



Climate Changes Your Business

KPMG's review of the business risks and economic impacts at sector level



I'm Voting for
REAL Action on

**Climate
Change**

Please Reduce Emissions NOW!

Voters Taking Action on Climate Change



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Forewords

KPMG International

Climate change no longer needs an introduction. It is now widely regarded as one of the most serious challenges the world faces, with consequences that go far beyond its effects on the environment. Climate change has reached a tipping point in global awareness. In a relatively short period of time the dynamics have changed drastically: media coverage and public awareness are growing rapidly, and government and corporate action indicates that the issues have clearly entered the political and economic sphere.

Businesses are also increasingly confronted with the implications of climate change. We observe among our clients around the world that the subject is steadily moving up their agendas. They recognise that climate change poses both risks and opportunities, with strategic and financial implications for their businesses. Companies that confront these challenges should take three steps. First, they should assess the direct implications of climate change to their businesses, such as the impact of extreme weather on their physical assets, and take corrective action. Second, they should consider how indirect effects, such as environmental regulation, may influence the way they operate. Third, they should seek to benefit from the opportunities brought by climate change, such as market demand for energy-efficient technologies.

At KPMG, we are committed to addressing climate change, first and foremost by acting as good corporate citizens. KPMG member firms around the world have set out ambitious climate-change programmes, ranging from reducing our energy consumption through energy-efficient buildings and finding alternatives to business travel, to working with our business partners in energy-conservation programmes, and supporting selected not-for-profit organisations and climate-change initiatives.

Furthermore, we have always sought to be at the forefront of developments that shape business behaviour. On the one hand, we provide services that help our clients both to meet challenges and to respond to opportunities. Our professionals have over 15 years' experience of offering sustainability and climate change-services to a wide range of clients, from global organisations to national businesses and government agencies.

On the other hand, we regularly provide analysis and industry insight into the role of business in relation to some of the most pressing societal issues. I commend KPMG in the Netherlands for taking the initiative of carrying out this review on the business risks and economic impacts of climate change. This publication comes at an important time, having recently decided to step up our efforts in addressing climate change as a global firm.

I believe the review will give you an insight into the current understanding of business risks resulting from climate change and that it will stimulate further debate on how to tackle these challenges.



A handwritten signature in blue ink, appearing to read 'Tim Flynn', written over a white background.

Timothy P. Flynn
Chairman, KPMG International
Chairman and chief executive of KPMG LLP in the United States

KPMG in the Netherlands

Science and macroeconomic analysis offer an ever-clearer picture of the formidable challenges that climate change presents. However, previous KPMG research, conducted in co-operation with the Global Reporting Initiative, suggests that there is still relatively limited understanding of the implications of climate change at sector level. Furthermore, companies appear to focus more on the potential opportunities than on the risks. For these reasons we decided to focus our review on the business risks and economic impacts of climate change at sector level.

Risk is still often viewed as anathema, an added burden that limits initiative and performance. However, in the face of today's increasing complexity and interdependence, I believe that ad-hoc responses to global risks such as climate change are no longer sufficient. Perhaps the biggest challenge business leaders face in this context is balancing short-term objectives with long-term risks. Risks to long-term profitability are often overlooked when organisations are only focused on the delivery of short-term performance targets.

It is vital for organisations to have effective frameworks in place for understanding and managing the long-term risks – as well as the opportunities – resulting from climate change. This does not mean that companies have to reinvent the wheel. The challenge of anticipating climate-change risks will be one of organisational integration rather than of developing entirely new systems of risk management and control.

I am convinced the review offers a meaningful contribution to the understanding of the business risks that result from climate change. We will continue conducting research in this area, which we believe is vital for shaping an appropriate response from businesses to climate change.



A handwritten signature in blue ink, consisting of a stylized 'B' and 'V' followed by a long horizontal stroke.

*Ben van der Veer
Chairman, KPMG's Europe, Middle East and Africa Region
Chairman of KPMG N.V. in the Netherlands*

Executive summary

This review brings together and analyses the most important research into the effects of climate change on the corporate world, in order to identify the specific risks and economic impacts at sector level that businesses must address. Its purpose is to contribute to the debate, to stimulate further research and, most important, to help companies better understand and respond to the issues at stake.

Climate Changes Your Business is the most comprehensive analysis of its kind to date. Its findings, summarised below, are based on a review of 50 reports from a variety of reputable sources, mostly from the financial sector, addressing the business risks and economic impacts of climate change at sector level. The analysis of these 50 reports both aggregates their findings and quantifies the levels of climate-related risks facing a wide range of business sectors, providing what is effectively an “aggregate view” of the total risk to business of climate change. In addition, with the help of observations from 11 external experts, the review assesses the degree to which that aggregate view is realistic. The end result is both an overview and a critical appraisal of climate-change risks as they are currently perceived.

Business risks and economic impacts remain underestimated

The nature and extent of the risks from climate change to business remain far from clear. Overall, there is a shortage of hard data, of quantitative projections, and also of consistency in the risk-assessment methodologies applied. The review suggests that many reports, while emphasising the opportunities arising from climate change, underestimate

the risks faced by specific sectors. This focus on opportunity over risk is striking in the light of a growing consensus on the significant macroeconomic costs of climate change, which inevitably have implications for companies.

Four types of climate-change risks identified

The review finds that climate change can expose companies to four types of risk: regulatory, reputational, physical and litigation risks, and that these risks are likely to increase in the future. The level of importance attached to each type of risk differs considerably both across sectors and regions.

Furthermore, these risks are materialising regardless of the actual rate of climate change, gaining a dynamic and pace of their own.

Regulatory risk most commonly cited

Of the four, regulatory risks were the most commonly cited in the reports surveyed, with 72% discussing the regulatory risks that businesses face. Companies and sectors that fail to adjust to a changing business environment created by new laws and regulations face competitive disadvantages, while regulatory uncertainties make it difficult for companies to plan ahead.

Physical risk: full analysis of impacts lacking

Half of the reports analysed address the physical risks of climate change. However, the majority of these refer exclusively to the direct impacts of weather-related events. The potential indirect and longer-term risks are little discussed.

Risks to reputation and of litigation underestimated

Relatively few of the reports pay attention to reputational and litigation risks (28% and 14% respectively). Although the scale and scope of such risks seem to be growing, they do not yet seem to be considered substantial. However, the review highlights a growing risk of litigation to companies in the United States and also identifies a bigger risk to corporate reputations than the reports suggest.

Most sectors at risk - but preparedness varies greatly

The review reveals that almost every sector is exposed to at least one of the four types of risk, with risk levels considered to be high or medium. Considerable discrepancy between sectors is revealed when the perceived level of risk is plotted against “preparedness” for the effects of climate change. For the purpose of further analysis KPMG classified sectors as belonging to one of the three following categories:

- Danger zone: sectors where risk is markedly greater than preparedness.
- Middle of the road: sectors where risk is roughly matched to preparedness.
- Safe haven: sectors that seem to be reasonably well prepared for climate change and that do not seem to face significant risks.

Six sectors in the danger zone

Six sectors lie in the “danger zone” when using KPMG’s risk versus preparedness framework (see figure 3.3 on page 48). In addition to oil & gas and aviation, this zone includes four sectors not widely perceived as vulnerable to climate change: health care, the financial sector, tourism, and transport. Despite a high level of perceived risk, KPMG believes that, except for oil & gas, the risks of these sectors remain underestimated.

Nine sectors perceived as middle of the road

The analysis reveals that nine sectors are considered to be “middle of the road”: automotive, construction & materials, insurance (including reinsurance), building & real estate,

manufacturing, mining & metals, pharmaceuticals, retail and utilities. However, critical analysis suggests that the risks to several of these sectors are underestimated in the reports reviewed, most notably in the case of the automotive sector.

Three sectors in safe haven

Three sectors lie in the “safe haven”: telecommunications, chemicals and food & beverages. For telecommunications this result is primarily due to companies in this sector having a perceived limited exposure to risk, rather than having a high level of preparedness. The chemicals sector is in the safe haven zone due to its high level of preparedness versus its relatively moderate level of risk. For food & beverages it was found from critical analysis that the reports reviewed do not give a complete picture of the issues at stake.

Looking ahead

Climate-related risks are now today’s realities. To meet these challenges companies must improve their understanding of how such risks affect their businesses, and they must also adapt to and mitigate such risks. Most companies already handle business risks: such generally accepted approaches to enterprise risk management and business continuity provide a sound basis for managing climate-change risks. In this way the challenge of anticipating the long-term direct and indirect implications of climate change will be one of organisational integration rather than the development of entirely new systems of risk management and control.

Companies will also need to grasp the opportunities generated by climate-change risks. Competitive advantage awaits those companies that take early action.

Lastly, companies must also account for this emerging business issue internally and disclose it to shareholders and other stakeholders. This may prove a significant business challenge.

The new climate reality

The strategies of successful corporations are increasingly shaped by environmental and socio-economic issues.

Yet despite this recognition, environmental issues such as climate change remain little accounted for in the broad economic system. This represents a market failure that is likely to be corrected over time by a combination of international co-operation, regulation, technology promotion and market-based incentives. The main challenge for governments is develop an international framework which successfully levels the playing field and provides incentives for taking decisive and sustained actions.

Companies that understand the new climate reality – and that are willing to invest in preparedness and risk management – are also best-equipped to seize the opportunities.

SOLAR COOKING FOR SUSTAINABLE LIVING - The Solar Cookers International Association is formed by Solar Cookers International. By the end of 2006, 99 individuals and 56 organisations from 32 countries had become founding members. The SCIA's aim is the wider spread of solar cooking, pasteurising and food processing through more partnerships with UN agencies, international development and relief organisations, policymakers, businesses and networks.

“I am convinced
that companies which
take the initiative to
improve their carbon
footprint will innovate for
the better – both for their
own prosperity and the
world as a whole”

Michael Hastings

“Climate change means business change”

The southern part of Australia has had to deal with seven years of extreme drought. Farming has been devastated. In northern Australia there has been extreme flooding. Such extremities have never before been experienced in the country. These examples and many other events all over the world – whether Hurricane Katrina in New Orleans or the floodings in Bangladesh – show that our ecosystem is in turbulence and that climate change has a damaging effect on all of us.

Destructive as these events may be, they have contributed to a new momentum in both business and politics. People have woken up to climate change and its unprecedented impact. The question is no longer whether the business community should act on climate change. The question for all of us is: what must be done?

While this KPMG report shows that not all business sectors share the same sense of urgency about climate change, initiatives are taking place and this gives room for optimism. We are seeing industries redesign their supply chains, production processes and logistics to drive down overall carbon emissions. They may react to regulatory measures or they may act upon the desire to innovate and to prove that a more energy efficient world is feasible – or both.

And companies are becoming aware that their reputations are also at stake. We are witnessing changes in the retail industry, for example, where every aspect of food production and distribution is being made more energy efficient. And it is not only the heavy energy users, like the automotive or aircraft industries, that are taking the initiative. In the services sector, for example, we are seeing companies taking account of their carbon footprint and reducing their daily energy consumption and paper flow.



Lord Michael Hastings of Scarisbrick is global head of Citizenship and Diversity at KPMG.

It is the responsibility of every organisation to respond to climate change and its consequences. Any CEO that has not yet done so should start by asking three key questions within his or her organisation.

The first question is for CFOs: “how much are we spending on all dimensions of energy consumption? Are we efficient and sustainable in every respect of our operations?” Every company that has posed these questions and acted upon them has saved enormous amounts of energy – and money.

Second, the CEO should ask the corporation’s head of operations: “do our people understand that every action has a consequence?” If not – or not sufficiently – the company should start an education programme on energy responsible behaviour.

Third, the company must ask itself: “who else can we team up with to achieve a lighter carbon footprint?” This last question is not only for the good of the company in question. All businesses must accept their responsibilities – both individually and together – to keep the issue of climate change in front of the public, the media, governments and regulators.

The consequences of climate change are beginning to be felt in every single market across the world. I am convinced that companies that take the initiative to improve their carbon footprint will innovate for the better – both for their own prosperity and the world as a whole.

Introduction

1

This review is part of a series of KPMG publications¹ addressing the role of business in relation to some of the most pressing societal issues. It has been prepared by KPMG Global Sustainability ServicesTM, based on an analysis of 50 reports, together with comments by 11 experts, addressing the business risks and economic impacts of climate change at sector level.

1.1

Background

The review addresses the business risks and economic impacts of climate change at sector level in order to focus more attention from business leaders and other decision-makers on the subject. There are a number of reasons for doing this.

1.1.1

Government intervention as response to market failure

Since the publication of the *Stern Review on the Economics of Climate Change*² it is acknowledged that climate change threatens to be the “greatest and widest-ranging market failure ever seen”. Standard economic theory³ dictates that government intervention in the economy is justified in the case of market failure. Thus it can be assumed that governments will take further action, and businesses will increasingly be confronted with a carbon-constrained world.

1.1.2

Lack of knowledge and hard data

Science and economic analysis offer an ever-clearer picture of the macroeconomic costs of climate change. Predictions of annual losses range from 1% of global GDP a year if strong and early action is taken, to at least 5% of GDP if economies fail to act. According to a UNFCCC report⁴ global investments of \$200-\$210 billion will be needed by 2030 to keep GHG emissions at today's levels. This amount represents around 0.3% of estimated global GDP and 1.1% of global investment in 2030. However, in the absence of hard data, little is known about which parts of the economy are exposed to risk. There is therefore a need for further analysis at sector level.

¹ Since the early 1990s, KPMG has conducted research that is often carried out with other experts, such as intergovernmental agencies, think tanks and universities. The publications can be found at www.kpmg.nl/sustainability under the section “Research and trends”.

² Stern (2006).

³ Concerns standard theory of public economics, refer for example to Atkinson et al. (1980).

⁴ UNFCCC (2007).

1.1.3

It's about risk, too

The growing public debate on climate change and its materialising risks means that the business case for action has never been stronger. But, despite alarming macroeconomic predictions, companies still tend to talk largely about opportunities. Previous research⁵ conducted by KPMG and the Global Reporting Initiative (GRI) found that companies reported significantly more on potential opportunities than financial risks. Polls also indicate that the large majority of corporate executives believe they will “win” against climate change in business, while being pessimistic about the likelihood of climate-change abatement in general.

This belief does not seem entirely realistic if macroeconomics and the lessons of history are applied. By focusing on risk rather than opportunity, we aim to strike a balance and promote a more realistic debate. Of course, certain risks can play out as opportunities for those that are quick to address them. A better understanding of the risks involved can help companies make the most of those opportunities.

1.1.4

Materialising risks

Regardless of the pace of the physical manifestations of climate change, the business risks are rapidly materialising. It is therefore vital to understand and underline the business perspective of climate change, and emphasise that the business world must take responsibility, along with governments and other organisations.

1.2

Review methodology

The review involved an analysis of 50 reports that address the business risks and economic impacts of climate change. We combined this analysis with 11 interviews from experts in the field, who were invited to comment on specific findings of the review. Each expert has extensive knowledge in at least one of the business risks identified, or in a selected sector.

A report had to meet the following criteria in order to be included in the review:

- It addresses the business risks of climate change and/or its economic impact on a sector or company.
- It assesses the business risks on the basis of a specified methodology or expert opinion.
- It has been published by a credible organisation.

The reports come from a number of sources, representing the views from a wide range of organisations, including investment banks, business associations, insurance companies, non-governmental organisations, consultancies, rating agencies and intergovernmental organisations.

⁵ KPMG Global Sustainability Services™ and the Global Reporting Initiative (2007).

Publishers of the reports reviewed

Allianz and WWF	JPMorgan Chase and Innovest Strategic Value Advisors
American Electric Power	Lehman Brothers
Aon	Lloyd's
Australian Business Roundtable on Climate Change	McKinsey
Barclays	Merrill Lynch and World Resources Institute
Carbon Trust and Lippincott Mercer	Milieudéfense and Profundo
Ceres	Moody's
Ceres and Calvert	Morgan Stanley
Ceres and Investor Responsibility Research Centre	Nature
Chatham House and Insight Investment	SAM Group
Citigroup and World Resources Institute	SAM Group and World Resources Institute
Columbia University	Social Investment Organization
Deutsche Bank	Standard & Poor's
Ford	Swiss Re
Goldman Sachs	Swiss Re and ETH-Zurich
Goodwin Procter	Trucost
Henderson Global Investors and Trucost	UBS
ING Wholesale Banking	UNEP FI
Innovest Strategic Value Advisors	University of Amsterdam
Innovest Strategic Value Advisors and UNEP FI	Vattenfall
Insight Investment	World Tourism Organization
Institutional Investors Group on Climate Change	

The reports were selected in consultation with climate-change experts familiar with the literature. Subsequently, they were analysed against a set of parameters such as industry, geographical coverage, risk types, cost estimates and methodologies used.

The list of reports is not exhaustive, but it constitutes an informed selection that provides for the first time an aggregation and quantification of expert views on the business risks related to climate change (see section 3.2 for a full account of KPMG's quantification methodology).

1.3

Contents of the review

Section 2 of the review presents four different categories of business risk resulting from climate change. In section 3 we present the results of the analysis from a sector perspective, discussing the risks and preparedness of each sector. Section 4 critically reviews the methodology used in the reports and looks at how it may be developed in the future. Furthermore it offers some thoughts on the practical implications of the review for individual companies.

Initiation of the review

This review was initially prepared as a contribution to a “Food for Thought” dinner with top decision-makers from business, government and politics that was jointly organised by the Dutch CSR business network “Samenleving & Bedrijf” and KPMG. The purpose of the dinner (Amsterdam, March 2008) was to provide a forum for learning and exchange on the strategic challenges of climate change.

AERIAL VIEW OF A FLOODED BRIDGE IN VILLAHERMOSA, STATE OF TABASCO, MEXICO, NOVEMBER 2007 – Rescuers battled to reach people stranded on rooftops as more than 1m struggled in the worst floods on record in the state. Around 58% of the Belgium-sized state was flooded after seven rivers burst their banks in the flat, floodprone region.



“There will be more weather-related surprises in the near future that will have a severe economic impact”
Nicholas Stern

“Smart companies take action”

There is a common understanding that business leaders can no longer get away with rhetoric. Climate change affects their business. They will have to think through the consequences of climate change in every aspect of their operations and plan for the risks that will have a significant impact.

Companies that want to act on climate change must anticipate the concrete risks they face and their consequences – whether these are in the fields of regulation, physical risks, reputational risks or litigation risks.

On regulatory risks, I believe that the business world and NGOs should co-operate with governments, and urge strong policies. That way, regulatory certainty can be obtained through dialogue; business can anticipate regulatory consequences – like the pricing of carbon emissions – and governments can decide which measures suffice.

As for physical risks, the frequency of climate-related disasters will increase. There will be more weather-related surprises in the near future that will have a severe economic impact, be they droughts, storms, extreme floodings or other catastrophes. The consequences will be destabilising. We must plan for responses and set up defence mechanisms against these risks.

Reputations are also at stake. I am convinced that the attitudes of the public, consumers and stakeholders will make companies reconsider their corporate social responsibilities towards our planet. Potential employees will question whether their company is sufficiently sustainable.



However, climate change also offers a lot of opportunity for innovation, such as low carbon infrastructures and solar energy. Some industries are already changing their operations to adapt to climate change: the automotive industry is a sector in which the supply chain, production methods and output will change in a revolutionary way; the retail sector is also taking action to show transparency in carbon emissions in the products they offer, and this requires positive action from their suppliers. We see increasing pressure on insurance companies, as building construction and emissions standards grow more rigorous. Even banks have declared climate change as among their strategic priorities.

The World Economic Forum in Davos in 2008 has shown that the debate on climate change has matured and has become more practical. Governments throughout the world are taking measures, whether in pricing and taxes, regulatory measures, or the promotion of technology. The smart companies are not waiting, they are taking action. All this is good news. I am impressed to see how much is actually being done, both on a country level and on a sector level.

We are starting to see changes everywhere.

The business risks of climate change

2

A vast majority of the business community recognises that climate change is a reality, with potential risks and opportunities. The most recent report of the Carbon Disclosure Project (CDP5) revealed that 79% of the responding FT500 companies consider climate change to present a “commercial risk”, while 82% regard it as a “commercial opportunity for both existing and new products”.

Before discussing the climate-change risks according to sector (Section 3), it is worth looking at the different types of business risks posed by climate change in general. Although there was no method of the categorisation of risk common to all 50 reports, the analysis suggests that companies face four types of climate-change related risks directly or indirectly. These risks concern physical impact, regulation, reputation and litigation. Of these, physical impact is the risk most directly related to climate change. The other three risk types are more indirect in nature in that they concern the responses of society to the way that companies address – or should address – climate concerns.



2.1

Physical risk

Companies may face physical consequences of climate change. The risks include the impact of weather-related events such as increased storms (including hurricanes, cyclones, typhoons, hailstorms, snowstorms and so on) and floods (including storm surges and flash floods from intense rainfall). The number of droughts, strong winds, heat waves and forest fires is also expected to rise.

A company's exposure to such risks varies with the sector and the location in which a company operates. Physical assets on coastlines are more exposed to the threat of high-intensity hurricanes. Growing economic wealth, especially in areas that are affected by more variable and extreme weather, leads to a greater loss potential (see Viewpoint).

Companies may also be at physical risk from the longer-term effects of climate change. These include variations in water availability, increased or decreased rainfall and rising sea levels. The implications of these physical risks for business are not always obvious. The more obvious consequences include damage to property from extreme weather events, increased insurance premiums and asset losses (for example, a drop in the value of property for weather-dependent businesses such as ski resorts). The less obvious risks include the impact on workforces (for example, heat-related illness or disease), enforced relocation of operations, and increases in commodity prices. While companies may be protected from some of these risks by various insurance products, there is a danger that newer forms of risk might be passed on to the private sector. Companies will have to carefully assess their exposure to the physical impact of climate change. Some companies may be able to reduce actuarial risk by introducing adequate protection measures. Others will have to reassess their entire business model.



Viewpoint

Ivo Menzinger

Damage limitation

The cost of catastrophe

Natural catastrophes have had a greater impact on insurance companies over the past 15 years than in the entire history of insurance. Swiss Re has recognised climate change as a major insurance risk for two decades now. While it is clear that climate change does not work in the interests of our company, it offers both risks and opportunities and is therefore of strategic relevance. Over the past few decades insured loss amounts as a result of natural disasters have grown several times over, from below \$4 billion in 1970 to \$21 billion in 1990. In 2005 losses were over \$100 billion, mostly as a result of a particularly destructive hurricane season. Catastrophe bonds allow insurers to pass some of the peak risk on to the capital market so that they can remain solvent in the event of a major disaster.

Such bonds have increased in value more than tenfold since 1999.

Prepare for more extreme weather

The most important factors contributing to the rising losses resulting from natural catastrophes are growing economic wealth and value concentration, higher insurance penetration, increased population density and changing hazard cycles and trends such as natural and man-made climate change. While the loss potential of hurricanes is greatest, Swiss Re is also projecting the impact of other forms of extreme weather. For example, the damages caused by winter storms on buildings in Germany are estimated to increase twofold between today and the end of the century.

The most important counter-measure is to reduce vulnerability to extreme

weather by means of regional planning, building and construction codes, protection measures and emergency organisation. But individual businesses need to be prepared as well in order to cope with the growing threats posed by storms, floods, hot summers or droughts.

The level of risk varies depending on sector and location. Sectors likely to be hardest hit by the physical impact of climate change are the financial sector, tourism, agriculture, infrastructure and building & real estate.

Companies directly and continuously exposed to rising temperatures or the growing threat of natural disaster will have to constantly monitor the sustainability of their business models. In the Alps, for example, winter sport will remain viable only in areas above

1,800 metres. And agribusiness needs to adapt to more variable and extreme weather by cultivating crops with a higher resistance to droughts or heat waves.

The role of the insurance industry

Insurance companies play an important role in mitigating the risks stemming from climate change, notably by providing financial protection against losses from catastrophic events. Furthermore, insurance can provide incentives for improved risk management by means of lower premiums for those who invest in risk-mitigation measures. For example, fortifying property to reduce the impact of storms and floods may reduce the actuarial risk, ultimately leading to lower insurance premiums.

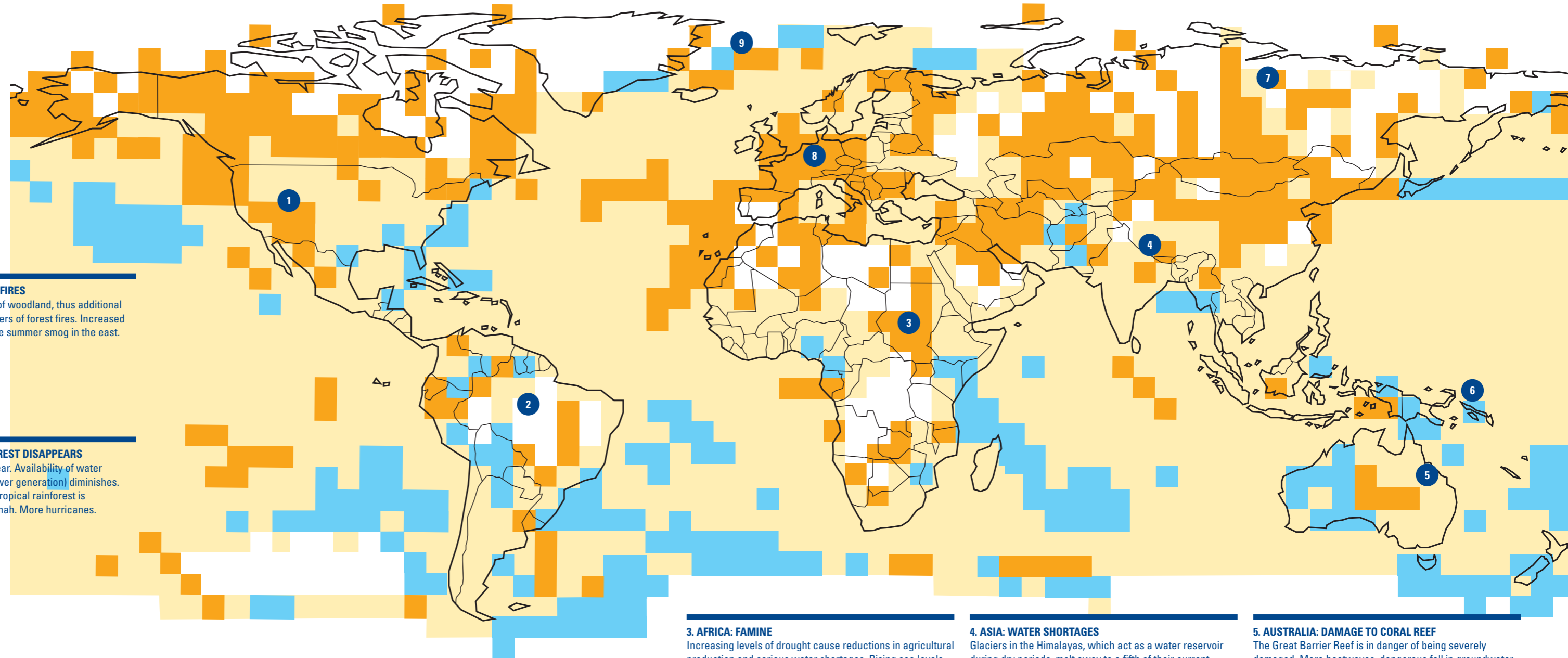


Ivo Menzinger is managing director of Sustainability and Emerging Risk Management at Swiss Re, the world's largest reinsurance company.

The anticipated effects of climate change until 2100

Temperature change over the period 1970 to 2004

- Temperature rise of 1.0 to 3.5 °C
- Temperature rise of 0.2 to 1.0 °C
- Small temperature increase (0.2 °C) or even a drop (-2.0 °C)
- No data



9. NORTH POLE: ICE DISAPPEARING

The ice cap over the North Pole is becoming thinner and will melt away even more during the summer months. The ice cap and glaciers in Greenland are retreating. This is causing sea levels to increase. A shipping route is being freed up.

8. EUROPE: DRIER

In the south, temperature increases lead to heatwaves, drought and a fall in agricultural production. In the north, agricultural production and forestry increase due to warmer climate. More and heavier winter storms.

7. RUSSIA: PERMAFROST MELTS

The permafrost decreases to 35% by 2050, making the ground underneath numerous buildings unstable. Large amounts of methane (a potent greenhouse gas) released.

6. SMALL ISLANDS: THREATENED

Increasing sea levels cause coastal erosion and destruction of the natural land defences such as mangrove swamps and coral reefs. Fresh water becomes saline.

1. NORTH AMERICA: FOREST FIRES

More heatwaves, expansion of woodland, thus additional threat due to increased numbers of forest fires. Increased frequency of hurricanes. More summer smog in the east.

2. SOUTH AMERICA: RAINFOREST DISAPPEARS

Glaciers in the Andes disappear. Availability of water (as drinking water and for power generation) diminishes. In the eastern Amazon area, tropical rainforest is threatening to become savannah. More hurricanes.

3. AFRICA: FAMINE

Increasing levels of drought cause reductions in agricultural production and serious water shortages. Rising sea levels threaten coastal areas. Sensitive ecosystems affected.

4. ASIA: WATER SHORTAGES

Glaciers in the Himalayas, which act as a water reservoir during dry periods, melt away to a fifth of their current volume. Between 120m and 1.2 billion people face water shortages. Rising sea levels threaten coastal areas. Reduction in agricultural production.

5. AUSTRALIA: DAMAGE TO CORAL REEF

The Great Barrier Reef is in danger of being severely damaged. More heatwaves, dangerous fall in groundwater levels.

2.2

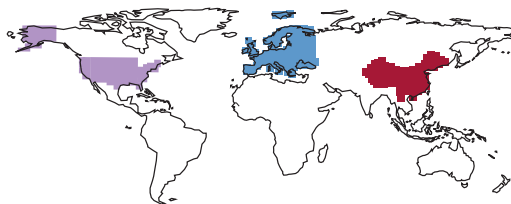
Regulatory risk

Climate change is increasingly seen as a serious market failure that must be corrected by some sort of governmental intervention. As a result, legislators around the world are introducing regulation. In principle, regulation can be divided into two types, notably:

- Traditional legislation, such as permits and energy-efficiency requirements for products and processes; and
- Market-based regulation, such as carbon taxes, emissions-trading schemes and fuel tariffs.

A sharp increase in both types of regulation is being prepared and implemented at an international, regional, national and local level.

Key policies that make a global difference



Source: IEA

The International Energy Agency's Alternative Policy Scenario

	ENERGY EFFICIENCY	POWER GENERATION
US	- Tighter Corporate Average Fuel Economy standards - Improved efficiency in residential & commercial sectors	- Increased use of renewables
EU	- Increased vehicle fuel economy - Improved efficiency in electricity use in the commercial sector	- Increased use of renewables - Nuclear plant lifetime extensions
China	- Improved efficiency in electricity use in industry - Improved efficiency in electricity use in the residential sector	- Increased efficiency of coal-fired plants - Increased use of renewables - Increased reliance on nuclear energy



At the international level, the Kyoto Protocol of the United Nations Framework Convention on Climate Change (UNFCCC) is the major regulatory framework, which expires at the end of 2012. At the 2007 conference in Bali the international community started work on a successor to the protocol, to be agreed at the end of 2009. At the regional level, Europe has the most stringent regulatory regime. This includes the European Union Emission Trading Scheme (ETS), with mandatory emissions-reduction targets and various sector directives. In the United States, some states and cities introduced their own initiatives in response to the refusal by the government to ratify the Kyoto Protocol. Ten northeastern and mid-atlantic states have a Regional Greenhouse Gas Initiative, while California has adopted its own carbon-related regulation for cars. At a local level, the mayors of more than 200 cities have issued the non-binding US Mayors Climate Protection Agreement, aimed at tackling climate change. Such efforts strongly indicate that companies around the world – whether directly or indirectly responsible for emissions – will be increasingly exposed to regulation.

Regulation is considered as a powerful force of change. According to the International Energy Agency a dozen policies in the US, EU and China account for around 40% of the global emissions reduction by 2030 in the Alternative Policy Scenario.

Viewpoint

Fatih Birol

The inescapable rightness of regulation

Regulations in the pipeline

The problem of climate change is far from being ignored. Thousands of regulations aimed at mitigating the dual challenges of energy security and climate change are being considered by lawmakers around the world.

The policies aim to ensure, among others things, a more efficient vehicle fuel economy, improved efficiency in residential and commercial sectors, increased use of renewables, and a greater reliance on nuclear energy. If adopted, such policies would pave the way for a viable alternative to a highly vulnerable, dirty and expensive global energy system.

The IEA maintains an online database of its member countries' policies and measures to mitigate climate change. With over 2,000 so far, the database provides a comprehensive annual

update of the policymaking process in place. The distinction made between policies in force and under consideration allows the IEA to devise various scenarios on how global emissions would evolve if proposed policies were adopted.

Potential for significant emissions reductions

The potential of such policies to reduce global emissions cannot be underestimated. Significant reductions in CO₂ emissions could be achieved if the regulations proposed were enacted. By implementing all the policies under consideration, CO₂ emissions from OECD countries would begin to decline by 2015. Global emissions would stabilise by 2025. The potential of energy savings that could be achieved is huge.

Regulation today, regulation tomorrow

However, the price of inaction is also huge. If new policies are not adopted, energy-related carbon emissions will increase by almost 60% by 2030.

While varying conditions across industries and countries preclude any blanket solutions, priorities for policies to mitigate climate-change risks can be defined. For example, every power plant built anywhere in the world after 2012 must be carbon-neutral in order to stabilise CO₂ levels by 2030.

An investment of \$1 trillion is necessary to ensure the early retirement of coal-fired power plants. Furthermore, energy efficiency will have to rise from 1.5% a year to 2.7%.

These requirements can be met only by means of far-reaching regulatory changes in place by the end of this decade, notably by the world's top

emitters, China, the United States and India. However, in the current political climate such changes are unlikely to materialise in time.

While it is questionable whether the policies designed to achieve the critical goal of stabilising and reducing CO₂ emissions will all be adopted in time, it is certain that more regulation will continue apace. Companies should be prepared for this.



Fatih Birol is chief economist of the International Energy Agency (IEA), based in Paris. He is responsible for the IEA's flagship publication, World Energy Outlook.

2.3

Risk to reputation

A company's reputation and brand are inherently linked to its overall value. According to Rita Clifton, chairman of Interbrand: "The intangible element of the combined market capitalisation of the FTSE 100 companies has increased to around 70%, compared with some 40% 20 years ago, and it is likely to grow even further as tangible distinctions between businesses become less sustainable. The brand element of that combined market value amounts to around a third of the total, which confirms the brand as the most important single corporate asset."⁶ So maintaining the brand as a company asset is critical.

According to *Brand Value At Risk*, a study produced by the Carbon Trust in 2005, climate change would become a "mainstream" consumer concern by 2010. More recent polls show that in certain countries, such as Britain, consumers are paying more attention to corporate behaviour in response to climate change. Companies run the risk of a decrease in consumer confidence and brand value if they are perceived as failing to address climate-change risks. They may also suffer a loss of reputation among other stakeholders such as the financial sector, governments, employees or the media.

Likewise, companies could find an opportunity to positively differentiate themselves from their competitors by measures aimed at reducing their carbon footprint (see Viewpoint). However, the Carbon Trust cautions that companies need to understand the response time necessary for introducing substantial changes to their operations. Therefore, in anticipation of heightened consumer awareness such changes should be introduced in a timely manner. While damage to reputation is difficult to quantify, certain sectors in particular run the risk of such damage if they fail to act.

WARNING

This product contains unnecessary packaging. The only purpose of which is to become waste and enter a landfill near you. Please consider a product with a smaller package.

WARNING

⁶ Clifton, R. and Simmons, J. (2003).

Viewpoint

Hans Verolme

How not to risk your reputation

Sectors at risk

The way that a company addresses climate-change concerns has an impact on its reputation, notably in sectors with high emissions levels and those that interface directly with customers. A failure to comply with legislation can damage the reputation of a company. Consumer awareness is on the rise, spurred by extensive media coverage of the effects of, and policy responses to, climate change. In the face of growing public expectations, particular sectors, such as the energy, aviation, consumer products, retail and automotive industries, are increasingly compelled to act beyond the basic legal requirements.

Creating advantage

The WWF-supported Climate Savers Computing Initiative is an example of

how leading companies from the same industry seek to turn the challenges posed by climate change into commercial advantage. By joining this initiative, computer and component manufacturers have committed themselves to increasing the energy efficiency of computers. What is important for the success of this and other WWF Climate Savers initiatives is that participation promises many benefits, including financial savings from energy-efficiency efforts, in addition to protecting reputation.

A recent survey by the WWF⁷ found that consumers choose responsible brands whenever they can, as long as those brands are as attractive as other alternatives. As a result – and in anticipation – of growing consumer

awareness, companies have begun to show themselves as responsible, and market their products as “climate-friendly”. Companies that are slow to act may eventually lose market share to those more successful in convincing consumers of their efforts to reduce their carbon footprint. While consumer expectations differ from country to country, consumers in some markets, such as Britain, respond positively to the availability of products with a comparatively low carbon footprint.

Beware greenwash

Companies’ reputations are at risk not only from consumer opinion. Anecdotal evidence from the oil, gas and energy sectors suggests that those companies perceived to be doing little in response to climate change face

greater challenges in attracting a talented workforce. Furthermore, companies should be wary of the risk of “greenwash”. Efforts by companies to market themselves as green leaders can backfire if a company distorts its climate credentials by, for example, overstating energy-saving measures in place.



Hans J.H. Verolme is the director of the Global Climate Change Programme of the WWF.

⁷ *Let them eat cake: Satisfying the new consumer appetite for responsible brands*, WWF-UK (2006).

2.4

Risk of litigation

Increased legislation inevitably leads to an increased risk of litigation. William Thomas, head of the environment practice of law firm Clifford Chance in the Americas, identifies three main strands of litigation: actions targeting heavy emitters; challenges related to emergent state and federal carbon controls; and increasing scrutiny of greenhouse-gas disclosure. Although the scale and scope of such risks is growing, they are not given much weight in the climate-change strategies of most companies.

According to Mr Thomas, one area worth watching is that of corporate disclosure and related carbon claims, as climate stakeholders step up pressure on the SEC, the Federal Trade Commission and other regulators to clarify, and uphold, transparency standards. This will have implications for corporate carbon governance, communications, stakeholder engagement and investor relations. Consensus on what may be considered reasonable disclosure has yet to emerge, and will take time. Meanwhile, companies must manage the interplay between mandatory and voluntary statements regarding climate, and work with external stakeholders to develop workable standards.

So far, the primary function of litigation is political in the sense that it serves as a catalyst for regulation. The Supreme Court decision in *Massachusetts v Environmental Protection Agency* was seminal (see Viewpoint). Not only did it send a strong signal to the EPA to regulate greenhouse-gas emissions, it also showed the business community that such regulation was on its way. Mr Thomas points out that this, together with other developments in Congress and state governments, has prompted many companies to call for greater regulatory clarity.



Viewpoint

Kevin Healy

Litigation USA: potential business risks

While the question of whether climate change claims should be considered by the courts in the United States is still being hotly debated, certain recent and impending judicial decisions may well increase the prospect for climate-change related litigation. At the moment there are three basic categories of potential climate-change lawsuits: procedural lawsuits, in which states and sometimes private parties seek vindication of a procedural right granted by law or regulation; actions against individual companies for damages or relief under the common law; and claims by shareholders against businesses for failure to take into account the risks posed by climate change. Decisions in test cases in each of these categories will determine the viability of future climate-change related litigation.

Procedural lawsuits

In April 2007 the Supreme Court recognized in *Massachusetts v. Environmental Protection Agency* that CO₂ is an air pollutant, and granted American states “standing” to ask the

courts to force the EPA to address CO₂ under the Clean Air Act. The court’s decision may have far-reaching consequences. Having been recognised as a pollutant, CO₂ could become subject to regulation under the Clean Air Act. This in turn could provide the legal grounds to demand that CO₂ emissions be considered in the permitting of fossil-fuel fired facilities. The challenge mounted by a coalition of Texas cities in opposition to a plan to build ten new coal-fired electric plants could presage other such attempts by governments and private parties.

In addition, certain American courts have held that climate change is an issue that merits consideration in the preparation of environmental impact statements (EISs) required under federal law. Allegations concerning deficiencies in an EIS prepared for a project often form the basis for judicial challenges. The stage is set for issues to be raised with respect to greenhouse-gas emissions in the approval process required for the construction of power plants and other facilities.

Claims against businesses

Lawsuits brought by individual states against companies for climate-change related damages and injunctive relief have so far been unsuccessful. However, appeals of the lower court decisions in these cases may still have consequences for climate-change related corporate risk in the form of damages or equitable relief. In one case, the state of California sought damages from six car manufacturers for the environmental impact of mobile source emissions of greenhouse gases.

In another, a group of states and the City of New York sought to force five major power companies to address the “public nuisance” of climate change by reducing their CO₂ emissions. In both cases the federal district courts refused to assert jurisdiction over the claims, on the grounds that the issues were “political questions” which should be handled by the legislative and executive branches of government.

In Mississippi, a federal district court dismissed a suit brought by individuals against energy companies seeking alleged climate-change damages from Hurricane Katrina. If courts eventually determine that they have jurisdiction to hear such claims, lawsuits by states and private plaintiffs could well proliferate.

Fiduciary duties

The third potential type of lawsuit – for

which there are no examples yet – may be based on shareholder claims for damages against senior executives for gross neglect of fiduciary duties in matters relating to climate change. Shareholders might argue that the duty of care of a company’s directors includes the responsibility to take into account the impending business risks presented by climate change. While there are many uncertainties concerning the impact of climate change on shareholder value, the possibility of shareholder claims means that companies should prepare for the possible risks in order to avoid allegations of gross negligence.

The extent to which companies will face litigation risks associated with climate change is still uncertain. The overall success rate of lawsuits has been low, and so far case law in the United States does not support claims against individual companies for injuries due to climate change. However, in light of recent decisions on procedural cases, it is likely that projects that plan to emit significant amounts of CO₂ will be challenged. With the prospect of further regulation, this will increasingly become the subject of courtroom debate. Companies should carefully consider the risk of climate-change litigation and its implications for their businesses, and seek advice as to how to minimise that risk by adjusting their strategy.



J. Kevin Healy is a partner at Bryan Cave LLP and co-chairs the Global Climate Change subcommittee of the environmental law section of the New York State Bar Association.

2.5

Review findings per risk category

The review finds that regulatory and physical risks are the most important risks to business. Other major findings include:

2.5.1

Regulatory risk most commonly cited

Of the four, regulatory risk was the most commonly cited in this review. From the reports analysed, 72% discuss the regulatory risks that businesses face.

2.5.2

Physical risks discussed in half of the reports

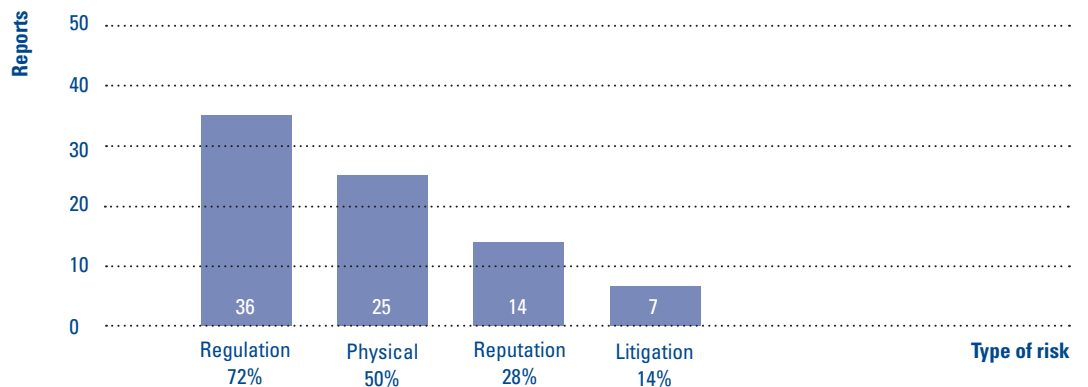
KPMG's analysis also showed that half of the reports reviewed address the physical risks of climate change. However, the majority of reports refer exclusively to the direct damage from climate change, such as the impact of weather-related events (for instance increased storms and floods, droughts, strong winds, heatwaves or fires). Reports fail to address the potential longer-term risks from climate change such as decreases in water availability; impacts on the health of workforces; relocation of operations or increases in commodity prices.

2.5.3

Less attention paid to risk to reputation and of litigation

Relatively few of the reports analysed pay attention to risks to reputation (28%) and of litigation (14%). Although the scale and scope of such risks seem to be growing, they are not considered to be substantial.

Figure 2.1
Risk types mentioned
in reports



2.6

Regional analysis

Climate change is a global phenomenon. But it also has many regional dimensions, such as varying perceptions around the world as to the extent of the problem. A 2007 survey by the Chicago Council on Global Affairs shows significant differences in attitudes to climate change. For example, 69% of Australians believe that climate change is a “serious and pressing problem and that steps should be taken even if this involves significant costs”, while in India only 19% share this view.

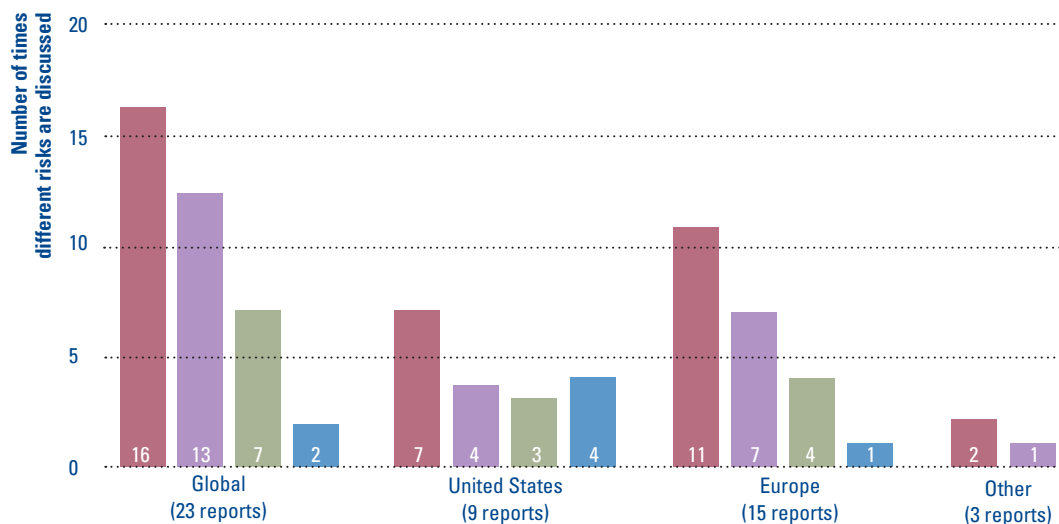
Regional analysis reveals the following conclusions:

2.6.1

Western perspective most dominant

The reports analysed for the review tend to offer a global view, from a European and/or American perspective. Perspectives from other parts of the world are less common. This focus on the Western world is of limited value for those companies in other regions seeking to create an effective climate-change mitigation strategy. There is a need to broaden and diversify research to include emerging markets with large emissions such as China, India, Japan and Russia. Asia and Africa also deserve more attention as the latest Intergovernmental Panel on Climate Change (IPCC) states that these regions are likely to be hit hardest by climate change.

Figure 2.2
Risk types mentioned
in reports



2.6.2

Regional perspectives show little variation

The distribution of business risks shows little variation according to regional perspective. Regardless of the regional perspective, regulation and physical impact are perceived as the dominant risks. Regulatory risk is also perceived as the top risk within the United States, despite the view of the current government: 78% of the reports that address the United States (of which there are 9), highlight regulation as a business risk.

2.6.3

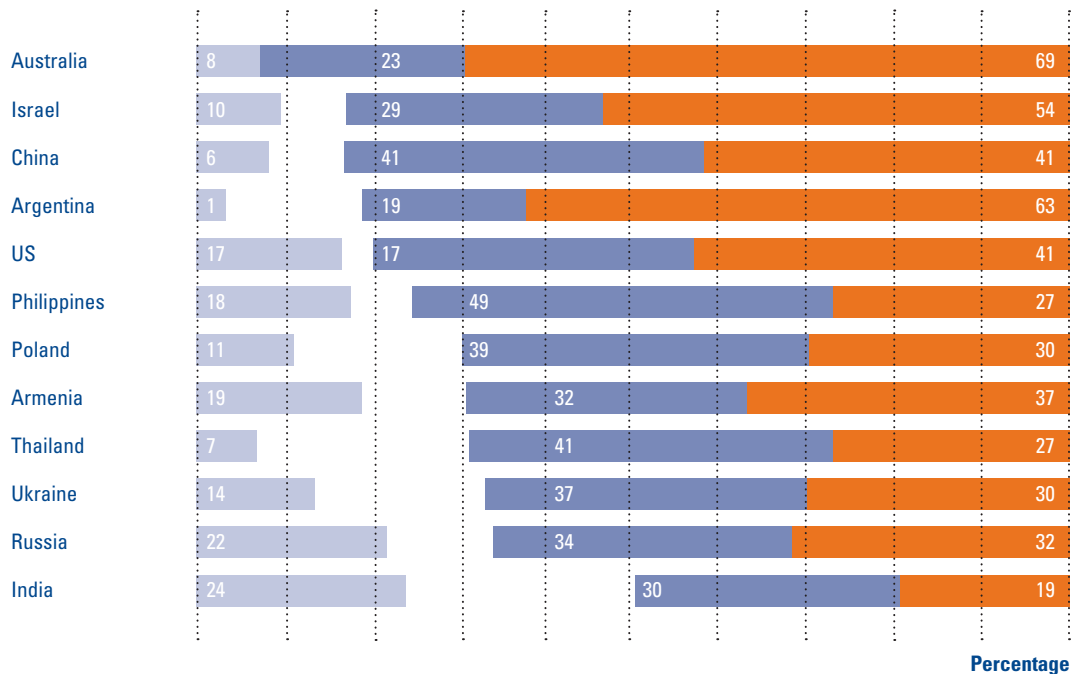
Litigation seen as risk only in the United States

Perhaps unsurprisingly, the risk of litigation is perceived as a material risk only in reports concerning the United States: 44% of the reports that refer to the United States mention the risk of litigation.

Figure 2.3

Survey by the Chicago Council on Global Affairs & World Public Opinion

- Until we are sure that it is really a problem, we should not take any steps that would have economic costs.
- Should be addressed, but its effects will be gradual, so we can deal with the problem gradually by taking steps that are low in cost.
- A serious and pressing problem. We should begin taking steps now even if this involves significant costs.



Source: Chicago Council on Global Affairs & World Public Opinion.

SKYSAILS COMBINE ECOLOGY AND ECONOMY ON THE HIGH SEAS - Application of a kite-propulsion system provides a sustainable way out of dependence on oil. Use of wind energy by means of the towing kite makes it possible to provide relief to the main engine. Potential savings of 20% to 30% are feasible. The carrier serves as an up-to-date link between economic efficiency and preservation of resources.

“There is a huge opportunity for innovations to help reduce our carbon footprint”
Ben Verwaayen

“Business must become green to grow”

In November 2007 the Climate Change Task Force of the Confederation of British Industry (CBI)⁸ published its report ‘Climate change: everyone’s business’. It was received enthusiastically, for two reasons. It successfully demonstrated that an adequate response to the risks of climate change is feasible and affordable. And it also succeeded in creating a common will for change among the CBI members, which is absolutely necessary for success: climate change is not an issue that can be solved in competition among businesses. It must be the number one priority for both governments and the business community.

The CBI report has led to many initiatives. An important example is a type of credit card that allows consumers to invest in insulating their homes without having to make repayments, as these are financed with the savings generated by the investment. This is an important example because it not only shows that innovation can be achieved through joint action – in this case by the financial and energy sectors – but also because this innovation directly involves consumers. And consumer purchasing decisions have an impact on around 60% of UK emissions. Therefore, we must help consumers make the right decisions – by encouraging them through better information and education, better products and the right incentives to make low carbon investments.

It is also extremely important that we act now – and that means action by both governments and businesses. Action now will save money in the long term. We must not lose ourselves in debates as to whether climate change should be a global “fight” or whether China will contribute effectively.

Joint action on climate change must be made the number one priority. If we treat it as merely “one of the many priorities”, momentum will be lost. For example, most local or regional development plans have a horizon of around 20 years but you cannot wait that long before you create change for the better. In these circumstances, business and governments must join forces.



Ben Verwaayen is chief executive officer of British Telecom Group and former chair of the UK Task Force on Climate Change.

For business, this means taking measures in three areas. First, within the organisation. Employees and customers are increasingly asking questions about the “greenness” of an organisation. Investments in an organisation’s own systems will not only generate money through energy efficiency and CO₂ reduction, but will also lead to goodwill.

Second, change is needed within the product and service offering of a company. There is a huge opportunity for innovations to help reduce our carbon footprint.

Third, companies must focus on their supply chains. Every company should be prepared to develop a supply chain that reduces emissions.

I am also very much in favour of a transparent, compulsory reporting system on CO₂ emissions. Reporting initiates change. One benchmark here is in the UK’s Health and Safety sector where compulsory reporting on work-related deaths has dramatically decreased the number of incidents. It is my firm belief that this will also work well if applied to climate change.

Where business does not act, it is the responsibility of politicians and governments to urge us to do so. The UK business community is demanding regulatory action from government either in the form of taxation – through the pricing of CO₂ – or by incentives. We must not forget that the biggest incentive for the business world is revenue: innovations and initiatives that lower greenhouse-gas emissions will create hundreds of billions in new business revenues.

⁸ The Confederation of British Industry (CBI) is the UK’s leading employers’ organisation. It represents around 200,000 public and private-sector companies across a range of sectors.

Sector view: who is running the risk?

3

The key messages from macroeconomic analysis are becoming increasingly clear (see box on next page) and commonly accepted, indicating that our economies are at substantial risk from the effects of climate change. But the nature and extent of the risks to business emanating from climate change are far from clear.

In this section we review what the selected 50 reports have to say on business risks and economic impacts at a sector level. The main findings are presented below.

3.1

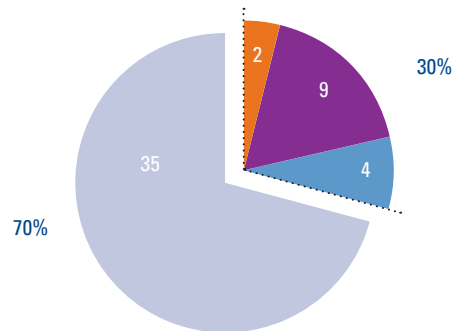
Economic impacts become apparent

The review reveals that 70% of the selected reports mention the economic impact of climate change only in qualitative terms. Only 30% of the selected reports discuss the economic impacts at a macro, sector and/or company level quantitatively (see figure 3.1). This relatively low percentage is striking in light of a growing consensus on the significant macroeconomic costs of climate change, which inevitably have implications for companies. As the debate on climate change and its economic implications evolves, it is assumed that more resources will be dedicated to the analysis of business risks, and the economic impacts for sectors and companies will be brought into sharper focus over the next few years.

Figure 3.1
Economic impacts mentioned
in selected reports

Number of reports with
estimation at

- Macro level
- Sector level
- Company level
- Qualitative approach



Key messages from macroeconomic analysis

- Strong, early action to reduce emissions can limit costs to around 1% of GDP a year. Failure to act will result in costs of at least 5% of GDP a year, and as much as 20% if a wider range of risks is taken into account.
- In the event of 5-6°C warming, which is a real possibility during this century, economic models estimate an average of 5-10% loss in global GDP, with poor countries suffering costs in excess of 10% of GDP.
- Net benefits up to \$2.5 trillion could result from implementing strong mitigation policies.
- In 2030 additional investment and financial flows of \$200 to \$210 billion will be necessary in order to return GHG emissions to current levels.

Sources: Stern (2006); UNFCCC (2007).

3.2

Risks by sector: omnipresent and underestimated

In this section the business risks as outlined in the 50 analysed reports have been aggregated and quantified by sector (see table 3.1). It reveals that almost every sector is, at a minimum, exposed to one high or medium level risk from climate change. At the same time it suggests that the analysed reports underestimate the risks faced, particularly by certain sectors.

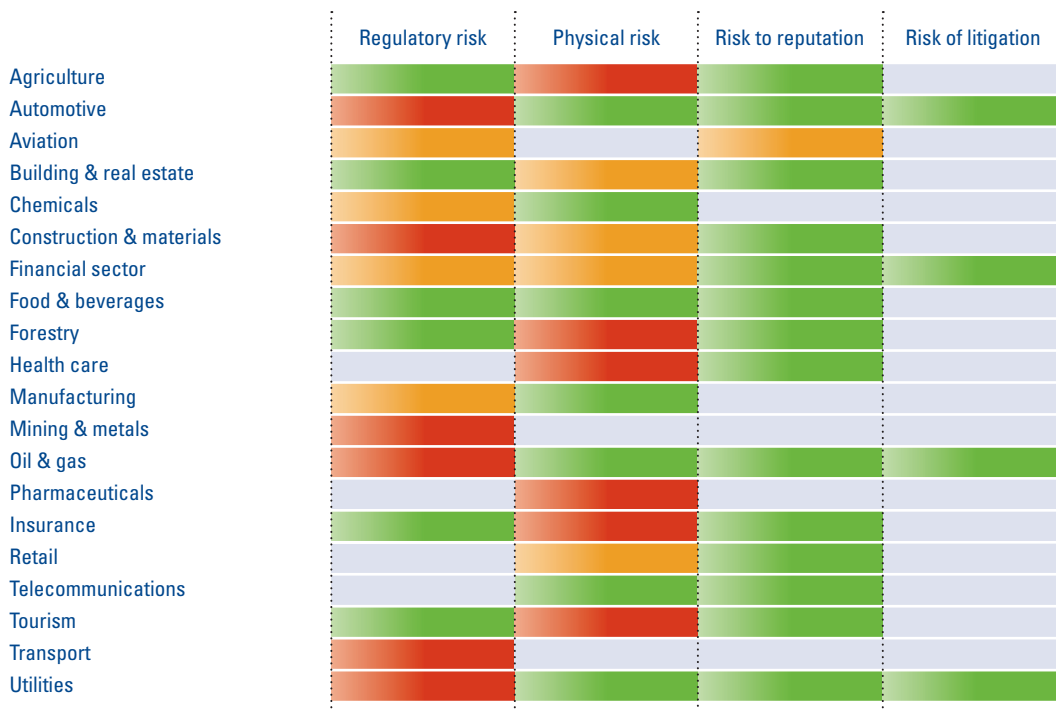
Below is an account of KPMG’s quantification methodology. Following is a closer look at the respective sectors (section 3.3).

Table 3.1
Perceived risk level by sector for the four types of climate risk according to the 50 reports

The score for each risk category has been calculated as the average of the risk assessments from the reports discussing the sector.

Legend

- **High risk**
(risk score 1.33-2)
- **Medium risk**
(risk score 0.66-1.32)
- **Low risk**
(risk score 0-0.65)
- **Not or hardly mentioned**



3.2.1

Derivation of risk levels

KPMG's methodology for assessing levels of risk identified in the 50 reports under review is based on five scored levels of risk:

- **High risk = 2 points**

A clear and articulated description in an analysed report indicating that the sector is running a high risk in the concerned risk category. An example would be the emerging regulatory regime on climate change in the oil & gas sector, which is regarded as a substantial business risk.

- **High-to-medium risk = 1.5 points**

An intermediate category between high and medium risk.

- **Medium risk = 1 point**

A clear and articulated description in an analysed report indicating that the sector is running a medium risk in the concerned risk category. An example would be the risk to reputation in the utilities sector, which in two of the reports is seen as a moderate risk.

- **Medium-to-low risk = 0.5 points**

An intermediate category between medium and low risk.

- **Low risk = zero points**

Where the risk is negligible or not mentioned. An example would be the manufacturing sector, where the physical risk is qualified as relatively low or unlikely to materialise.

In most cases, the reports explicitly state the degree of risk, making a straightforward assessment possible. However, where the risk description was less clear or tangible, we created two intermediate risk categories: "high-to-medium" risk and "medium-to-low" risk to reflect a more accurate and appropriate score.

After assessing the level of risk in the respective reports, we then calculated the average score per sector for each of the four identified risk categories: regulatory, physical, reputation and litigation.

For example, the calculation of the regulatory risk in utilities is based on discussions in 18 of the reports. In 11 of them, regulatory risk is defined as high. In two of them, regulatory risk is defined as high-to-medium. In two of the reports, the risk is perceived as medium. In another it is perceived as medium-to-low. Two of the reports do not discuss regulatory risks at all.

The regulatory risk for the utilities sector is therefore calculated as follows:

$$((11 \times 2) + (2 \times 1.5) + (2 \times 1) + (1 \times 0.5) + (2 \times 0)) / 18 = 1.53$$

3.2.2

Overall level of risk for a sector

The level of risk for each sector is calculated as the average risk of the four risk categories. For example, the level of risk for the oil & gas sector is made up of:

- Regulatory risk 1.33
- Physical risk 0.61
- Reputation risk 0.50
- Litigation risk 0.22

The risk level of oil and gas is therefore $(1.33 + 0.61 + 0.50 + 0.22) / 4 = 0.67$

In light of the straightforward methodology applied, no meaning should be attributed to the absolute risk score for a sector. Its only purpose is to provide a relative indicator for the risk levels across sectors.

3.3

See Figure 3.3, page 48

Sketching the landscape

KPMG also analysed the extent to which a sector is prepared for these risks and compared this with the level of risk (Figure 3.3). At a first glance, considerable discrepancy between sectors can be observed when the perceived level of risk according to the analysed reports is plotted against the preparedness of a sector.

As it is important for a good understanding of the graph we give below an account of the methodology applied before taking a closer look at the respective sectors.

3.3.1

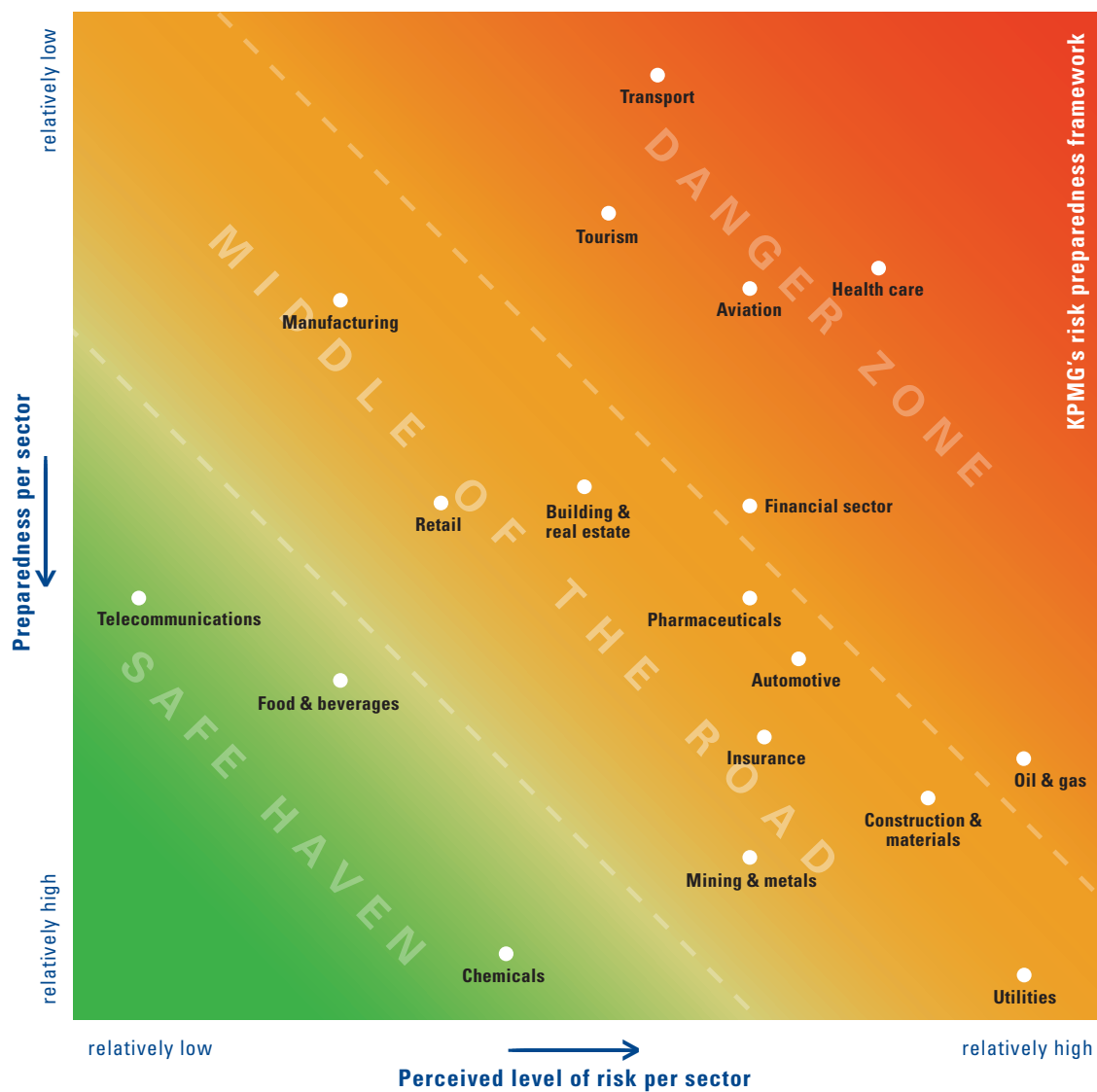
Preparedness

Preparedness determines to what extent sectors are prepared for climate change. The preparedness score has been based on the results of the Carbon Disclosure Project 2007 (CDP5). The CDP questionnaire addresses corporations' greenhouse-gas emissions and climate-change management strategies⁹. It is important to note that the CDP score is only an indication of the preparedness of a sector.

The main reason for using the CDP scoring is that it is a worldwide programme to which many companies have responded. It is therefore currently the best indicator available of the preparedness of sectors to climate change. Nevertheless, the CDP has its limitations: it reflects responses to a limited number of questions related to the awareness of companies and the initial responses of those companies. It is not certain whether all responding companies are fully prepared to cope with the consequences of climate change in the longer term. Also, it is important to note that the CDP scores demonstrate significant variances (see appendix D).

⁹ For more information on the Carbon Disclosure Project see appendix D.

Figure 3.3
Sector map: perceived risks
versus preparedness¹⁰



¹⁰ For the following sectors the risk assessment is based on less than five out of the 50 analysed reports: aviation, transport, food & beverages, retail, mining & metals, health care, pharmaceuticals, manufacturing and telecommunications.

For the purpose of further analysis KPMG classified sectors as belonging to one of the three following categories:

- Danger zone: sectors where risk is markedly greater than preparedness.
- Middle of the road: sectors where risk is roughly matched to preparedness.
- Safe haven: sectors that seem to be reasonably well prepared for climate change and do not seem to face significant risks.

This results in a graph which combines the overall level of risk stemming from climate change for a sector (refer to section 3.2) and the preparedness of a sector to respond to climate-change challenges. Below we will briefly discuss the sectors which find themselves in each of the three zones.

3.4

Sectors in the danger zone

According to the 50 reports analysed, six sectors find themselves in the “danger zone” when using KPMG’s risk preparedness framework (see Figure 3.3). In addition to the two sectors widely believed to be at risk – oil & gas and aviation – four other sectors appear in this zone: health care, financial sector, tourism and transport. Despite a high level of perceived risk, KPMG believes that, except for oil & gas, the risks of these sectors remain underestimated. Below is a closer look at these sectors.

3.4.1

Transport

The transport sector attracts attention for its relatively low preparedness, despite the risks to the sector having been recognised for some time. For example, in 2005 Henderson Global Investors ranked the transport sector fourth in terms of carbon intensity¹¹. The sector is a significant contributor to greenhouse-gas emissions (13%)¹² due its consumption of fossil fuels. As a result, it is increasingly targeted by policymakers to reduce its emissions. The main risks are regulation in the form of government initiatives to make transport more expensive, by means of fuel taxes, road pricing, emissions trading and a fiscal burden on air transport. Deutsche Bank (2007) differentiates between road, rail, air, public transport and shipping (sea and inland). Air and road transport account for the highest greenhouse-gas emissions per kilometre and will be targeted with deterrent policies. Conversely, emissions-pricing policies create opportunities for rail transport and public transport to be seen as increasingly attractive substitutes. The transport sector is also subject to physical risks, such as risk of delays, cancellations and accidents. However the analysed reports hardly mention risks other than regulatory risks, which suggests that the level of risk for the transport sector is underestimated. Besides physical risks we consider that there are also risks to reputation for sub-sectors such as marine transport and road transport. We asked a sector specialist for his opinion on the impacts of climate change on the transport sector.

¹¹ Based on tonnes of CO₂-equivalents divided by turnover and tonnes of CO₂- equivalents divided by market capitalisation respectively.

¹² According to the IPCC.

3.4.2

The financial sector

The consequences of climate change for the financial sector are mostly indirect, as financial institutions are indirectly exposed to climate risks through their investment portfolios. In addition, risk to reputation is increasing as consumer awareness grows.

Overall, the financial sector is reasonably aware of climate-change issues. This awareness is highlighted by the review, in which 20 out of the 50 reports analysed were produced by financial institutions. These reports – by asset managers, credit-rating agencies and investment banks – focus on where the risks and opportunities stemming from climate change are likely to be in an investment portfolio. For example, an analysis of 32 companies in the oil & gas sector demonstrated that companies best equipped to deal with climate change tend to achieve the best business performance (SAM Group, 2006).

Despite this level of awareness in the sector, results from the Carbon Disclosure Project (CDP) do show a wide variation in preparedness among banks. For example, the CDP claims that global banks tend to be better prepared for the effects of climate change than local ones. There is increasing pressure for banks and other members of the financial-services industry to acknowledge and address climate change as a major issue, including the potential effects on their businesses and those of their customers (Goodwin Procter, 2007). The investment community has responded by setting up “sustainable” investment funds and increasing investments in renewable energy, in order to address consumer concerns and reduce indirect emissions.

Trucost (2007) assessed the carbon intensity of 185 UK investment funds by calculating a portfolio’s greenhouse-gas emissions in relation to the value of the portfolio. The study includes both Socially Responsible Investment (SRI) funds and mainstream funds. Although most SRI funds performed better on carbon intensity, a quarter of SRI funds are more carbon-intensive than the benchmark. The study shows that it is possible to reduce a fund’s exposure to carbon liabilities without affecting returns.

Although banks have been able to take advantage of the opportunities arising out of growing investor awareness, managing climate-change risks in investment portfolios seems to be more difficult. The Institutional Investors Group on Climate Change (IIGCC) concluded in 2006 that most investment research focuses on the implications of climate change for equity and, to a lesser extent, corporate-bond investments. Other asset classes have not received the same attention. Consequently, the implications of climate change for investment portfolios as a whole remain relatively unexplored.

Interview

Eric Heymann

Q: What is the position of the transport sector with regards to climate-change risks?

A: There are still many companies that resist higher fiscal burdens, including taxes, emissions trading and other kinds of regulation. In defending themselves against these higher burdens, transport companies refer to their supposed low share of greenhouse-gas emissions. But according to the latest figures from the IPCC, the transport sector is responsible for an average of 13% of global greenhouse-gas emissions, although different modes of transport contribute different amounts. Despite their efforts, higher fiscal burdens are inevitable in the medium to long term. Furthermore, only a few transport businesses take into account the potential risks of extreme weather events in their decision-making. There

are a few more progressive companies in the sector that recognise the risks and acknowledge that they – like everyone else in the world – have to contribute to a reduction in greenhouse gases.

Q: How can companies in the sector prepare for the risks?

A: Efficiency is key for the future of companies in the transport sector. Lower fuel consumption per kilometre, or per passenger, is one of the most important factors for the future success of the industry. Despite previous achievements, it is clear that the efforts to increase the efficiency of transport services have to be redoubled. There are benefits: those companies which monitor the efficiency of their services regularly, and prove themselves to be the drivers of technological progress,

will improve their relative competitiveness.

Q: What are the financial consequences of the risks ahead?

A: Right now it is extremely difficult to quantify the financial consequences of higher tax burdens and the increasing physical risks to the transport sector. However, the message is already clear: mobility will become more expensive and this means – all else being equal – that the growth potential of the sector will decline. It also should be pointed out that other sectors will be at risk as a result of increased transport costs.



Eric Heymann is a transport analyst at Deutsche Bank Research.

3.4.3

Four other sectors in the danger zone

Health care, aviation, tourism and oil & gas also find themselves in the danger zone. The table below offers a selection of some interesting findings.

Health care	<p>Climate change may have a huge impact on human health; both global warming and extreme weather events are connected to the outbreak and spread of disease. In countries with public-health financing the ability to cope with increases in various diseases may be limited.</p> <p>A Lehman Brothers (2007) report provides a complete analysis of the climate-change impact on the health-care and pharmaceuticals sectors, including potential winners and losers.</p> <p>The Institutional Investors Group on Climate Change (IIGCC) (2006) warns that weather-related impacts are likely to have a harmful effect on investments in the health-care sector.</p> <p>Ceres (2007) claims that the health-care sector has been largely unresponsive to the financial risks brought about by climate change.</p> <p>The analysed reports focus almost exclusively on the effects that climate change may have on human health and therefore the health-care sector. Other types of physical risks and the other three risk categories remain largely unexplored.</p>
Aviation	<p>Emerging regulation and risks to reputation pose challenges for the aviation sector.</p> <p>The Carbon Trust (2005) estimates that the risk from climate change to aviation accounts for 50% of the sector's market value. Since 1990 CO₂ emissions from the industry have increased by 87%, and now account for around 3.5% of total greenhouse-gas emissions (IPCC, 2007). Regulation is being developed which will bring flights departing from EU airports under the EU's Emissions Trading Scheme (EU ETS).</p> <p>Analysts' reports on the aviation sector are included in Lehman Brothers (2007), Deutsche Bank (2007) and the IIGCC (2003). Ceres (2006b) also reports on the industry.</p> <p>It is interesting to see that the analysed reports only mention two of the four risk categories: regulatory risks and reputational risks. However, as with the transport sector, neither physical risks nor risks of litigation can be excluded.</p>

Tourism	<p>The Australian Business Roundtable on Climate Change (2006) points out that the A\$32 billion (\$29 billion) Australian tourism industry is highly climate-dependent. For example, the Great Barrier Reef supports a A\$1.5 billion industry. With a 2-3°C increase in temperature, 97% of the reef could be bleached. The physical impact could lead to significant reductions in tourism to the area.</p> <p>The World Tourism Organization promotes the development of sustainable tourism, but companies in the sector appear to lag behind on preparedness.</p> <p>Analysts' reports covering the tourism industry include Henderson Global Investors (2005), UBS (2007), the IIGCC (2006) and SAM Group (2006).</p> <p>The analysed reports only mention two risk categories, physical risks and reputational risks. The latter rank strikingly low at 13 out of 20 and seem, in the light of the recent intensification of public awareness, to be underestimated.</p>
Oil & gas ¹³	<p>The oil & gas sector is exposed to a high level of regulatory risk, as well as physical risk and risk to reputation. As for preparedness, companies in the sector revealed a wide disparity of responses to both CDP and Ceres questionnaires. A few European companies are showing initiative, whereas American companies lag behind.</p> <p>Analysts' reports covering the oil & gas sector are Lehman Brothers (2007), Henderson Global Investors (2005), UBS (2007) and the IIGCC (2006). Ceres (2007) and the Carbon Trust (2005) included the oil & gas sector in their reports. Sector-specific reports include Barclays (2007) and Moody's (2003).</p>

For more information on climate-change risks in the danger zone sectors please visit www.kpmg.nl/sustainability section "climate change".

¹³ More sector information can be found at the website of KPMG's Global Energy Institute: <http://www.kpmgglobalenergyinstitute.com/>.

3.5

Sectors in the middle of the road

The review reveals that the nine sectors in the “middle of the road” are: automotive, building & real estate, insurance, construction & materials, manufacturing, mining & metals, pharmaceuticals, retail and utilities. However, critical analysis shows that the risks to several of these sectors in this zone are underestimated. Below is a closer look at these sectors.

3.5.1

Automotive

Greenhouse-gas emissions from the transport sector in the United States and the EU account for 25% and 19% respectively of total global emissions¹⁴. The car industry has a critical role to play in developing technologies to mitigate emissions. The automotive sector is exposed to a high level risk, as governments introduce regulation to improve the environmental performance of cars, and to reduce car use. Both performance-based regulation (maximum CO₂-level per vehicle) and a wide range of market-based incentives are emerging.

Standard & Poor’s (2007) report provides an insight into the costs of regulatory compliance. A new standard in the United States would raise the manufacturing price of light trucks by \$1,900 and cars by \$1,300 by 2017. In Europe, estimates of between €600 (\$888) and €3,000 extra cost per vehicle are based purely on vehicle-efficiency improvements.

Interestingly, most reports do not place much emphasis on risk to reputation, although car manufacturers are frequently pressed to respond to demand for carbon-efficient transport. Many manufacturers have initiatives to develop carbon-efficient engine technology, as well as carbon-efficient production processes in response to this pressure. Centre Info (2007) analysed the carbon intensity of car manufacturers over the entire product lifecycle (that is, supply chain, production, product use and disposal), which helps investors assess the carbon risks of different manufacturers. The report concludes that the brand value of car manufacturers may be influenced by their “green performance”.

The risk of litigation for the automotive sector is not explored in any of the reports analysed here. However, cases against car manufacturers for alleged pollution have already been brought before the courts. Overall, the review found that the climate-change related risks to the automotive sector seem to be considerably higher than represented in the reports.

3.5.2

Building & real estate

The building & real estate sector is subject to several risks from climate change and has an average preparedness score. The reports studied emphasise the physical risks to the sector. Sustainable infrastructure is dependent on current building projects taking into account rising sea levels, water shortage, heavy rainfall and extreme winds. Lehman Brothers (2007) also stress the regulatory risk

¹⁴ Source: Climate Analysis Indicators Tool (CAIT) online version 4.0 of the World Resource Institute (WRI).

for the sector, especially the costs of complying with mandatory energy efficiency certificates for buildings planned by the EU. In addition, buildings with a low energy-efficiency rating will probably secure lower rents. UBS (2007) predicts that energy-efficiency labelling will form part of the asset-valuation process and will be an important criterion when buying a property. Property developers face the challenge of designing energy-efficient buildings while being at risk of functional obsolescence as new legislation is introduced. Overall, the review found that the regulatory risks for the building & real estate sector are underestimated in the analysed reports. The built environment is coming under increasing public scrutiny and likely to be subjected to tighter energy-efficiency regulation.

The potential for the industry to conserve energy is great. Buildings take up 40% of worldwide energy consumption and produce 20% of all greenhouse-gas emissions, if upstream emissions from electricity and heat are included (8% excluding upstream emissions). As UBS concludes, "The technology for energy efficiency is available; the question involves the speed at which it is applied."

3.5.3

Insurance

The insurance sector scores relatively high in terms of preparedness. The awareness in the sector is underlined by the large number of reports and articles written by insurance companies on the subject. Insurance companies have had significantly higher numbers of claims resulting from extreme weather events over the past few years, and expect further increases as a result of global warming. Swiss Re published a comprehensive study of the damages in 2006. Citigroup analysts estimate that, in 2005, 96% of the \$94 billion in global insured catastrophe losses were a result of windstorms, up from 78% in 2004 (Citigroup, 2007). These figures emphasise the fact that risk estimates cannot be based on historical data, resulting in increased uncertainty in calculating future damages and related premiums.

While insurance companies can pass on part of the risk through higher premiums, some of the risk remains with the company. The scale of damages could cause liquidity problems if they are not adequately anticipated. Standard & Poor's (2007) points out that insurers increasingly turn to capital markets to mitigate the risk related to extreme weather events. By the end of 2006, S&P had rated 97 catastrophe-bond transactions, representing \$12.2 billion. The regulatory risks for the insurance sector are strikingly low, both in absolute terms (0.09) and relatively (position 13 out of 20 - see Appendix C) and might be higher than represented in the reports, particularly in relation to the coverage and transfer of risks, which limit the room for manoeuvre for the industry.

Lloyd's (2006) advises insurers to update risk-management practices through pricing and capital-allocation models. Lloyd's also urges insurers to prepare for the impact of climate change on asset values.

In this review, sector-specific reports focus on the financial impact of extreme weather events: Allianz (2006), Aon (2006) and Swiss Re (2006). Investment bank reports by Lehman Brothers (2007), Citigroup (2007) and Deutsche Bank (2007) provide a more comprehensive qualitative analysis of climate-change impact.

Insurance companies have made use of market opportunities arising from climate change. For example, Swiss Re has a policy that provides coverage for the risks related to Clean Development Mechanism (CDM) project registration and the issuance of Certified Emission Reductions (CERs) (Citigroup, 2007). However, the general view is that the risks outweigh the opportunities in the insurance sector¹⁵.

Facts and figures

The business risks and economic impacts are particularly well-documented in the insurance sector.

Estimates at sector level

In 2005 natural catastrophes killed 97,000 people and cost the insurance industry *\$83 billion* (Lloyd's, 2006). Insurers were hit with *\$45 billion* of insured losses from Hurricane Katrina alone (Ceres, 2007).

Estimates at regional level

In 2005 there were record floods in Switzerland, Austria and Germany, and insured losses of *\$1.7 billion* (Lloyd's, 2006). There have been 67 weather disasters in the United States since 1980 that each caused at least \$1 billion of damage, including droughts, fires, tornadoes, heatwaves and floods. These events cost over *\$500 billion*, normalised to 2002 prices (Ceres, 2007).

The expected annual loss of winter storms in Europe is about *€2.6 billion*. Claims for winter storm damage in Europe are set to increase by as much as 68% over the period from 1975 to 2085, in constant currency. Assuming linear regression, this could amount to about *€11 billion* a year (Swiss Re, 2006).

Estimates for individual companies

JPMorgan Chase reported a *\$400m* special provision related to hurricanes in the third quarter of 2005 (Ceres, 2007). BellSouth suffered more than *\$100m* of losses from hurricane damage (Ceres, 2007).

3.5.4

Other sectors in the middle of the road

There are six other sectors included in the middle of the road category: construction & materials, manufacturing, mining & metals, pharmaceuticals, retail and utilities. Below are summaries from the reports relating to these sectors.

¹⁵ More information can be found in A Changing Climate, KPMG Frontiers in Finance, published by KPMG LLP (UK) in September 2007.

Construction & materials	<p>A high regulatory risk and a medium physical risk are posed for the construction & materials sector. The IIGCC (2004) explains how the weather and regulatory pressures challenge companies in the construction sector to develop new building materials and techniques. Regulation is expected to take the shape of new building standards, leading to a significant cost increase. UBS (2007) describes how industries with a large direct carbon footprint, such as the cement industry, are exposed to a stricter regulatory climate. Other reports covering the industry are Lehman brothers (2007), McKinsey (2007), Henderson Global Investors (2005) and Deutsche Bank (2007).</p>
Manufacturing	<p>Climate-change risk for manufacturers is mainly a regulatory risk. As Deutsche Bank (2007) states, many sectors will be faced with higher prices for raw materials and changes in consumer preferences, particularly for the clothing, furniture and paper industries. The review finds that although regulation is clearly the most important risk factor, the other risk categories remain relatively unexplored. Physical risks and reputational risks seem to be considerably higher for at least some sub-sectors than represented in the reports. The mechanical and electrical-engineering industry can offer part of the solution by developing energy-efficient technologies. Ceres (2006) and the IIGCC (2006) both address this subject.</p>
Mining & metals	<p>The mining & metals sector is among the largest contributors to greenhouse-gas emissions, and climate change is a big risk for this sector. However, in the reports analysed, only regulatory risks are cited for the sector. This means it gets a relatively low overall risk score, but is not in the safe haven zone. Although regulatory risk is clearly the most important factor for the mining industry, the other risk categories, cannot be excluded. Therefore the climate-change related risks to the mining & metals sector seem to be higher than represented in the reports. However, Henderson Global Investors' (2005) carbon-intensity study reveals that the "steel & other metals" sector exceeds other sectors as the most exposed to climate-change risks. Most companies in the sector are aware of this. CDP (2007) and Ceres (2006) report above-average scores for corporate governance for climate change in the metals and mining industry. Lehman Brothers (2007) notes that economic policies based on climate change could positively affect the demand for some commodities, such as uranium and aluminium, and negatively affect demand for others, such as thermal coal and steel.</p>
Pharmaceuticals	<p>As mentioned in the health-care section, climate change may have a huge impact on human health and consequently over time will have an impact on the pharmaceutical sector.</p> <p>A Lehman Brothers (2007) report provides a complete analysis of the climate-change impact on the health care and pharmaceuticals sectors, including potential winners and losers.</p> <p>Ceres (2007) concludes that the pharmaceuticals sector still has a long way to go with regard to climate disclosure, especially given the potential impacts climate change may have on its business.</p>

Retail	<p>Retailers face a limited risk from climate change. Lehman Brothers (2007) provides a comprehensive analysis of the climate-change impact on food and other retailers. Food retailers can significantly reduce costs and greenhouse-gas emissions by buying more local produce. Retailers generally will face increased costs of transport and energy use.</p> <p>The Carbon Trust (2005) argues that a customer's choice of retailer brand is not likely to depend on climate-change issues. However, product range is an important influence. Therefore retailers have to adjust their products to new suit consumer preferences shaped by environmental concerns. Deutsche Bank (2007) and Ceres (2007) also discuss the retail sector. Market dynamics have changed since the Carbon Trust (2005) issued its report. To date most global retailers and also several national retailers, particularly in Britain, have started to respond actively to climate change, increasing reputational risks for those perceived to have fallen behind.</p>
Utilities ¹⁶	<p>It is not surprising that many climate-change reports pay attention to the utilities sector. Emissions from the energy sector (electricity and heat production) account for 24% of total greenhouse-gas emissions. As a result, the utilities sector is highly exposed to emissions regulations. Operating costs associated with fuel-switching and reducing carbon output are expected to increase. So far, the electricity-generation companies in the EU ETS have benefited from higher CO₂-induced prices, while industrial and residential power users bear the cost (Citigroup, 2007; Lehman Brothers, 2007; S&P, 2007).</p> <p>ING (2006) stresses that climate change represents an opportunity for the utilities sector, with the possibility of developing low-carbon technologies and investing in renewable power. Ceres (2006a) refers to a recent study which found that electric power companies with above average environmental management earned 30% greater total shareholder return over three years than companies with below average management over the same period.</p> <p>The utilities sector is one of the best researched sectors and regulatory risks in particular have been extensively scrutinised. The sector is exposed to all of the four risk categories.</p> <p>Reputational risks may be higher than represented in the analysed reports (utilities ranks 9 out of 20). However, electricity companies that are found to neglect their "public duty" are increasingly held accountable by public campaigns.</p>

For more information on climate-change risks in the middle of the road sectors please visit www.kpmg.nl/sustainability section "climate change".

¹⁶ More information can be found at the website of KPMG's Global Energy Institute: <http://www.kpmgglobalenergyinstitute.com>. Other KPMG publications on the energy sector include Offshore Wind Farms in Europe; Central and Eastern European Electricity Outlook 2007; Taxes and Incentives for renewable energy and Alternative Energies in China.

Interview

Gerard Rijk

Q: What are the main business risks for the food & beverages sector?

A: First, the volatility of input prices and the volatility in operating margins, both of which result in a reduced ability to predict profits. For example, look at agricultural inflation. Until 2005, agricultural prices were stable and could be seen as fixed costs. Presently, prices are volatile, affecting the profitability and stock value of companies. In early 2007, Heineken communicated that the input prices for beer would increase by 8%. Within a few days, the value of Heineken dropped by 10%. Later that year, when it became clear that the higher input prices were being offset by higher selling prices, the stock price recovered. Second, we expect sales in certain parts of the sector to be affected, resulting from changing

consumer preferences and also the availability of resources. For example, at the moment the consumption of fish is growing faster than that of meat, mainly due to health considerations. Because of the acidification of the oceans and overfishing, companies with fishing as their core business could face problems.

Q: The sector seems to be relatively ready for Climate Change. Is this because of the nature of the sector, or is it really being achieved by efforts on behalf the sector?

A: The sector is not actively prepared for climate change. It is much more to do with the nature of the industry. Furthermore, we have our doubts about the readiness of the meat sector. Companies in western Europe, for example, are faced with consumers with

a growing awareness. These companies are mainly local-for-local companies, and should be aware that the demand for their products will not grow, and may even decline. Our latest report, *Inflationary Environment: a convenient truth* (2007), shows that the smaller F&B companies could face difficulties in the coming 12 years. This is due to a low exposure to premium branding (less affected by rising input costs) and a low exposure to the most relevant emerging markets. For the big-cap companies with high sales in brands, premium brands and in relevant emerging markets, our conclusion is that it is indeed a “convenient truth”.

Q: How can companies in the sector prepare themselves for the risks?

A: In the light of the accelerating demand for grain and higher input

prices, companies should focus on premium brands. With premium brands, it takes a lower percentage sales price increase to compensate for rising input costs. And they should invest in central and eastern Europe, Latin America and Africa. Climate Change will increase the demand for biofuels, and thereby the demand for grain. More agricultural land will be needed and these regions can benefit from strongly rising income levels due to their agricultural potential. Food & beverage companies must position themselves in these regions. In Asia, about 80% of available land is already in use. As we have seen, the Chinese are already shifting their focus to Africa.



Gerard Rijk is a food & beverages analyst, ING Wholesale Banking, the Netherlands.

3.6

Sectors in safe haven

The review reveals that the three sectors in the “safe haven” are: telecommunications, food & beverages and chemicals. For telecommunications, this result is primarily due to companies in the sector having a perceived limited exposure to risk, rather than having a high level of preparedness. The chemicals sector is in the safe haven zone due to its high level of preparedness with a relatively moderate level of risk. For food & beverages, it was found from critical analysis that the reports reviewed do not give a complete picture of the issues at stake. Below we take a closer look at the safe haven sectors.

3.6.1

Food & beverages: the worst is yet to come?

Strikingly little has been written about the consequences of climate change for the food industry. The *Stern Review* sums up some alarming prospects. Crop yields in developing countries will decrease when temperatures increase by 1.5°C. A temperature increase of 4°C or more poses a serious threat to global food production. Increasing CO₂ levels cause a higher rate of acidification of the sea, with possibly negative effects on fish stocks. Melting glaciers pose a threat to water supplies in certain areas. The food industry could be confronted with acute disruption of the supply chain within a few decades.

According to the reports, the food & beverages sector overall is exposed to only limited physical and reputational risk. However, it was found that several sub-sectors with a high dependence on raw produce are exposed to a high physical risk. The meat industry is an example, as it depends on agriculture for supply of feed.

As for preparedness in the sector, Ceres (2006) employed a Climate Change Governance Checklist to evaluate how 76 American companies and 24 non-American companies are addressing climate change through board oversight, management execution, public disclosure, emissions accounting and strategic planning. The report identifies food products as an industry where climate change continues to be widely ignored as a governance priority¹⁷. Although several leading food companies acknowledge the threat posed by climate change to raw materials and water resources, few have articulated a strategy to address this threat.

As stated, the risk to reputation depends on the share of brand value to total market value. The Carbon Trust (2005) states that brand value from climate change poses a risk for six sectors. The food & beverages sector was found to have the second-highest (behind aviation) intangible value at risk (10% of market value). Food and beverage manufacturing is exposed to a high level of risk to reputation, particularly when taking into account the ease with which consumers can switch brands (and the precedents for them doing so), and the material contribution the sector makes to a consumer's overall emissions.

¹⁷ Ceres (2006) has researched eight companies in the F&B industry. The different outcome from CDP5 can be explained by the smaller population and the different methodology used.

However, companies are able to turn the brand-value risk into an opportunity by anticipating changes in consumer preferences. ING (2007) that the increasing premium brand share in consumer goods permits enhanced pricing power. Consequently, price increases are easily transmitted through premium brands. ING calculates that the impact of the rise in agriculture and energy costs will be 0.6% negative a year on EBIT for the industry.

3.6.2

Other sectors in safe haven

Two other sectors can be found in the safe-haven zone. Below is a summary of some perspectives for these two sectors, which can be found in the reports reviewed.

Telecommunications	<p>Of all the sectors discussed, telecommunications is least exposed to climate-change risks. However, infrastructure damage caused by extreme weather events could have a significant financial impact. For example, BellSouth suffered in 2005 more than \$100m of losses from hurricane-related damage (Ceres, 2007).</p> <p>As for reputation, the Carbon Trust (2005) emphasises opportunities for companies in “low carbon” sectors to create positive brand value if they position themselves appropriately on the climate-change issues that affect their customers, rather than their own operations.</p>
Chemicals	<p>As a carbon-intensive sector (Henderson Global Investors, 2005), the chemicals industry is exposed to a high regulatory risk. The sector generally recognises its part in greenhouse-gas emissions reduction, and so has a relatively high preparedness score.</p> <p>Based on CDP responses, Ceres (2007) states that the chemical industry provided 32% of the information sought by investors, an above-average level of disclosure. Morgan Stanley (2006) approves of the relevance of information supplied, and argues for inclusion of carbon credits in chemical company valuations.</p> <p>Leading companies in the sector advocate their position as part of the solution to tackling the effects of climate change rather than part of the problem. Products from the chemical industry could be used in many climate technologies, in the development of new materials and in aiding the acceleration of technical advances (Deutsche Bank, 2007; Lehman Brothers, 2007). In addition to the regulatory risk, Lehman Brothers (2007) maps the physical risks for major chemical sites. They estimated that 45% of plants are at a high risk of flooding due to their coastal locations.</p>

For more information on climate-change risks in the safe-haven sectors please visit www.kpmg.nl/sustainability section “climate change”.

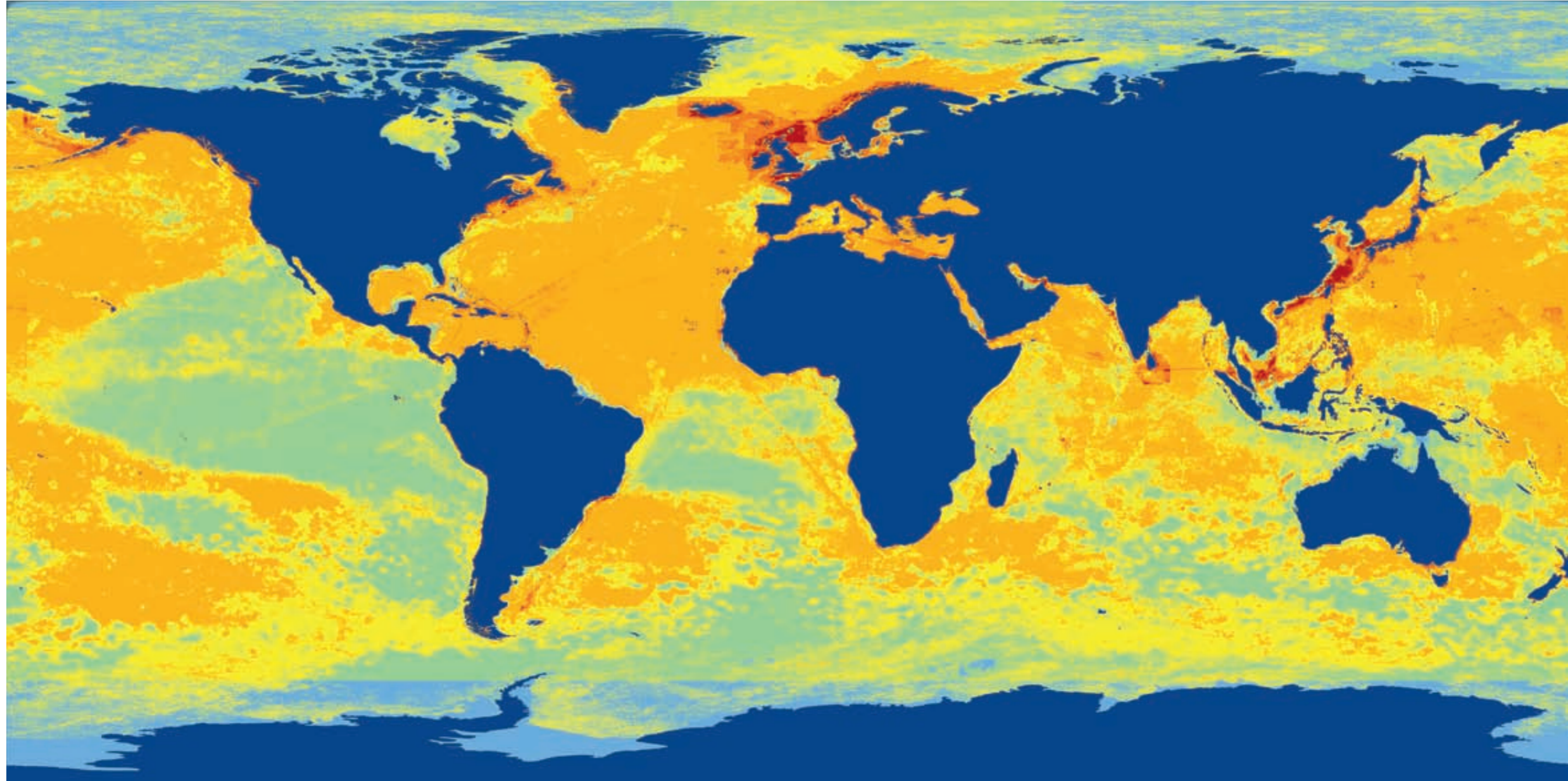
THE IMPACT OF HUMAN ACTIVITY ON MARINE ECOSYSTEMS

The map is a result of extensive scientific research by the US National Center for Ecological Analysis and Synthesis into the consequences of human activity on the world's oceans. The main drivers in determining the effects of human activity have been identified as climate change, water acidification, fishery and chemical pollution.

Although the scientific validity of the research is still subject to debate, it has already caused a stir among policy and decision-makers around the globe. Measures to reverse and/or more evenly spread the effects of human activity may include reviewing or even reforming fishery policies and traditional sea-faring routes. Such developments can be expected to have widespread economic consequences on both local and global scales.

- Very low impact (<1.4)
- Low impact (1.4-4.95)
- Medium impact (4.95-8.47)
- Medium high impact (8.47-12)
- High impact (12-15.52)
- Very high impact (>15.52)

Source: National Center for Ecological Analysis and Synthesis



MAKATI CITY MAYOR JEJOMAR BINAY TEST-DRIVES AN ELECTRIC-POWERED "JEEPNEY", ASSEMBLED IN THE PHILIPPINES, IN 2007 - The Jeepney is the result of a venture between Greenpeace and the Green Independent Power Producer's Climate Friendly Cities Project. The project aims to contribute towards climate-change reduction, sustainable transport and waste management through renewable-energy technology.



“It is essential to transfer new technologies to economies outside Europe”
Bernard Wientjes

Bernard Wientjes

“Business can be the solution”

In November 2007 several Dutch ministers, secretaries of state, and the heads of the three leading business organisations in the Netherlands signed the Netherlands Sustainability Agreement. This stipulates that the business sector will do whatever possible to achieve greater energy efficiency, produce more renewable energy, and reduce greenhouse-gas emissions. At the same time the Dutch government committed to ensuring that business and industry will not thereby be disadvantaged competitively.

The agreement is remarkable in that all parties have made far-reaching commitments. We are convinced that it contains the right strategy to realise significant improvements in CO₂ reduction and energy efficiency, while keeping business competitive.

Competitiveness is vital, as the Netherlands – like other EU member states – has a very open economy. In an open and global economy, a competitive position is necessary if long-term investment is to be secured.

If European industry leaves it to the EU alone to create stringent environmental policies, it will damage the fight to combat climate change. Policies that hamper economic growth and lead to carbon leakage are in my opinion unsustainable. The Netherlands Sustainability Agreement is aimed at rolling out the right strategy to combine climate-change policy and economic growth – and it is economic growth that will ensure the technical innovation necessary for what I believe is a new “industrial revolution”.



Bernard Wientjes is Chairman of the Confederation of Netherlands Industry and Employers (VNO-NCW) .

Only through these new technologies can we combine economic growth with CO₂ reduction and energy-efficiency improvements in processes and product chains. These technologies also need to be transferred to economies outside Europe. This is because almost 85% of global CO₂ emissions are from outside Europe. If we really want to tackle climate change successfully, this is where we must focus our efforts.

The industrialised world must take the lead in developing new technologies for sustainable growth, and that must be in close co-operation with the developing and emerging countries. With smart energy-efficient concepts and low CO₂-emitting processes, the developing world can continue its economic growth while also improving its own environmental and social wellbeing.

This will make emerging and developing countries eager to participate in such an approach, as it fits exactly in what – in my opinion – these countries really need: understanding, support and a licence to grow in a sustainable way.

Climate change has to become our business. Although industry contributes to greenhouse-gas emissions, we have to realise that society at large is responsible for tackling climate change too. The business sector’s responsibility is to position itself to generate the necessary sustainable solutions.

Looking ahead

4

The “risk and preparedness” methodology used in this review was designed to provide an overview of the threats posed to business by climate change, as presently perceived. But that methodology and its results demands critical appraisal, in order for individual companies to know how to act in response to the effects of climate change.

In this final section we look at how such appraisal and further guidance may be developed in the near future. Furthermore, we offer some thoughts on the practical implications of this review for individual companies. What is it that companies should consider doing today?

4.1

What is necessary at sector level?

The analysis does not attempt directly to evaluate any of the 50 reports that form the basis of this review, or to offer specific advice to individual companies as to how they should respond to the threat of climate change. Such evaluation and guidance demands further data and detailed analysis. The value of the review primarily comes from bringing an integrated view across sectors using a standardised “risk and preparedness” methodology, which helps business leaders and other decision-makers to understand better the specific business implications of climate change. It is important to improve the risk and preparedness methodology and conduct further research at a sector level. In particular, it will be necessary to gain a better understanding of the specific business risks.

- **Physical risks:** although valuable research in this area has already been undertaken, mainly by the insurance industry, this needs to be continued and extended to all vulnerable sectors. In addition to the direct effects, more attention should be given to the less obvious and longer-term risks.
- **Regulatory risks:** of the four risk areas, regulatory risks were the most commonly cited in the analysed reports. The requisite data in this area is available but dispersed. This information needs to be aggregated, and further interpreted, on both a sectoral and regional basis in a more quantified way.
- **Reputational risks:** the understanding of climate-related risks to reputation remains in its infancy. Knowledge is anecdotal and unquantified: reputational risk itself is still seen as an intangible factor, rather as brand value was seen 20 years ago, before being systematically quantified and integrated into corporate valuation. Environmental and socio-economic issues such as climate change must be factored in to reputation and brand valuation.
- **Litigation risks:** these risks are perhaps the most difficult to forecast. Companies will need to follow litigation as it emerges, particularly in the United States, and prepare for the risk of litigation to spread beyond the automotive, oil & gas, financial and utilities sectors.

Such research initiatives may come from a variety of sources

Financial institutions already produce a large share of the research on the business impacts of climate change. This is likely to continue, and the quality of research is likely to improve when these issues become more material and are tackled by the large community of mainstream financial analysts, fund managers and rating agencies, rather than the much smaller community of niche SRI analysts alone. We expect the United Nations Environment Programme Finance Initiative (UNEP FI)¹⁸ and similar projects to be a valuable source of climate-change research for business.

Global think tanks such the World Resources Institute (WRI), the World Business Council for Sustainable Development (WBCSD) and the World Economic Forum (WEF) are already making contributions to the understanding of the business impacts of climate change.

Business associations and industry bodies should be encouraged to take the initiative in generating focused sectoral research projects; some industry associations, such as the Association of British Insurers (ABI), have already begun this type of work.

The second dimension of the methodology is business preparedness. This report uses the results of the Carbon Disclosure Project 2007 (CDP5) as the basis of a quantification of preparedness. In our view it is the best indicator currently available. However, as detailed in the main report, there are limitations inherent in its approach and we believe that it is necessary to work towards a more sophisticated estimation of preparedness.

¹⁸ A partnership between UNEP and 160 private-sector financial institutions.

4.2

What can companies do?

Clearly companies should not let risks accumulate merely because the understanding of climate-change impacts is imperfect. Many companies are already proactively managing the risks and opportunities presented by climate change. Business risks are materialising, faster than research is anticipating those risks. Regulatory and reputational risks are today's realities, not tomorrow's possibilities.

It seems likely that businesses which take precautionary measures will benefit. Governments are already applying the "precautionary principle" in the case of climate change. This means taking action with a small cost today to avoid a larger loss in future that has a reasonable chance of occurring. The principle may justify taking action even when future outcomes are highly uncertain. Although not undisputed, the precautionary principle has proven to be effective in the past (a recent example being the management of bovine spongiform encephalopathy (BSE), or mad-cow disease)¹⁹.

To what extent can the precautionary principle also be applied to individual businesses and whole sectors? The evidence in cases of other forms of risk – including intangible risks, such as reputational risks and corporate catastrophes – is that the ability to respond in a state of preparedness protects or increases shareholder value²⁰.

On the assumption that it is financially advantageous for businesses to invest in preparedness, companies should consider three priorities:

- Invest in understanding risks and developing risk management
- Invest in opportunities
- Provide disclosure

4.2.1

Invest in understanding risks and managing risks

Understanding and managing risks already has a central role in strategic management. Most companies have the tools and the talent in place to handle business risks. This is the framework that should also be used to tackle climate-change risks.

The professionalism of risk management in the corporate world has been improving, due to a combination of regulatory changes, particularly in the aftermath of high-profile financial scandals, and the growing complexity of globalisation. Companies have increased their levels of investment in this area and are widely expected to continue to do so in the future²¹.

¹⁹ Swiss Re (2007).

²⁰ KPMG (2007) and Rory F. Knight (2005).

²¹ KPMG International (2007).

While the focus of risk management has been on financial and operational risks, it is now necessary to broaden the scope of risk management and address the emerging risks of climate change. Despite its specific characteristics, the issue of climate change is simply another lens through which to view risk. There is no need to reinvent the wheel: the basic concepts of risk management and business-continuity assurance apply to climate risks as to any other forms of risk.

Generally accepted control frameworks²² in enterprise risk management are applicable to climate risk. Such control frameworks can be used to identify the events that may occur as a result of climate change, assess the risks related to those events, and define responses to deal with the risks identified.

Established risk-management approaches offer a variety of responses for businesses. They may take the risk, transfer the risk to other parties, treat it with controls, or terminate the activity related to the specific risk. If a company decides to “treat” the risk, adequate controls and measures should be defined, implemented and reviewed to see whether the risks are truly mitigated and whether the company is really in control of the effects of climate change.

A further distinction can be made between external risks which are relatively difficult to manage and internal risks which are easier to control. When addressing internal risks, managements define controls in order to eliminate risks. When addressing external risks, including climate change, responses tend to be focused on limiting the effects of risks.

External risks are sometimes perceived as too difficult to manage. When dealing with climate change it may be necessary for management to alter its perception of the manageability of external risks.

4.2.2

Seizing opportunities

This review has focused primarily on the business risks resulting from climate change. But where there are risks there are also opportunities. Those companies that respond best to the risks they are facing by taking early action are likely to gain a competitive advantage at the same time.

While a certain sector may be suffering from the negative consequences of climate change, individual companies within it that introduce innovative products and services can benefit. An obvious example is the car manufacturer that develops and introduces a car with lower fuel consumption and lower emissions than its peers. Such a company gains a competitive advantage, especially if fuel prices continue to increase, and regulatory and tax measures are introduced to encourage cleaner transport. Another example is emissions trading, which is generally perceived as a burden for industry. But those companies that face the challenges of emissions pricing early on, and implement the right measures at the right time, can turn it into a competitive advantage.

²² Such as the enterprise risk management framework established by the US-based Committee of Sponsoring Organizations of the Treadway Commission (COSO).

Climate change may also alter the pattern of competitive advantage on a sectoral basis. For example, some sectors such as telecommunications will benefit if the cost of travel rises, due to increased fuel prices and emissions pricing.

It is likely that similar opportunities exist in all sectors. The challenge is to be ahead of the game and identify and seize specific opportunities as they arise.

4.2.3

Provide disclosure

Companies must not only manage climate-change risks and opportunities; they must also account for this emerging business issue internally and disclose it to shareholders and other stakeholders. Reporting climate-change exposure and strategy may well prove a significant business challenge.

To give one example, reporting on matters that seem relatively easy to quantify such as carbon emissions remains inconsistent, despite the fact that companies have made such disclosures for many years. Reporting relates primarily to direct emissions, rather than the total climate impact of corporate activities. The inclusion of indirect emissions to assess the carbon footprint of the total supply chain will be required before companies can develop valid carbon-reduction strategies – yet total emissions approaches need to be co-ordinated and systematised to eliminate double counting.

Companies should be working on assessing their own footprint and developing methodologies to calculate the total supply-chain carbon footprint, not only to provide a basis for strategy but also to build credibility among stakeholders and to enhance the brand.

Although generally accepted reporting and disclosure procedures in this area do not yet exist, there are a number of projects and initiatives which offer guidance. The most advanced of these is the Carbon Disclosure Project (CDP) which is also used in this review. Over the past eight years the CDP has become the standard for carbon disclosure in the investment community and large corporations (for more information see appendix D).

But various other organisations and initiatives are contributing to the development of reporting and disclosing practices. The Global Reporting Initiative (GRI) Sustainability Reporting Guidelines now contain an indicator of “financial implications and other risks and opportunities for an organisation’s activities due to climate change”.

In 2007 the Voluntary Carbon Standard (VCS) was launched at the London Stock Exchange. The VCS was initiated by the Climate Group²³, the International Emissions Trading Association (IETA) and the World Business Council for Sustainable Development (WBCSD) and is a global benchmark standard for project-based voluntary carbon reductions, and includes reporting and disclosure requirements.

23 A not-for-profit organisation dedicated to advancing business and government leadership on climate change.

Another initiative is the Accounting for Sustainability project²⁴ which examines how reporting on climate change and other sustainability issues should be set in the context of organisations' strategies, and how what is measured and reported should be determined. It examined what kinds of data should be reported, and how an organisation should calculate and report how its activities affect its suppliers and customers, as well as its own direct activities in a "Connected Reporting Framework".

Companies must keep abreast of these developments. Sound measurement and reporting systems are needed not only to satisfy stakeholder demands for balanced and accurate disclosure; they will also generate important management information. A better understanding of the specific business implications of climate change is likely to lead to better decision-making overall.

4.3

The new climate reality

Many people now believe that the days of unlimited energy use and resource extraction are over, and that economic and consumption growth may have natural limits. This implies a paradigm shift unprecedented since the industrial revolution. Others are of the view that the situation is merely "business as usual", and that history shows that economies have always been able to adjust to new realities. Regardless of who is right, it is fair to say that corporate strategy is increasingly shaped by environmental and socio-economic issues.

Business leaders are certainly paying more attention to the environment and to socio-economic issues. This increased attention has been driven by opportunities such as innovation in products and services, as well as by the risks involved in complying with societal expectations and governmental regulation.

Yet despite a broad acceptance that such issues are important, environmental and socio-economic issues are still little accounted for in our broader economic system. In the case of climate change, it is widely accepted that emitters of greenhouse gases such as CO₂ are likely to impose costs on society. But without a price on carbon, there is no economic incentive or market mechanism to pay for these external costs.

Such market failures are likely to require correction by a combination of international co-operation, regulation, technology promotion and market-based incentives. The main challenge for governments is to develop an international framework which successfully levels the playing field for all business, and provides incentives for taking decisive and sustained actions. Tracking these initiatives, forecasting their impacts and positioning for advantage in this complex new business environment is going to prove a testing challenge for all businesses. But those companies that understand such a challenge exists – and that are willing to invest in preparedness and risk management – are the companies also best-equipped to seize the opportunities.

²⁴ For more information refer to <http://www.sustainabilityatwork.org.uk>.

Appendices

A List of reports

1. Allianz Group and WWF, *Climate Change and Insurance: An Agenda for Action in the United States*, 2006.
2. American Electric Power (AEP), *An Assessment of AEP's Actions to Mitigate the Economic Impacts of Emissions Policies*, 2004.
3. Aon, *Annual Global Climate and Catastrophe Report: 2006*, 2006.
4. Australian Business Roundtable on Climate Change, *The Business Case for Early Action*, 2006.
5. Barclays Capital, *2007 Equity Gilt Study*, 2007.
6. Carbon Trust and Lippincott Mercer, *Brand Value at Risk from Climate Change*, 2005.
7. Ceres, *Best Practices in Climate Change Risk Analysis for the Electric Power Sector*, 2006.
8. Ceres and Calvert, *Climate Risk Disclosure by the S&P 500*, 2007.
9. Ceres and Investor Responsibility Research Center, *Corporate Governance and Climate Change: Making the Connection*, 2006.
10. Chatham House and Insight Investment, *Climate Change Policy Uncertainty and the Electricity Industry: Implications and Unintended Consequences*, 2006.
11. Citigroup, *Climatic Consequences: Investment Implications of a Changing Climate*, 2007.
12. The Earth Institute (Columbia University), *The Path to Climate Sustainability: A Joint Statement by the Global Roundtable on Climate Change*, 2007.
13. Deutsche Bank, *Climate Change and Sectors: Some like it hot!*, 2007.
14. Ford, *Ford Report on the Business Impact of Climate Change*, 2005.
15. Goldman Sachs, *Portfolio Strategy: The growing interest in environmental issues is important to both socially responsible and fundamental investors*, 2005.
16. Goodwin Procter, *Environmental & Energy Advisory: Climate Change Strategies for the Financial Services Industry*, 2007.
17. Henderson Global Investors and Trucost, *The Carbon 100: Quantifying the Carbon Emissions, Intensities and Exposures of the FTSE 100*, 2005.
18. ING Group, *European Utilities. Climate Change: when hell freezes over*, 2006.
19. ING Wholesale Banking, *Food, Beverages & HPC. Inflationary Environment: a convenient truth*, 2007.
20. Innovest Strategic Value Advisors, *Dynergy: Carbon Risk Accompanies LS Power Merger*, 2007.
21. Innovest Strategic Value Advisors and UNEP FI, *Climate Change & The Financial Services Industry: Module 1 – Threats and Opportunities*, 2002.
22. Insight Investment, *Climate Change Disclosure Standards and Initiatives: Have they Added Value for Investors?*, 2006.
23. Insight Investment, *The Climate Change Disclosures of European Electricity Utilities*, 2006.
24. Institutional Investors Group on Climate Change (IIGCC), *Climate Change and Aviation: Flying into Stormy Weather*, 2003.

25. Institutional Investors Group on Climate Change (IIGCC), *Climate Change and Construction Materials: Building on Hot Air*, 2004.
26. Institutional Investors Group on Climate Change (IIGCC), *Climate Change and Power Generation: Hitting the Coal Face*, 2003.
27. Institutional Investors Group on Climate Change (IIGCC) and Insight Investment, *Managing Investment in a Changing Climate*, 2006.
28. JPMorgan and Innovest Strategic Value Advisors, *JENI-Carbon Beta*, 2007.
29. Lehman Brothers, *The Business of Climate Change: Challenges and Opportunities*, 2007.
30. Lloyd's, *Climate Change: Adapt or Bust*, 2006.
31. McKinsey, *A Cost Curve for Greenhouse Gas Reduction*, 2007.
32. Merrill Lynch and World Resources Institute (WRI), *Energy Security and Climate Change: Investing in the Clean Car Revolution*, 2005.
33. Milieudefensie (Friends of the Earth Netherlands) and Profundo, *Investing in Climate Change: Dutch Banks Compared 2007*, 2007.
34. Moody's, *How will Canada's Ratification of Kyoto Impact Alberta's Oil Sands Development?*, 2003.
35. Morgan Stanley, *Chemicals*, 2006.
36. Nature, *There goes Texas, Volume 446*, 2007.
37. SAM Group, *Climate Risks Affect Share Price Performance*, 2006.
38. SAM Group and World Resources Institute, *Transparency Issues with ACEA Agreement: Are Investors Driving Blindly?*, 2005.
39. Social Investment Organization, *Climate Change and Investment Risk: Best Practices for Canadian Pension Funds and Institutional Investors*, 2004.
40. Standard & Poor's, *Can Global Automakers Meet Emissions Limits Without Steering off the Road?*, 2007a.
41. Standard & Poor's, *Combating Climate Change in the EU: Risks and Rewards for European Utilities*, 2007b.
42. Standard & Poor's, *Insurers Seek to Weather Changes in the Weather*, 2007.
43. Swiss Re, *Opportunities and Risks of Climate Change*, 2002.
44. Swiss Re and ETH-Zurich, *The Effects of Climate Change: Storm Damage in Europe on the Rise*, 2006.
45. Trucost, *Carbon Counts: The Trucost Carbon Footprint Ranking of UK Investment Funds*, 2006.
46. UBS, *Climate Change: Beyond Whether*, 2007.
47. UNEP FI, *Adaptation and Vulnerability to Climate Change: The Role of the Finance Sector*, 2006.
48. University of Amsterdam, *Business Response to Global Climate Change*, 2006.
49. Vattenfall, *Curbing Climate Change: An Outline of a Framework Leading to a Low Carbon Emitting Society*, 2006.
50. World Tourism Organization, UNFCCC, IPCC, WMO, UNEP, UNCCD, UNESCO and the government of Tunisia, *Climate Change and Tourism*, 2003.

B Bibliography

In addition to the 50 analysed reports we made use of the following reports/literature:

- 1 Association of British Insurers, *Insuring our Future Climate: Thinking for Tomorrow, Today*, 2007.
- 2 Atkinson, A.B. and Stiglitz J.E., "Lectures on Public Economics", McGraw-Hill, 1980.
- 3 Carbon Disclosure Project, *Global FT 500 Report 2006*, 2006.
- 4 Carbon Disclosure Project, *Global FT 500 Report 2007*, 2007.
- 5 CBI Climate Change Task Force, *Climate Change: Everyone's Business*, 2007.
- 6 Centre Info, *The Carbon Intensity of Car Manufacturers*, 2007.
- 7 Clifton, R. and Simmons, J., "Brands and Branding", 2003.
- 8 Henry, C., *Decision-Making Under Scientific, Political and Economic Uncertainty*, 2006.
- 9 HM Treasury, *Stern Review on the Economics of Climate Change*, 2006.
- 10 ING Group, *Food & Beverages. Climate Change: Food versus fuel*, 2006.
- 11 IPCC, *Fourth Assessment Report: Climate Change*, 2007.
- 12 KPMG, *Living on the Frontline: The resilient organisation*, 2007.
- 13 KPMG's Global Reporting Initiative, *Reporting the Business Implications of Climate Change in Sustainability Reports*, 2007.
- 14 KPMG and the Economist Intelligence Unit, *The Evolution of Risks & Controls: From Scorekeeping to Strategic Partnering*, 2007.
- 15 Oxford Metrica, *Protecting Value in the Face of Mass Fatality Events*, 2005.
- 16 Swiss Re, *The Economic Justification for Imposing Restraints on Carbon Emissions*, 2007.
- 17 The Chicago Council on Global Affairs, *Public Opinion Survey*, 2007.
- 18 UNFCCC, *Investment and Financial Flows to Address Climate Change*, 2007.
- 19 World Business Council for Sustainable Development, *Facts & Trends to 2050*, 2004.
- 20 World Business Council for Sustainable Development, *Pathways to 2050*, 2005.
- 21 World Economic Forum, *Global Risk Report*, 2008.

C Business risks per sector

The table below shows the score on each of the four risks as well as the average level of risk.

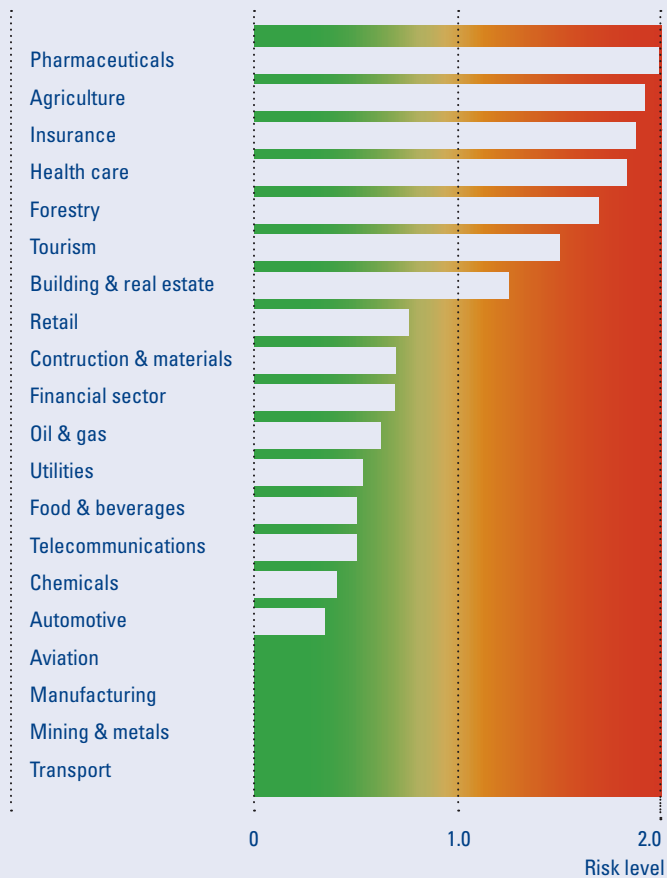
	Regulatory risk	Physical risk	Risk to reputation	Risk of litigation	Average level of risk
Insurance	0.09	1.88	0.09	0.00	0.51
Agriculture	0.25	1.92	0.25	0.00	0.61
Automotive	1.33	0.28	0.28	0.22	0.53
Aviation	1.00	0.00	1.00	0.00	0.50
Building & real estate	0.08	1.25	0.25	0.00	0.40
Chemicals	1.00	0.40	0.00	0.00	0.35
Construction & materials	1.56	0.69	0.19	0.00	0.61
Financial sector	0.80	0.60	0.50	0.10	0.50
Food & beverages	0.00	0.50	0.50	0.00	0.25
Forestry	0.30	1.70	0.30	0.00	0.58
Health care	0.00	1.83	0.50	0.00	0.58
Manufacturing	1.00	0.00	0.00	0.00	0.25
Mining & metals	2.00	0.00	0.00	0.00	0.50
Oil & gas	1.33	0.61	0.50	0.22	0.67
Pharmaceuticals	0.00	2.00	0.00	0.00	0.50
Retail	0.00	0.75	0.50	0.00	0.31
Telecommunications	0.00	0.50	0.00	0.00	0.13
Tourism	0.00	1.50	0.19	0.00	0.42
Transport	1.75	0.00	0.00	0.00	0.44
Utilities	1.53	0.53	0.28	0.28	0.67

Physical risk

Graph 1 shows the physical risk level for the different sectors. For an explanation of regulatory risk see section 2.1.

Graph 1

Physical risk across sectors.

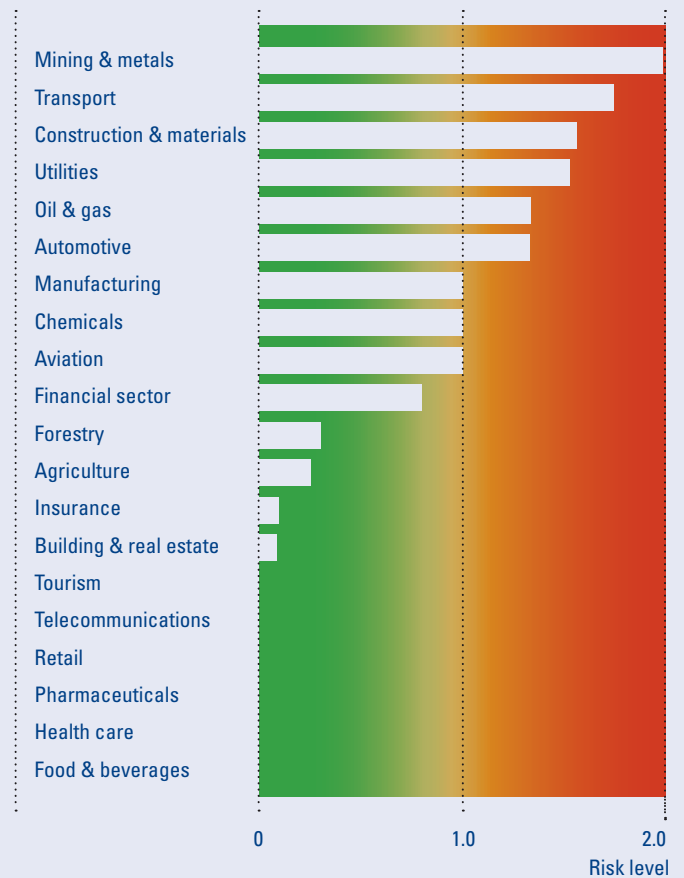


Regulatory risk

Graph 2 shows the regulatory risk level for the different sectors. For an explanation of regulatory risk see section 2.2.

Graph 2

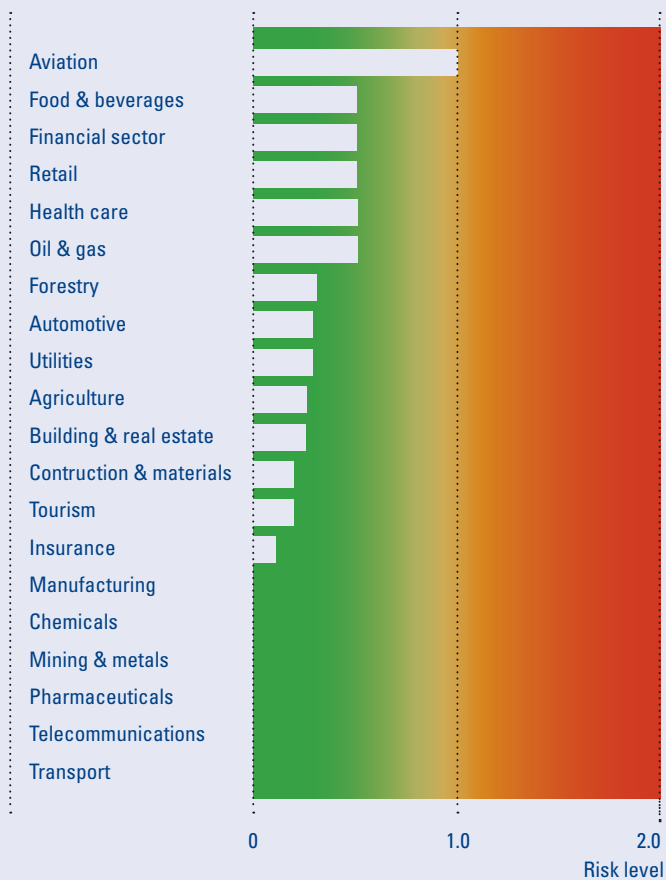
Regulatory risk across sectors.



Risk to reputation

Graph 3 shows the risk to reputation risk for the different sectors. For an explanation of the risk to reputation see section 2.3.

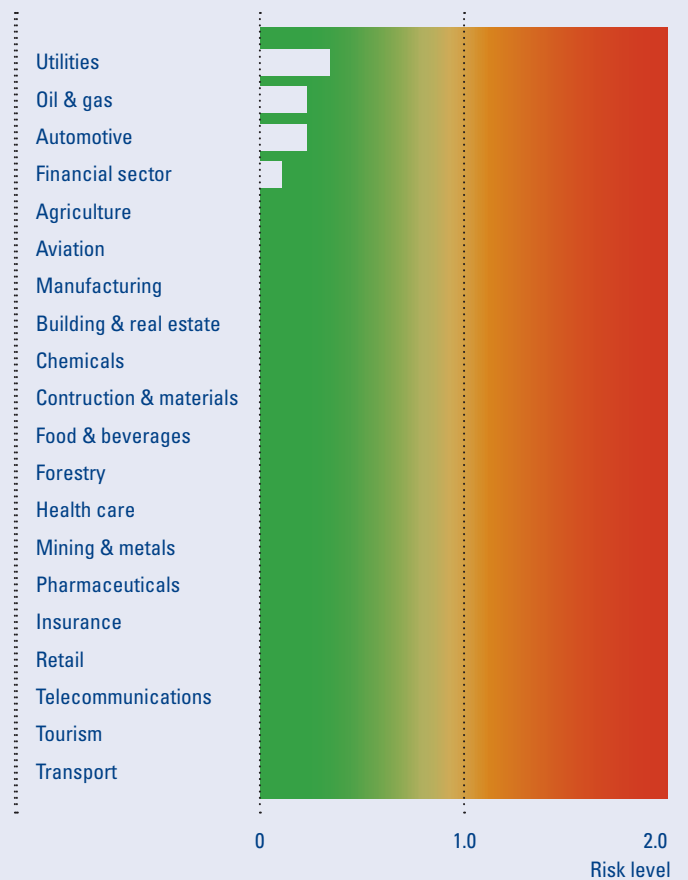
Graph 3
Risk to reputation across sectors.



Risk to litigation

Graph 4 shows the risk to litigation for the different sectors. In the selected 50 reports the risk to litigation is only identified for four sectors: utilities, oil & gas, automotive and the financial sector. For an explanation of the risk to litigation see section 2.4.

Graph 4
Risk to litigation across sectors.



D Clarification of use: Carbon Disclosure Project

CDP is the secretariat for a collaboration of over 315 institutional investors, with more than \$41 trillion in assets under management. Each year since 2002 CDP has sent a questionnaire to the world's largest publicly owned companies on behalf of investors, including ABN AMRO, ABP, Robeco, Merrill Lynch, Goldman Sachs, and Allianz. This elicits detailed information on company responses to the risks and opportunities posed to their businesses by climate change. Companies also report their greenhouse-gas emissions through the CDP system.

For more information on the CDP project, questionnaire and scores, visit www.cdproject.net

1. Cross-reference

As the CDP sectors and sub-sectors don't match with the KPMG review sectors we have used the following cross-reference.

KPMG review sectors	CDP Sub-sectors
Automotive	Auto components Automobiles
Aviation	Aerospace & defense Air freight & logistics
Building & real estate	Real estate investment trusts and real estate management & development
Chemicals	Diversified Speciality
Construction & materials	Construction & engineering Construction & farm machinery & heavy trucks Construction materials & building products
Financials	Global banks Investments banking & brokerage Asset management Banks emerging markets Banks Europe Banks Japan Banks North America
Food & beverages	Food products Beverages and tobacco

Health care	Health care equipment and supplies Health care providers and services
Insurance	Life & health insurance Multi-line insurance & brokerage property & casualty Insurance Reinsurance
Manufacturing	Industrial conglomerates and industrial machinery
Mining & metals	Metals & mining Steel
Oil & gas	Integrated oil & gas Oil & gas exploration and production Oil & gas refining and marketing
Pharmaceuticals	Pharmaceuticals
Retail	Food and drug retailing Multiline and speciality retail
Telecommunications	Broadcasting & cable TV Communications equipment Computer & peripherals Integrated telecommunication services Wireless telecommunication services Software & IT services
Tourism	Hotels, restaurants and leisure
Transport	Airlines, marine transport and road and rail transport
Utilities	Electric utilities international Electric utilities USA Multi-utilities & unregulated power Gas utilities

2. CDP variances

The table below shows the number of companies that responded to the CDP5 questionnaire, the average CDP5 score and the standard deviation.

	Number of company responses to CDP5 questionnaire	Average CDP5 score of respondents	Standard deviation CDP5 score
Automotive	11	61	22
Aviation	11	45	22
Building & real estate	4	53	25
Chemicals	7	73	24
Construction & materials	9	67	11
Financial sector	71	54	29
Food & beverages	19	62	22
Health care	7	44	25
Insurance	19	64	19
Manufacturing	6	46	24
Mining & metals	17	69	16
Oil & gas	29	65	23
Pharmaceuticals	18	58	19
Retail	17	54	27
Telecommunications	52	58	26
Tourism	3	42	15
Transport	4	36	6
Utilities	25	74	19

E Glossary

CC	Climate Change
CDM	Clean Development Mechanism
CDP	Carbon Disclosure Project
CER	Certified Emission Reduction
CR	Corporate Responsibility
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency (United States)
EU ETS	European Union Emission Trading Scheme
FTC	Federal Trade Commission (United States)
FT500	Financial Times 500
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GRI	Global Reporting Initiative
GSS	KPMG Global Sustainability Services™
IEA	International Energy Agency
IGO	Intergovernmental Organization
IPPC	Intergovernmental Panel on Climate Change
JI	Joint Implementation
NGO	Non-Governmental Organization
OECD	Organization for Economic Co-operation and Development
SEC	Securities and Exchange Commission (United States)
SRI	Social Responsible Investment
UNFCCC	United Nations Framework Convention on Climate Change
WBCSD	World Business Council for Sustainable Development
WEF	World Economic Forum
WWF	World Wide Fund for Nature

Colophon

Climate Changes Your Business

KPMG's review of business risks and economic impact at sector level

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Nicholas Stern, author of the Stern Review on the Economics of Climate Change

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