, and are taking action to address the issue. Consequently, investor groups such as the Institutional Investors Group on Climate Change (IIGCC) in Europe and the Investor Network on Climate Change in the United States have been established with the same common purpose: to promote better understanding of the risks of climate change among institutional investors and encourage companies and markets to address any material risks and opportunities to their business associated with climate change and a shift to a lower carbon economy. Furthermore,

Table 5
Equity Value at Risk to
Climate Change
 Source: Carbon Trust,
 2005

	Adjusted carbon intensity ^{a)}	% of brand value at risk	Equity value at risk (billion euros) ^{b)}
Food and drink manufacturers	1	10	9.9
Banking	0.45	1–2	8.55
Oil and gas	10	2–2.5	5.85
Airlines	14.5	50	2.25
Telecommunications	0.3	1	1.8
Food retailers	0.7	<1	<0.6

a) Measured in kg CO₂ emitted per GBP of corporate earnings

b) Assumption: exchange rate GBP:EUR 1:1.5

projects such as the Carbon Disclosure Project are additional evidence of investors willing to collaborate in order to better understand the implications of climate change and to increase transparency (see Box 10).

Although the CDP and other climate change investor groups demonstrate the rising importance of impacts from climate change for the investment process, the issue and its consideration still remain largely ignored by the majority of short-term oriented mainstream investors and fund managers. As such, only a small proportion of such investors and their fund managers are actively considering climate change issues in the course of their investment decisions. The reasons behind this are varied and can be best explored by looking at the chain of responsibility of asset management.

4.3.1 Institutional Investors

Institutional investors or pension fund trustees have a fiduciary duty to their pension fund beneficiaries to ensure that they act in the best, long-term interests of plan members and beneficiaries by maximising the returns of the pension fund assets entrusted to them. In fulfilling this responsibility, trustees must maintain maximum diversification and have an understanding of the risks their assets are exposed to and manage them accordingly.

The consideration of environmental, social or ethical issues in the management of these assets has started to permeate trustee thinking, as a result of pension legislation e.g. UK Pension Reform Act 2001 and as a result of increasing attention being paid to these issues by consultants and the media. However, this has been limited as trustees grapple with how they should be addressing climate change. A large proportion of institutional investors still sees the issue within the context of socially responsible investment which is viewed with some skepticism as to the financial benefits.⁸⁵ Crucially, the majority of institutional investors are finding it difficult to make the link between climate change risk and investment risk and consequently they are not actively instructing their fund managers to take the issue into consideration in the running of their assets.

Given the potential impact that climate change may have on financial performance, trustees have yet to recognize that they have a responsibility to consider climate change if they are to act in the best interests of their beneficiaries. Some institutional investors, such as the Dutch pension fund PGGM, have taken the step to actively explore the added value of considering climate change in their investments by allocating pools of funds to various socially responsible investment strategies ranging from “best in class” to engagement overlays. Alternatively, pension fund trustees leave the consideration of issues such as climate change to the discretion of their fund manager.

Pension fund trustees are also facing a number of significant challenges, the most pressing and immediate being to meet their pension fund liabilities. In this respect, there is limited amount of time available to focus on issues such as climate change and, coupled with greater pressure to perform, so this has led to greater focus on short term, relative performance measurement.⁸⁶ This is at odds with the long term nature of climate change, since climate change risks are usually talked about in the space of decades. Some investors are looking to address this, one example being the “The Marathon Club” which is a consortium of individuals representing major pension funds to research how their funds can encourage active long term and responsible investing. There is less doubt than ever that climate change is a fact, that it is happening, and that it has the potential to pose a real threat to global economies and financial markets.⁸⁷ The remaining uncer-

tainty is when and to what extent these threats from climate change will become a reality. Being prudent investors, pension fund trustees need the appropriate tools to help them understand the implications of climate change on their investments and instruct their asset managers accordingly. Alternatively, they may look at the possibility of diversifying their assets into investment vehicles that provide a hedge against climate change risk.

4.3.2 Consultants and Actuaries

The role of consultants and actuaries as advisors to pensions fund trustees is to provide commercial, financial and prudential advice on the management of assets and liabilities – especially where long-term management and planning are critical factors. Environmental factors such as

Box 10

Carbon Disclosure Project (CDP)

The Carbon Disclosure Project was launched in November 2003, and provides a secretariat for the world’s largest institutional investor collaboration on the business implications of climate change. CDP provides the process through which many institutional investors, including Allianz, representing USD 20 trillion, collectively sign a single global request for disclosure of information on Greenhouse Gas Emissions. CDP then sends this request to the FT500. 300 of the 500 largest corporations in the world currently report on climate change issues through the CDP website. The CDP has been successful in both attracting institutional investors to sign up to the project, starting from 35 institutions in the first year to 143 in the third year, and getting more companies to provide responses to the questionnaire. The CDP has helped to illustrate the extent to which the largest global companies

are aware of and responding to climate change. The first (CDP₁) survey found that while 80 percent of respondents acknowledged the importance of climate change as a financial risk, only 35 to 40 percent were actually taking action to address the risks and opportunities. The second (CDP₂) survey showed that climate change and shareholder interest are becoming more closely intertwined. However, significant differences in opinion remain as to the importance of climate change to business and competitiveness. Major discrepancies still exist between some companies’ responses and what is publicly known about their actual climate change stance. Not all companies respond to shareholder requests for more climate change information. CDP₃ was launched in February 2005, representing a larger group of investors.

climate change should not be viewed as a natural consideration. Given the long-term nature of climate change and the wide-ranging impacts it may have on client assets, this ought to be a natural consideration for them. However, many consultants are fairly skeptical of the moves towards shareholder activism and socially responsible investments.⁸⁸ Climate change is often pigeon holed into socially responsible investment, which is seen as potentially interfering with trustee fiduciary duty and an issue that falls into the environmental rather than the financial sphere.

There is also a significant element due to political and regulatory uncertainty. Consultants, just like institutional investors, do not have the correct tools to enable them to understand the impacts of climate change and as such remain reluctant to provide advice on an issue they are not familiar with and which does not yet fall into their area of expertise. Given that climate change and its impacts remains a complicated issue it may be acting as the “barrier to entry” for consultants and actuaries to understanding how this issue could impact investments, since it requires a wide range of skills to be able to give the kind of advice that would affect a portfolio. Among other issues, it requires an understanding of climate change policy and how the price of carbon may affect a particular market.⁸⁹ Some consultants such as Mercer Investment Consulting have already formalized their approach towards socially responsible investment, and have dedicated SRI capabilities. The next steps for Mercer include the assessment of fund managers and how they are integrating issues such as climate change within their traditional or mainstream investment practices.⁹⁰ Mercer is soon to publish a report in July 2005 for the Carbon Trust and the IIGCC, entitled “A climate for change: A trustee’s guide to understanding and addressing climate risk”.

In conclusion, if investment consultants and actuaries are to take climate change into account when advising clients, this needs to be supported by increased awareness and knowledge building

as well as an understanding of the approaches that fund managers are taking towards climate change in their investment processes.

4.3.3 Fund Managers

When making decisions on a client’s assets and fulfilling a client’s requirements, the core of a fund manager’s decision-making process is to evaluate the relative risks and opportunities of their investments. Traditionally, these have been financial and include the growth of a company, the margins it is generating and the annual profits it is making. Non-traditional issues such as climate change do not normally fall into the realm of a traditional fund manager’s thought processes, an exception being the introduction of the EU Emissions Trading Scheme, which places a value on the price of carbon leading to direct financial implications for specific sectors and investee companies. Climate change is a regular consideration for SRI fund managers whereas mainstream managers still tend to marginalise the issue and rarely include it in their investment considerations. There are several reasons for this. Such fund managers are finding it difficult to make a clear link between climate change and portfolio risk, thus it is still being seen as an “SRI issue”, and as such not relevant to mainstream investments. There is also a conflict for fund managers: the long-term nature of climate change appears to clash with the short-term measurement of their performance by institutional investors, despite the fact that such investors ought to have a long-term investment horizon.

The lack of clarity around climate change policy and its long-term time frame places a level of uncertainty around the actual impacts this will have on investments. The availability of investment tools to enable fund managers to evaluate the impact of climate change is limited; although some organisations such as the World Resource Institute (WRI) have developed frameworks which provide fund managers with a multidimensional framework for assessing climate change risk in

their portfolios.⁹¹ The framework highlights that “greenhouse gas regulatory risk and its competitive implications are most immediate and tangible aspects of risk”. It also states that “to accurately analyse the implications of policies on greenhouse gas emissions, investors should consider how companies respond competitively to these policies and ultimately how this affects cash flows”. It therefore appears to be an issue relevant to a prudent investor, which is the responsibility of the fund manager to their institutional investor.

Fund managers are in the early stages of being provided with the tools and information that should enable them, better than before, to start understanding the impact of climate change risk on their investment decisions and ultimately their client portfolios. These will include WRI reports, the Carbon Disclosure Project, and support from their in-house SRI specialists who have

been evaluating the impacts of climate change on investments for many years (see Box 11).

Having described this situation, there are indications that mainstream fund managers are beginning to recognize the importance and approaches of socially responsible investment. In their annual “Fearless Forecast survey” review conducted in late 2004, Mercer Investment Consulting asked 190 fund managers worldwide whether certain SRI practices would become a common component of mainstream investment processes in the near and long term. The survey findings indicated that the majority of fund managers outside the USA are becoming more convinced that the adoption of SRI practices and strategies will become more commonplace. Furthermore, some participants in the financial markets are recognizing the importance of integrating environmental, social and governance issues into mainstream investment processes and have

Box 11

Socially Responsible Investment at RCM

RCM is the core growth equity platform within Allianz Global Investors, a wholly-owned subsidiary of Allianz. RCM’s in-house SRI specialists are responsible for focusing their research on non-traditional or extra-financial issues, by means of a proprietary sustainability scoring and rating process, which among other issues evaluates companies on their approach towards the management of climate change risks and opportunities. RCM was one of the first signatories to the Carbon Disclosure Project when it was launched in November 2003, recognizing the need for consistent and comparable climate change information from companies for a better research process. RCM’s SRI specialists also use GrassrootsSM, which is a proprietary research entity within RCM that provides the investment platform

with additional market analyses by conducting market research at the local, regional and global levels. In SRI analyses, it helps to confirm and identify where material environmental and social factors are starting to have an impact on a company’s financial performance. RCM SRI specialists discuss with companies areas relating to material business issues such as climate change, especially in instances where companies do not fully disclose their policies and approach towards their management. Finally, all SRI research outputs are fed back into the RCM global investment platform, which includes RCM fund managers and financial analysts, to aid the integration of extra-financial issues into mainstream research and investment decision making.

produced a set of recommendations for asset management, securities and brokerage to take action under a UN-based initiative.⁹² This is encouraging and provides confidence that extra-financial issues such as climate change will become more of a regular feature in fund manager thinking. Especially since there is increasingly strong evidence suggesting that companies with good environmental governance standards, such as the management of climate change risks, have better financial returns compared to those that do not.⁹³

4.3.4 Financial Analysts

The consideration of climate change – or its lack of – by mainstream financial analysts is based on the very same issues as presented for fund managers. The availability and quality of climate change information being provided by companies varies and long-term political frameworks have not been established, making comparative and consistent modeling and analysis difficult. This is daunting, given that climate change is one of many factors that both analysts and fund managers need to take into account when evaluating investments. The Carbon Disclosure Project is, however, aiming to address this issue. Furthermore there has been rising criticism directed at the financial markets for its short termism, where

Box 12

Enhanced Analytics Initiative (EAI)

The EAI was set up by a group of asset owners and fund managers to promote better broker or sell-side research on extra-financial issues, i.e. factors that cannot be readily quantified but nevertheless have considerable power over asset value. Extra-financial issues include factors such as climate change, human capital management, reputational risk, mergers and acquisitions and corporate governance. The EAI hopes to see research that identifies corporate prospects across different time scales and sectors, integrating the findings into conventional “stock-picking” valuation. Members of the EAI (which include AGF Asset Management, BNP Paribas Asset Management, Generation Investment Management, London Pension Fund Authority, Mistra, PGGM, RCM, SNS Reaal Group, Trade Union Congress, Superannuation Society and the Universities Superannuation Scheme) have committed to allocate 5 percent of their respective broker commission budget (approximately 8 million euros in 2005) to brokers on the quality

of their extra-financial research, as regularly evaluated by an independent consultancy, OnValues. The second evaluation completed in June 2005, highlighted that there was an increase in extra-financial research being generated, however, there is still a long way to go with regard to the quality of research. It also indicated encouragingly that research houses are beginning to integrate extra-financial research into their mainstream reports and that the breadth of issues being researched – including corporate governance, emerging environmental liabilities, consumer and public health issues, and business ethics and brand management – is expanding. However, whilst there are signs that some research houses are gearing up to consistently provide extra-financial research, the overall coverage and quality of the research need to be expanded further in order for it to become a useful tool for the buy-side (in house financial analysts of fund management houses).

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company performance is measured on a quarterly basis rather than over the longer term, with the trend primarily being driven by hedge funds.⁹⁴ A number of fund managers and institutional investors are, however, addressing this issue by providing incentives to mainstream, sell-side research analysts to produce more long-term research, which incorporates extra-financial issues such as climate change (see Box 12).

4.3.5 Companies

Company disclosure on climate change is improving. However the quality, comparability and consistency of this information varies from company to company, limiting its usefulness for financial analysis and valuation. The communication of climate change policies and strategies is mostly limited to discussions in meetings with SRI analysts and fund managers rather than with mainstream investors. The exception is where SRI analysts also attend such mainstream meetings and ask relevant questions in the presence of mainstream investors. However, companies who have well-developed climate change policies and strategies are indicating that mainstream investors are not showing much interest in this type of information. Consequently, they do not include their climate change strategies in mainstream investor presentations.

It is clear that there is a discrepancy here and two things need to happen. Companies ought to re-evaluate their investor-directed communication regarding their approaches to environmental government – it needs to be more meaningful and the materiality should be clearer for mainstream investors. Mainstream investors should take greater notice of the growing evidence of the link between good environmental and financial performance and find out why companies do or do not allocate resources towards addressing: firstly, the challenges of climate change to their business and secondly, the potential impact climate change can have on the value of investments. This will not only highlight to companies

that investors are taking a greater interest in non-traditional aspects of company performance but also put greater pressure on companies to produce more consistent and meaningful information that is useful in company financial analyses.

Conclusions

1. A few institutional investors and fund managers have acknowledged that climate change will have a material impact on their investments and that they are taking action to address the issue.
2. Investors who have been following socially responsible investment strategies for some years now treat climate change as a strategic factor in portfolio performance.
3. There is increasing evidence to indicate a positive link between good corporate environmental governance, including climate change, and good financial performance, but it is still insufficient at the corporate level in particular.
4. The comparability and quality of climate change information provided by companies remain insufficient for credible financial analysis. Although, the availability of comparable and consistent data on climate change as well as tools for fund managers to assess climate change risk in their portfolios are increasing.
5. There is a lack of understanding among both institutional investors and consultants on how they should be evaluating the financial implications of climate change on investments.
6. Climate change, its implications and uncertainty around policy and regulation remain complex, acting as a “barrier to entry” to institutional investors and consultants in understanding the related financial risks.
7. Fund manager performance is measured over a short time frame, causing fund managers to focus on short-term corporate performance, which is in direct conflict with the long-term nature of climate change.

4.3.6 Recommendations

With a growing body of evidence on climate change, and its wide ranging impacts especially on financial performance, institutional investors, consultants, fund managers and analysts should start to build up their understanding of the relevance of climate change to their advice, analyses and investment decisions.

Specifically, fund managers and financial analysts should:

- Evaluate their client portfolios for climate change risks and opportunities so that they are able to respond to changes in climate change policy and legislation.
- Help company management understand how climate change is impacting their business and what strategies they can employ to minimize its risks or maximize opportunities from it. Educate clients about the benefits and processes being used to incorporate extra-financial issues in the management of their assets.
- Request and reward external research providers e.g. brokers to produce consistent, quality, long-term research which incorporates extra-financial issues such as climate change, and to integrate such issues into their mainstream analyses and investment decisions with the help of in-house or external SRI expertise.
- Challenge both buy- and sell-side analysts on their understanding and incorporation of climate change risks and opportunities in their investment research and ideas.
- Support the development of climate change databases and request more consistent information from companies on their climate change performance.
- Develop innovative investment vehicles that capitalize on changes in climate change policy and regulation.

5 Financing Low-Carbon Energy

The solution to climate change is essentially to convert the world's economies to low-carbon technologies, either through alternative energies or more efficient energy conversion.

Renewable energy technologies can be both a contribution to the mitigation of GHG emissions and a business opportunity for project developers and investors. The future outlook for the renewable energy market is promising, since ambitious targets for renewable energy generation have been set in many regions and countries. Germany is taking the lead with its target to generate 50 percent of its energy needs from renewable energy sources by 2050.

- According to the World Energy Council, the clean technologies market could be around 1.4 billion euros by 2020.
- According to the Carbon Disclosure Project, the proportion of major banks involved in such investments rose from 13 percent to 31 percent between 2002 and 2003, despite regulatory risk problems in some markets.
- The International Energy Agency assumes that capital and generating costs of renewable energy technologies will fall steeply over the next decade, making such technologies more competitive. Worldwide capacity from renewables are expected to be in the region of 400 GW, compared with 2,000 GW for gas, 1,400 GW for coal and 400 GW for hydro. About 1.3 billion euros in cumulative investments will be needed in OECD countries only to replace ageing plants and meet rising demand.

One survey found that investment in renewables and clean energy technology rose 150 percent between the years 2000 to 2004 across a wide

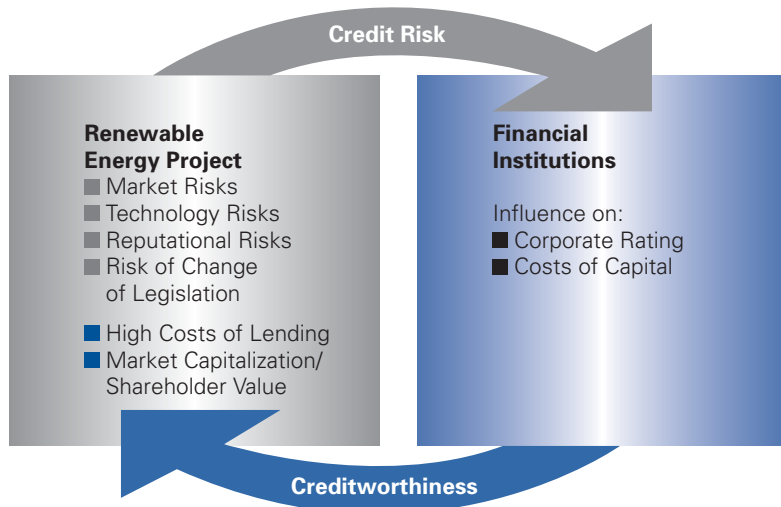
range of applications (efficiency, windpower, fuel cells, etc.). US pension funds as well as global investors are now entering this field in a big way, but with expert advisors to avoid expensive mistakes.

- The Environmental Technology Program of the Californian pension funds CalPERS will focus on providing capital to “investors who have a proven track record, and avoid over-exposure to any one target area by diversifying sectors and geographical areas”⁹⁵
- According to the International Energy Agency, investment in cleaner energy at present is USD 20 billion a year, mainly in solar and wind power, and is expected to grow to USD 100 billion globally within 10 years, compounded at an annual growth of 15 to 20 percent.
- Allianz Group is approaching this area through specialist operators such as Allianz Capital Partners, who now own Hansen Transmission, a major supplier of wind turbine components. The group sees wind energy as an important component in its strategy to treble its private equity exposure (currently 1.5 billion euros in 23 projects), because a diversified windpower portfolio offers long term stable cash flow with relatively low risk. A newly-founded unit, Allianz Specialised Investments, will continue investing in this sector.
- Allianz estimates that by 2010 installed global wind capacity will be more than double its current level of around 50 GW, with more than half of this expected to be in the European Union.
- In Italy, Rasfin, another Allianz subsidiary, is closely monitoring opportunities in fuel cell technology, and also exploring possibilities to

work on clean technology with local government bodies such as cities and states, because their decision-making processes are often quick. Banks, in their role as lenders and investors, play an important role in developing and promoting the renewable energy markets. However, a bank's primary criterion for investment is the expected profit. The due diligence for renewable energy projects is no different compared to other investments. In addition to that, renewable energy technologies often face a number of additional barriers compared to other projects, e.g. technical problems or higher upfront costs.

Due diligence for renewable energy projects therefore requires special expertise. Banks analyse renewable energy investments in particular in view of market risks, technology risks, reputational risks and policy risks (see Figure 5).

Figure 5
Banks and Renewable Energy Technology



Notwithstanding the additional barriers in the renewable energy market, the structured finance market for renewable energy has taken off in recent years:

- The Carbon Disclosure Project (CDP) reports increasing activities of major banks in this field. Dutch Dexia holds an outstanding in the renewable energy sector worth more than 200 million euros. Spanish Santander Central Hispano has financed wind farms over the past years; an investment worth over 250 million euros.

UK Barclays, Dutch ABN AMRO and French BNP Paribas provide tailor-made financial services to renewable energy projects.

- Dresdner Bank founded its Renewable Energy Competence Centre in 2004 to bundle the bank's existing expertise in the field of renewable energy investments and lending criteria. In particular, Dresdner has developed specific expertise and financial involvement in on-shore wind energy, solar power and biomass.

The growing market in renewable energies also opens increasing business opportunities for investment banks: Allianz's investment banking arm, Dresdner Kleinwort Wasserstein, has conducted four large business transactions in the last two years.

- DrKW advised in April 2005 the selling shareholders in Dersa, the Spanish renewable energy company, on the company's acquisition by Spain's largest gas supplier, Gas Natural.
- Also in April 2005 DrKW executed a capital increase for Nordex, the German wind turbine manufacturer, for an equity consideration of 42 million euros.
- In May 2004, DrKW concluded the sale of a participation in Cesa, the fourth largest wind energy developer, to Bridgepoint Capital.
- Vesta's merger with NEG Micon was also advised by DrKW. Both companies are wind turbine manufacturers. The merger confirmed the new group has the largest wind turbine manufacturer in the world. The transaction size was 500 million euros.

A boost in energy efficiency could create a "win-win" solution that both helps improve the economic competitiveness of energy-intensive companies and offers investment opportunities for banks. According to the WWF, the EU Directive on Energy End-Use Efficiency and Energy Services – if adequately implemented – could bring a net economic gain for the entire EU economy of approximately 10 billion euros per year.

Energy efficiency activities are taking on a new strategic importance for energy intensive companies. Investments in energy efficiency projects also offer new opportunities for banks –

the first players have already started to develop new products in this respect:

- According to CDP, Dexia is developing an Energy Efficiency and Emissions Reduction Fund. Italian Sanpaolo IMI is also working on the structuring of funds dedicated to energy efficiency projects.
- For the European Bank for Reconstruction and Development (EBRD), energy efficiency is a key issue. The bank systematically screens both existing and potential projects to identify possible energy savings and – where possible – facilitates the sale of carbon credits from these projects.

6

Recommendations

Recommendations addressing Financial Service Providers

FINANCIAL SERVICE PROVIDERS SHOULD:

- Call for a reliable, transparent and internationally co-ordinated policy framework as well as for long-term and appropriate CO₂-reduction goals that provide certainty for investment decisions and initiate business opportunities for clients.
- Include climate change risk in their internal governance procedures, in line with the existing financial corporate risk identification, controlling and reporting structures and best practice in reporting requirements.
- Contribute to the international debate on carbon research and analysis for a better understanding e.g. of the carbon-related economic impacts.

Recommendations addressing Insurance Companies

INSURANCE COMPANIES SHOULD

- Gather information on future climate risks and thereby better predict and underwrite climate-associated risks.
- Control their exposure to natural catastrophes and other climate-related risks by developing adequate risk assessment tools such as flood zoning and establishing expertise for natural catastrophes.
- Upgrade risk selection assessment methodologies such as identifying potential new liabilities from carbon emissions or using environmental due diligence screening of a company.
- Develop risk management expertise regarding low-carbon technologies jointly with industrial clients to develop new products supportive of low-carbon technology (such as multiperil cover for renewable technologies, loss of revenue cover for renewable technologies, eco-package in Allianz Property/Commercial Clients).

Recommendations addressing Banks

BANKS SHOULD:

- Review and optimize their own carbon risk management and (further) develop assessment tools applied to carbon risks and carbon risk reduction strategies (e.g. by using carbon related economic analysis for sectors or companies and/or by developing climate change related risk matrixes).
- Define clear risk requirements for clients regarding carbon risk reduction and market strategies (e.g. by discussing rating requirements with clients).
- Define clear requirements for rating agencies on carbon risk in corporate and sector ratings.
- Foster the development of carbon risk hedging products e.g. derivatives.
- Facilitate finance for public programs that foster the introduction of low carbon technologies.
- Offer carbon risk advisory services for clients.
- Improve the opportunities of JI/CDM-project development to generate CO₂-reduction certificates for optimizing the cash flow of project financing.
- In respect of their own operations and on a voluntary basis adapt frameworks such as the Global Reporting Initiative (GRI) or guidelines more specifically based on the emissions inventory of the GHG protocol as an accounting and reporting standard.

Recommendations addressing Asset Managers

SPECIFICALLY, FUND MANAGERS AND

FINANCIAL ANALYSTS SHOULD:

- Evaluate their client portfolios for climate change risks and opportunities so that they are able to respond to changes in climate change policy and legislation.
- Help company management understand how climate change is impacting their business and what strategies they can employ to minimize its risks or maximize opportunities from it. Educate clients about the benefits and processes being used to incorporate extra-financial issues in the management of their assets.
- Request and reward external research providers e.g. brokers to produce consistent, high quality, long-term research which incorporates extra-financial issues such as climate change, and to integrate such issues into their mainstream analyses and investment decisions with the help of in-house or external SRI expertise.
- Challenge both buy- and sell-side analysts on their understanding and incorporation of climate change risks and opportunities in their investment research and ideas.
- Support the development of climate change databases and request more consistent information from companies on their climate change performance.
- Develop innovative investment vehicles that capitalize on changes in climate change policy and regulation.

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- ¹ IPCC 2001.
- ² Cost-benefit techniques based on even modest discount rates lead to distant costs being assigned a low present-day value. However the people affected by that damage have no say in the decision.
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- ³⁴ Agricultural and forestry processes and simple domestic energy use also create greenhouse gases, but not on the same scale as fossil fuel.
- ³⁵ Because of the high natural variability of the climate system, it is generally difficult to say which events are due to climate change and which might be “natural”. The European heatwave of 2003 seems to have been “man-made”.
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- ³⁸ Lord Browne, CEO of BP, at IIGCC Conference, November 2003.
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