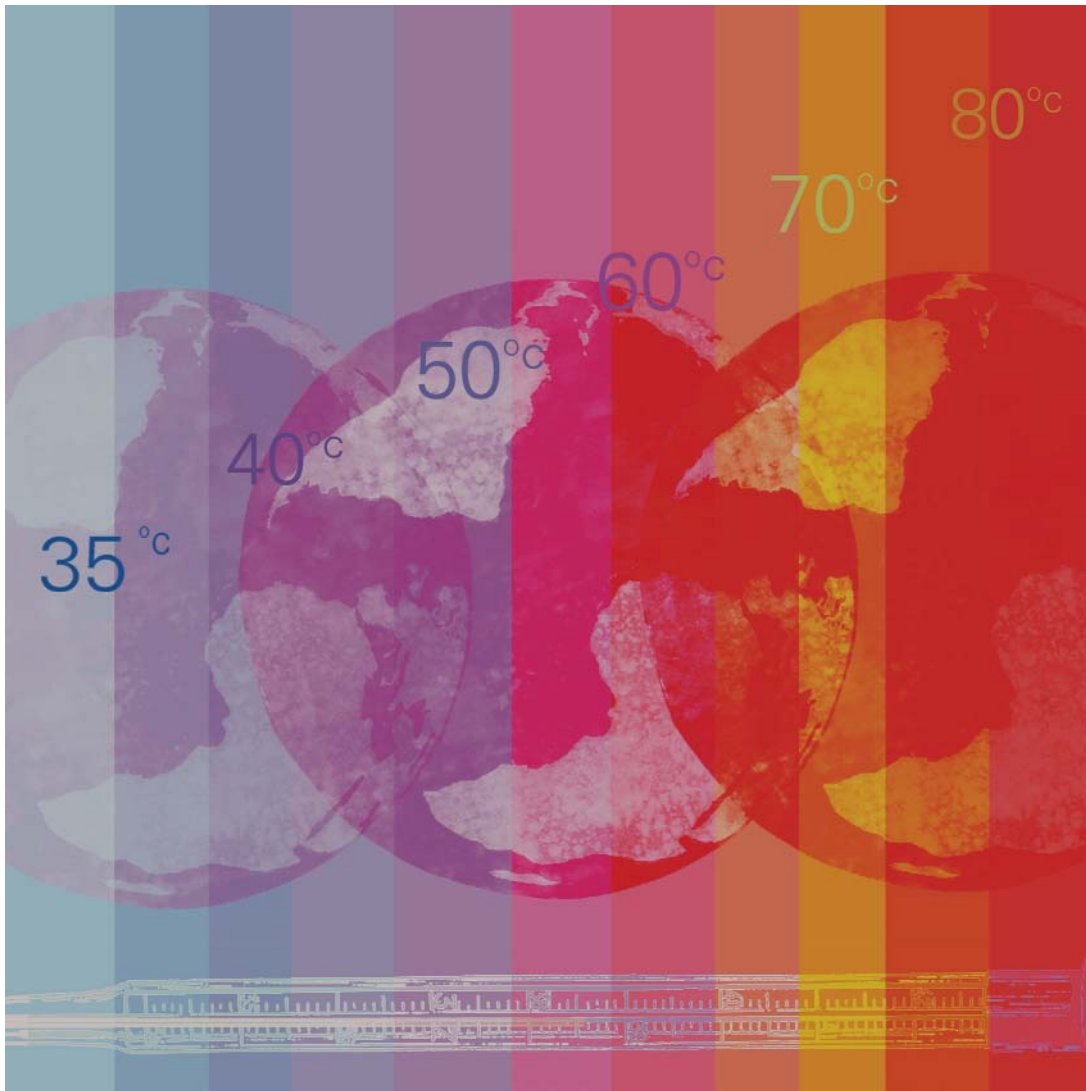


Risk Alert

A report for clients and colleagues of Marsh on risk-related topics

Climate Change: Business Risks and Solutions



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Marsh publishes *Risk Alert* to keep its clients and colleagues informed on critical issues related to risk. For additional copies, please contact questions@marsh.com. This report is also available for download at <http://www.marsh.com>.

Author: Tom Walsh

Editor: Meike Olin, CPCU, CIC

Production Manager: Christine Reilly

Publisher: Timothy Mahoney

Climate Change at Davos

When world business and government leaders gathered for the World Economic Forum in Davos, Switzerland, in January 2006, climate change was high on the list of risk issues they discussed.

One of the cornerstone reports on risk released at the forum looked at emerging global risks, the links between them, and their likely effect on different markets and industries.

Global Risks 2006—produced by the World Economic Forum in collaboration with MMC (Marsh's parent company), Merrill Lynch and Swiss Re—concluded that climate change is one of a set of emerging risks that are “moving to the centre of the policy debate and may offer the greatest challenges for global risk mitigation in the future.”

The report identified three core areas where such risks can be addressed and risk mitigation improved:

1. Enhance the quality of information on risk and improve its flow among stakeholders.
2. Reassess risk priorities and reallocate resources and incentives to act.
3. Strengthen the capacity and resilience of all levels of business, political, and administrative institutions.

Of climate change, the report said: “Consensus on the nature of this risk and its consequences for global society and for the global economy has not yet been reached, though a growing body of scientific evidence points to the seriousness of the long-term challenge.”

Copies of *Global Risk 2006* can be obtained by visiting <http://www.mow.com>.

Introduction

Climate change—often referred to as “global warming”—is one of the most significant emerging risks facing the world today, presenting tremendous challenges to the environment, to the world economy, and to individual businesses. It is also one of the most difficult risks to mitigate.

Climate change is a clear example of a risk where long-term planning is essential to mitigate some potentially irreversible effects. This is a complex global issue at the intersection of science, risk, and public policy. Although some debate continues about the extent to which human activity—specifically, the emission of “greenhouse gases” (GHGs) into the atmosphere—is linked to climate change, very few experts now question whether the climate is indeed changing.

The business risks from climate change include:

- the strong threat of increasingly volatile weather conditions, rising sea levels, and new health impacts;
- resulting impacts on insurance markets, business resources, personnel, and corporate preparedness;
- increasing legal and regulatory pressures; and
- mounting public and shareholder activism.

Climate risk also presents new opportunities for businesses, such as participation in the emerging carbon-trading markets; use and development of new, cleaner energy resources; reputational boosts; and more. For example:

- General Electric Co. has undertaken an initiative it calls “Ecomagination,” with plans to double its revenues from “green products”—including wind turbines and coal gasification technology—by 2010.
- DuPont has committed to reducing its GHG emissions by 65 percent in 2010 compared to its 1990 levels.
- Bank of America has outlined a set of actions aimed at reducing GHG emissions in both its operations and its investment opportunities.

This report provides background on the science behind climate change, discusses the business risks and opportunities associated

Physical Effects of Climate Change

The following are among the possible physical effects that could result from climate change:

Sea level rise: Melting of the polar icecaps and a resulting rise in the sea level could be one of the most serious consequences of climate change. The potential for damage is enormous, especially as coastal areas become more developed. Companies could be affected not only through direct loss of facilities and real estate, but also through potential impacts on their workers, many of whom could be forced to move if seawaters rise significantly. Not only might some areas be submerged, but areas not previously at risk to storm surge could become so.

Hurricanes and typhoons: Hurricane Katrina focused world attention on the damage a massive hurricane causes when it strikes a populated area. As with a rising sea level, coastal areas could expect to bear the brunt of the damage from increased storm activity; although tropical-storm damage from floods and wind can extend hundreds of miles inland. Asian countries dependent on monsoon season could be damaged by any change in the timing and intensity of storms.

Drought: Some areas of the world may become more prone to drought; already-dry areas may find the delicate balance they now live under tilted to one of desertification. Among the potential losses are destroyed crops, loss or reduction of water resources, damage to ecosystems, and forced migration of people.

Wildfires: Along with increased drought conditions comes the possibility of an increase in wildfires, both in forests and grasslands. Wildfires could threaten business facilities;

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with climate change, addresses development of risk management strategies, outlines relevant insurance coverage issues, and looks at the risks involved with the rapidly developing renewable and alternative energy.

Climate Change Science

Climate change has been a contentious issue for more than two decades. Underlying climate change is the greenhouse effect, the basic premise of which is simple: Greenhouse gases in the upper atmosphere let in short-wave radiation from the sun. But they absorb the long-wave heat radiation that comes back from the Earth's surface, re-radiating it and keeping the planet's overall temperature livable. As the concentration of these gases increases, so do the warming effects.

Part of our understanding of this effect comes from climatology, the study of long-term weather patterns and conditions. Using tree rings, seabed sediments, and ice cores bored from glaciers, climatologists piece together a record of the general weather conditions going back tens of thousands and even hundreds of thousands of years. Although the underlying science encompasses many fields and can be exceedingly complex, there is broad agreement that the Earth's surface—including the surface air and the subsurface ocean—has recently entered another period of warming attributed to a buildup of carbon dioxide (CO₂) and other GHGs.

Since temperature records using reliable instruments were first kept in the 1860s, the warmest 10 years have all occurred since 1990. Indeed, NASA recently announced that 2005 was the warmest year ever recorded. Much of the remaining debate about climate change occurs over why the Earth is warming: specifically, over how much, if any, of the warming is related to human activities—primarily the burning of fossil fuels, industrial activity, and deforestation. The predominant GHG—and the one receiving the most attention—is CO₂.

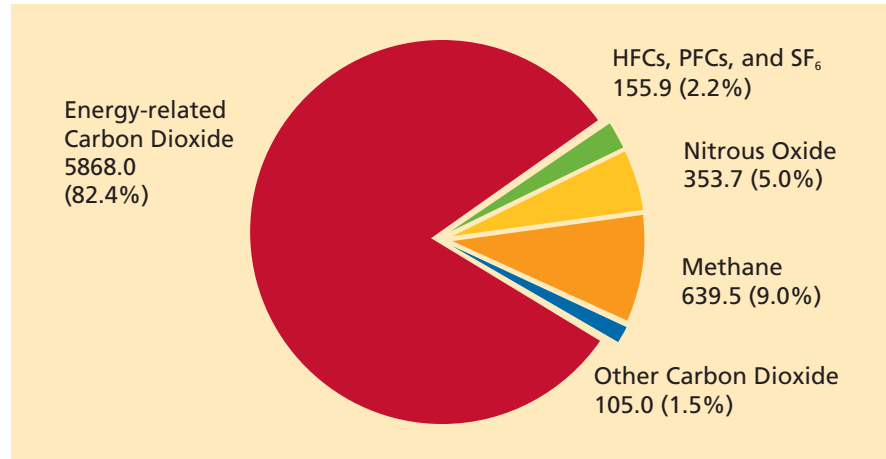
Physical Effects of Climate Change

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tourism centers; timber, grazing, and agricultural land; wildlife habitat; private homes; and more.

Heat waves: The European heat wave of 2003—widely cited as being related to climate change—caused the deaths of an estimated 22,000 people. Demand for air conditioning during periods of extreme heat could lead to massive power outages.

U.S. Greenhouse Gas Emissions by Gas, 2004



Source: U.S. Energy Information Administration

In recent years, many respected groups have weighed in to say climate change is occurring, including:

- the United Nations International Panel on Climate Change (IPCC), comprising 2,500 leading experts;
- the joint National Academies of Sciences from 11 countries—including the United States;
- the G8, which issued a joint communiqué at the G8 Gleneagles Summit in 2005 calling climate change a “serious and long-term challenge”; and
- six former leaders of the U.S. Environmental Protection Agency (EPA)—five Republicans and one Democrat.

The reality is that governments, international bodies, shareholders, media, and members of the public are asking—and in some cases requiring—companies to take climate risk seriously. They are doing so through treaties, regulations, resolutions, and public debate.

Climate Change and Natural Disasters

One of the alarming unknowns about climate change is how it will affect natural disasters (see sidebar on page 2).

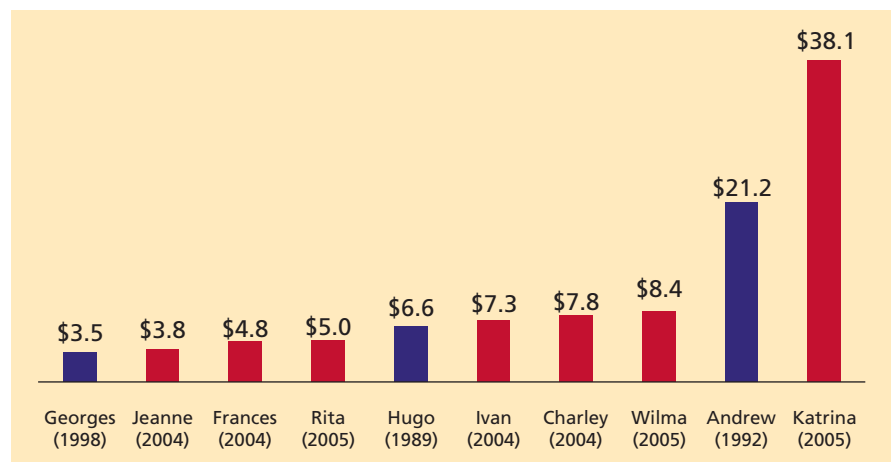
Two weeks before Hurricane Katrina hit the Gulf Coast of the United States and caused unprecedented damage, a professor

Climate change also poses a threat through potential impacts on the spread of diseases.

from the Massachusetts Institute of Technology wrote that he had compiled statistical evidence that climate change affects hurricanes. Writing in the journal *Nature*, a respected and peer-reviewed publication, Professor Kerry Emanuel—long known for his neutrality in the global warming debate—said the heating of the oceans was causing storms in the Atlantic to be more intense. Katrina—followed swiftly by Rita and Wilma—helped make the 2005 Atlantic hurricane season not only the most active on record in the number of storms, but also the most economically damaging. These three storms produced an estimated 2.8 million insurance claims and \$49.2 billion in insured damages, according to the Insurance Information Institute.

Health risks: Climate change also poses a threat through potential impacts on the spread of diseases. A recent study by Harvard Medical School, for example, concluded that rising temperatures and extreme weather affect the breeding and spread of disease vectors such as mosquitoes that carry malaria and ticks that carry Lyme disease. Rising temperatures may also increase the growth of ragweed pollen and cause a rise in the incidence of asthma, according to the 2005 study. Air pollution could also worsen in some areas, with a related rise in respiratory illnesses. The economic consequences in terms of cost to company and government health plans could be significant.

Top Ten Most Costly Hurricanes of All Time
(in billions)



Source: ISO/PCS; Insurance Information Institute

Glaciers: Canaries in the Coal Mine

For more than 50 years, the world-wide retreat of glaciers has been cited as evidence that the climate is getting warmer.

A recent study by NASA's Jet Propulsion Laboratory and the University of Kansas found that the rate of ice loss from Greenland doubled between 1996 and 2005 as glaciers atop Greenland's ice sheet flowed faster into the ocean.

Using data gathered by satellite over the past decade, researchers concluded that the changes to Greenland's glaciers in the past 10 years are "widespread, large and sustained over time. They are progressively affecting the entire ice sheet and increasing its contribution to global sea level rise" (<http://www.jpl.nasa.gov>).

Greenland's massive ice sheet—up to two miles thick in spots—contains one-tenth of the world's freshwater reserves and can be expected to be a significant contributor to sea-level rise. Scientists have estimated that if the entire Greenland ice sheet were to melt, sea levels would rise by 20 feet worldwide.

Natural disaster catastrophe modeling: Catastrophe models for weather events estimate losses based on a large number of events and their associated probabilities. A key factor is the estimated frequency of events of varying severity. Relevant data also include the insured values at stake in areas subject to damage. Models are important risk management tools as they can help companies:

- understand and assess their exposures to natural hazards;
- analyze infrastructure damage;
- obtain advice on risk-reduction measures; and
- identify the need for upgrades to buildings.

But because models are based in large part on what has happened in the past, some people fear they are not prepared to capture potential changes caused by the relatively rapid warming of the climate in recent years. Worried that the risk of loss may be being underestimated, the U.S. National Association of Insurance Commissioners has asked insurers to begin considering the impact of climate change on their models.

A 2004 study by the Association of British Insurers (ABI), *Financial Risks of Climate Change* (available at <http://www.abi.org.uk>), modeled the potential impacts of climate change on extreme storms—hurricanes, typhoons, and windstorms—in the United States, Japan, and Europe. The following are among the conclusions from the ABI study:

- Climate change could increase insured losses from hurricanes in the United States, typhoons in Japan, and windstorms in Europe by two-thirds to an annual average total of \$27 billion (in 2004 U.S. dollars) by the 2080s.
- Climate change could increase losses from the most extreme storms (those expected to happen once every 100 to 250 years) to a range of \$100 billion to \$150 billion in the United States, \$25 billion to \$34 billion in Japan, and \$32 billion to \$38 billion in Europe.
- Climate change could increase the annual cost of flooding losses in Europe by \$120 billion to \$150 billion by the 2080s.

Coastal development: Under any model and in any discussion of preparing for potential climate change impacts, a major factor to

The Kyoto Protocol

The Kyoto Protocol is an international treaty, adopted in 1997, intended to reduce greenhouse gas emissions. It took effect on February 16, 2005, when Russia signed the treaty. The United States has not signed onto Kyoto. President Bush has instead called for other means of reducing emissions, relying heavily on voluntary measures.

The Protocol sets legally binding limits for the industrialized nations that have signed it on their emissions of carbon dioxide (CO₂), methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. The Protocol's stated goal is to reduce the overall emissions of greenhouse gases by at least 5 percent below 1990 levels by 2012, when the Protocol's first "commitment period" ends.

Developing countries—including India and China—are exempt from the regulations. The commitment level under the Protocol varies from country to country. Cuts of 8 percent from 1990 levels are expected from most European Union countries, Switzerland, and most Central and East European countries; and 6 percent from Canada, Hungary, Japan, and Poland.

The United States was called on to make a reduction of 7 percent, but, as noted above, withdrew its support—as did Australia—and did not sign the Protocol. New Zealand, Russia, and Ukraine are called on to stabilize their emissions, while Norway is allowed an increase of up to 1 percent and Iceland up to 10 percent.

The Protocol offers three mechanisms for countries to meet their targets, apart from outright reductions in emissions.

Joint Implementation (JI): This allows for countries to earn emissions credits if they help develop climate-friendly projects in other industrialized nations.

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consider is the ever-increasing development of coastal areas. As the shores are built up, not only does the number of potential insureds increase, but the insured value of property subject to storms also increases. The ABI study, for example, said that if Hurricane Andrew had hit southern Florida in 2004 instead of in 1992, insured losses would have doubled due to increased coastal development and asset values.

Climate Risks and Opportunities

Climate risk cuts across almost every industry in every corner of the world—energy producers and consumers; transportation providers and those reliant on it; forestry, agriculture, and food producers; construction; chemicals, pharmaceuticals, and the life sciences; real estate; communications and technology; tourism and hospitality; the retail industry; and more. The number of companies publicly addressing the risks and opportunities posed by climate change has increased dramatically over the past several years.

Most have put aside the debate over the extent to which human activity has contributed to climate change and are focused, instead, on climate risk as a business reality for which they must plan. In a survey completed by 354 of the *Financial Times* Global 500 companies, more than 90 percent cited climate change as posing commercial risks and/or opportunities (see sidebar on page 14).

Regulatory Risks and Opportunities

Regulatory risks are particularly pronounced in Europe, where the European Union Emissions Trading System has been operational for more than one year, with over 6,000 companies facing mandatory emissions-reduction targets and stringent noncompliance penalties. In the United States, a growing number of companies and legislators believe it is likely that some form of emissions restriction at the federal level will soon be put in place.

International obligations: The major international regulations on climate change fall under the Kyoto Protocol of the United Nations Framework Convention on Climate Change. The Kyoto Protocol went into force in early 2005 (see sidebar on page 6),

The Kyoto Protocol

(continued from page 6)

Clean Development Mechanism (CDM): This allows countries to earn credits for establishing or assisting climate-friendly projects in developing nations.

Emissions Trading (ET): This allows countries to buy and sell emissions credits (generally accomplished in one-ton units). It allows companies/countries that produce fewer emissions than the Protocol sets as a cap to sell credits to companies/countries that do not expect to meet their caps.

Both CDM and ET mechanisms represent a significant growth area for meeting Kyoto targets and for new investment opportunities.

More information about the Kyoto Protocol can be found at <http://www.unfccc.int>.

more than 15 years after the first calls for a global treaty on climate change. The Protocol targets emissions in 35 industrialized countries; only the United States and Australia among industrialized countries have not ratified it. But even U.S. companies are affected by the Protocol if they have operations in countries that are party to it.

The first round of commitments under the Protocol expires at the end of 2012. Planning for the next round of commitments began in earnest in December 2005 at a meeting in Montreal.

Regulatory confusion: Companies, particularly those based in the United States, may find themselves mired in a multitude of potentially conflicting regulations. In the absence of U.S. government participation in the Kyoto Protocol, some U.S. cities, states, and regions have taken their own actions on climate change issues. If states and other entities adopt a variety of regulatory regimes, companies may find themselves forced to operate under different rules in the different states in which they operate. This may make it difficult to adapt standards throughout a company and expose the company to unforeseen events that will affect its long-term planning on such strategic decisions as capital outlays.

The following are a few of the federal, state, and local initiatives currently taking place in the United States:

- Efforts are under way at the federal level to limit GHG emissions. Some businesses with international obligations are looking for a sense of consistency across their operations and clear guidance as to what will be expected of them. For those that participate in carbon-trading programs, there is also a desire to see the programs increase in size.
- One of the first efforts to limit GHG emissions to be put in place in the United States is the Regional Greenhouse Gas Initiative, an agreement signed by the governors of seven Northeastern states (see sidebar on page 8). Under the program, the states will establish a total amount of emissions to be allowed—the “emissions cap”—by power plants in the region.
- At the state level, California recently adopted regulations aimed at reducing CO₂ emissions from automobiles. In doing so, the state cited a desire to limit the impact such emissions have on the climate. Since then, 10 other states have said they

United States: Regional Greenhouse Gas Initiative

On December 20, 2005, the governors of seven states in the Northeastern United States signed an agreement to implement a mandatory program to limit GHG emissions from power plants in their states.

The Regional Greenhouse Gas Initiative (RGGI) is the first mandatory GHG cap-and-trade program in the United States. The seven states—Connecticut, Delaware, Maine, New Hampshire, New Jersey, New York, and Vermont—expect to have their individual programs up and running by January 1, 2009.

Under the cap-and-trade program, the states will establish a total amount of emissions to be allowed—the “emissions cap”—by power plants in the region covered by the agreement. The total amount will be split among the states, which will further divide the emissions allocation among power plants located in their states.

For each ton of emissions, a power plant will be issued one allowance, setting up the “trade” portion of the program. Power plants that do not have enough allowances to cover their projected emissions can either find a way to reduce their emissions or buy allowances from others.

As with the international Kyoto Protocol, the RGGI will allow companies to meet some of their obligations through offsets such as planting trees on land not currently forested or improving energy efficiency.

The RGGI set a goal of reducing CO₂ emissions by 2018 to a level 10 percent below 1990 levels, to approximately 121 million tons per year. Failure to comply with the program would subject a company to enforcement by state environmental authorities.

will follow California’s lead. The auto industry has sued to prevent the rules from going into effect, arguing that the changes that would be required to meet the regulations would dramatically increase the price of automobiles.

- At the local level, the mayors of more than 200 cities in 38 states have signed the nonbinding “U.S. Mayors Climate Protection Agreement.” The mayors are urging Congress to pass federal legislation to reduce GHG emissions, working to get their state legislatures to reduce GHG emissions, and pledging to meet or better Kyoto Protocol targets in their own communities. Despite being nonbinding, businesses could find themselves in a public-relations quandary if they do not work with local officials.

Other environmental regulations: There is a possibility that environmental laws not specifically aimed at climate change could nevertheless come into play. For example, some lawsuits in the United States have been brought under the National Environmental Policy Act. The plaintiffs in those cases have alleged that defendants failed to consider climate change when detailing the impacts their projects would have on the environment.

Regulations and opportunities: Consideration of the range of potential scenarios is especially critical for companies undertaking or planning for major capital outlays that could be affected by climate-related regulations. Companies that make an informed effort to reduce emissions now—after careful analysis of their unique situations—could find themselves in a better position to meet regulations that may eventually be put in place. Careful analysis is essential, as a company that reduces its emissions now may find itself in a difficult situation later. For example, if a company reduces its emissions by 20 percent voluntarily now, what happens if a government mandate were to appear in five years saying it must reduce emissions by 20 percent? Will the voluntary reduction be “grandfathered in?” Or will the company be required at that time to reduce its emission by another 20 percent?

Some companies that anticipate regulation of GHGs may find themselves in a position to sell services or emissions credits to companies that need to reduce their emissions.

A company that ignores questions from shareholders about its climate change policies may run afoul of its own bylaws.

Shareholder Risks and Opportunities

Increasingly, shareholders and investment managers are asking companies about their policies on climate change. As with most issues, such questions carry with them potential risks and potential rewards. One of the first questions facing those overseeing investment accounts is: “Is there a fiduciary responsibility to address climate risk?” When examining the issue from the perspective of public and private pension trustees in the United Kingdom, Mercer Investment Consulting, a Marsh sister company, answered with a definitive “yes.”

“The materiality of climate change...clearly shows that climate change risk could have the potential to impact a Fund’s investments over the long term. In addition, we suspect climate change risk is neither fully known nor understood and that it is not yet properly managed by the various groups involved in the ongoing management of pension scheme assets” (*A climate for change*, Mercer Investment Consulting, the Carbon Trust, and the Institutional Investors Group on Climate Change, August 2005, available at <http://www.mercerIC.com/climateforchange>).

A company that ignores questions from shareholders about its climate change policies may run afoul of its own bylaws. If such questions are answered haphazardly—or if the company has no answers to give—investors may wonder if the corporation is fiscally responsible and may ultimately decrease their investments. Finally, a company that unnecessarily runs afoul of important shareholder groups may find the issue dragged into the media spotlight, potentially damaging its reputation.

On the opportunity side, a company may find that answering its shareholders’ questions helps to uncover important strategic and operational issues related to climate change. Companies already addressing such issues may find their reputations boosted by making such efforts and strategy public. Typically, shareholders are asking that the companies in which they invest disclose three types of information:

1. What policies and procedures does the company have in place to evaluate the financial consequences of climate change issues?

World Cities Commit to Emissions Reductions

The International Council for Local Environmental Initiatives is an association of worldwide governments that have made a commitment to sustainable development. Under its Cities for Climate Protection (CCP) program, it enlists municipalities to adopt and implement measures to reduce greenhouse gas emissions. Among the cities taking part in the program are:

Cape Town, South Africa: The southernmost metropolitan area in Africa, Cape Town has committed to a goal of reducing GHG emissions by 10 percent by 2010, in part through the development of renewable energy sources and efficiency measures. For example, some government buildings have recently been retrofitted for electricity efficiency. Another goal is to switch 80 percent of energy sources to natural gas and renewable sources by 2050.

Heidelberg, Germany: The southern German city has reduced CO₂ emissions from government buildings by 30 percent. Other efforts include requiring developers to guarantee high levels of energy efficiency in new buildings. Economic growth has made it difficult, however, for the city to meet its goal of reducing overall GHG emissions by 20 percent from 1987 levels.

Hyderabad, India: The fifth largest city in India is one of 17 in India taking part in the CCP program. Projects aimed at reducing overall GHG emissions include the development of more energy-efficient street lighting and water-pumping stations, improved traffic flow, and increased use of solar water-heating systems.

London, England: In June 2005, London's mayor established the London Climate Change Agency to look at the CO₂ dimensions of energy,

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2. What action is the company taking to maximize shareholder value in light of current and anticipated climate change regulations?
3. How many tons of GHGs does the company currently emit—including emissions from the end use of a product—and what steps is it taking to reduce emissions?

A recent survey by Mercer Investment Consulting of 183 U.S.-based institutional investors—pension funds, endowments, and the like—about their perceptions of various environmental, social, and corporate governance (ESG) issues found:

- 44 percent of those surveyed believed climate change was “very important” or “somewhat important” from an economic risk/return standpoint; and
- an additional 14 percent said climate change “will be important in five years.”

The survey found (available at <http://www.mercerIC.com/usrisurvey>) that other environmental issues ranked higher as a concern than climate change, a possible indicator that climate change will continue to grow in importance over time if its potential environmental impacts come to bear. The survey found:

- 77 percent of respondents ranked “sustainability” as “very important” or “somewhat important”; and
- 74 percent ranked environmental management as “very important” or “somewhat important.”

In a related survey, Mercer Investment Consulting asked 157 investment managers from around the world—managing an aggregate of more than \$20 trillion—their views on the relevance of ESG issues to investment performance. That survey, too, found that climate change and other environmental issues are rising in terms of perceived importance to investment decisions. Among all respondents, climate change:

- ranked 9th out of 11 ESG topics in terms of current relevance to mainstream investment analysis; and
- ranked 4th out of the 11 in terms of its likely relevance in five years time.

World Cities Commit to Emissions Reductions

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waste, water, and transportation. One of the goals is to reduce the municipality's CO₂ emissions 20 percent below 1990 levels by 2010 and 60 percent by 2050. The city also began charging automobile drivers a fee to enter certain zones in London at peak hours in an effort to reduce congestion and emissions.

Melbourne, Australia: Australia's second-largest city reduced GHG emissions by 15 percent between 1996 and 2003 and hopes to reduce net emissions to zero by 2010. Another goal is for 50 percent of the power used by the municipality to come from renewable sources.

Mexico City, Mexico: The Mexico City metropolitan region produces an estimated 20 percent of the country's greenhouse gas emissions. Under an initiative it calls "Proaire," the city is combining efforts to improve air quality and reduce GHG emissions. Among the goals are to replace 80,000 of the city's taxis with lower-emissions vehicles, improve domestic water and energy efficiency, and participate in international emissions-trading markets.

As in the investor survey, broader environmental issues were perceived as becoming increasingly important factors in investment decisions.

Litigation Risks

With a growing perception among the public, government officials, and businesses that climate change causes damage, the likelihood increases that lawsuits may be filed against those believed to contribute to the buildup of GHGs. Companies could find themselves embroiled in courtroom battles on a number of fronts.

Regulatory agencies: As government agencies and world bodies put regulations in place limiting emissions, enforcement action can be expected against companies found not to be in compliance. Such companies may then face significant costs from fines or from fighting against the regulations—or against allegations of having violated them—in court.

Shareholders: Lawsuits from shareholders could center on whether a company suffered financially due to a lack of planning for climate risks by directors. For example, it's conceivable that a power company may choose to do nothing to limit emissions, and then the federal government could pass legislation requiring CO₂ limits. Companies that had not prepared for the possibility could find themselves at a disadvantage to competitors that did prepare.

Mass torts: In a world increasingly following the U.S. trend of filing class-action-style lawsuits, climate change could become a more popular cause of action. Already, a handful of lawsuits have been filed or contemplated.

- Residents of several island chains—including Tuvalu and the Maldives—have said they may attempt to file lawsuits against companies and/or governments they blame for contributing to climate change. The islanders fear that their homelands will be swallowed by the sea should ocean levels rise.
- Energy and resource companies in Australia have been threatened with class-action lawsuits stemming from climate change issues.

Emissions Offsets and the Carbon-Neutral Pledge

From rock stars' musical tours to entire corporate operations, there is a growing movement to offset the overall emission of CO₂ through other means. The offsets can involve a variety of activities, from planting new trees to improving energy efficiency.

Projects that tie up CO₂ in "carbon sinks" or that lead to cleaner energy create emissions credits for companies. These credits can be used to offset some of their CO₂ emissions, or they can be sold to other companies that cannot meet their emissions-reduction targets.

Among the methods companies can use to generate offsets are:

- energy-efficiency gains through projects that conserve and improve energy use;
- use of renewable energy sources such as solar, sea, wind, or biomass;
- switching fuel sources from carbon-intensive sources such as coal to less-intensive sources such as gas or renewable energy;
- capturing and combusting GHG emissions from landfills and converting them to energy (waste-to-energy projects); and
- undertaking forestry projects and/or soil and land conservation projects that lock up CO₂ in a natural process known as sequestration.

The idea behind a pledge to be carbon-neutral is that if a company can figure out how much CO₂ it causes to be emitted into the atmosphere, it can offset that amount through activities that tie up an equivalent amount of CO₂. For example, trees and other plants, in a process known as "sequestration," remove CO₂ from the atmosphere

(continued on page 13)

- At least one lawsuit filed in the wake of Hurricane Katrina seeks class-action status based on allegations that the extensive damages were caused in part by climate change. The lawsuit contends that the emissions from numerous companies caused Katrina to become exceptionally strong.
- In September 2005, a federal judge in New York dismissed two lawsuits that had been filed against five power companies. The lawsuits—filed by eight states, New York City, and several environmental groups—alleged that CO₂ emissions from the companies' coal-burning power plants damaged the health, safety, and financial well-being of citizens. The judge in the case cited national and international debate about climate change and said the issue was a political one, not a matter for the courts. The plaintiffs have appealed.
- A challenge to the U.S. government's decision not to treat CO₂ as a "pollutant" under the Clean Air Act is now pending consideration by the U.S. Supreme Court. Adding to the confusion, at least one state has adopted the government finding as a matter of state law.

One of the issues in any potential lawsuit based on a claim of climate change is the legal issue of standing. Experts say that having the proper standing to be allowed by a court to file a suit could pose a high hurdle, but one that could be cleared. In an important case in California, a federal district judge found that plaintiff environmental groups had sufficiently demonstrated concrete harm, causation, and redressability to challenge the Overseas Private Investment Corporation (OPIC) and the Export-Import Bank over their failure to conduct an environmental assessment of the climate impacts of project lending guarantees for projects that would increase GHG emissions in developing countries.

Another vexing issue will be the assessment of blame and, thus, damages. It would likely be exceedingly difficult to apportion blame for CO₂ emissions—only one of the GHGs, albeit the most prevalent—among all of the possible emitters. However, one need only look at asbestos lawsuits to find cases in which the "deep pockets" are tapped.

Emissions Offsets and the Carbon-Neutral Pledge

(continued from page 12)

through photosynthesis and store it in their trunks, roots, branches, and leaves.

Recently, a rock super group made its world tour carbon-neutral by planting a sufficient number of trees to act as “sinks” to store an amount of carbon equivalent to the amount the events would produce. Several major financial institutions have pledged to become carbon-neutral through a variety of offsets.

Such efforts likely bring at least a small reputation boost among consumers concerned with climate change. However, it should be noted that some skeptics are questioning whether carbon-neutral efforts are all they’re cracked up to be. They say it could be a way for companies—and individuals—to continue wasting energy on the premise they will offset the usage.

Others say that tree planting may be relied on too heavily as an offset and that there is not enough available land to be planted to truly offset carbon emissions over the long term. Some also point to scientific questions about how much CO₂ trees actually remove from the air and how long it remains tied up.

Some insurers have worked with consumer-products companies to entirely transfer to the insurer the burden of a voluntary offset of the carbon emissions impact products. For example, a company in Australia installed “carbon-neutral” gas pumps at gas stations. The cost to the consumer was a few cents more per gallon, but the company said it would use the extra revenue to offset the GHG emissions associated with the gasoline from those pumps. The company paid an insurer to locate and manage carbon offsets on their behalf.

Reputational Risks and Opportunities

Although most consumers do not currently consider climate change to be a front-burner issue, it is likely to become a mainstream consumer concern by 2010, according to *Brand Value at Risk From Climate Change*, a study conducted by the Carbon Trust with Lippincott Mercer, a Marsh sister company. In part, climate change will gain visibility among consumers in the coming years through the impacts of media reports on severe weather, increased regulations, political debate, and an increase in products marketed as climate-friendly.

As climate change gains awareness among consumers, companies may find themselves at a disadvantage if competitors manage to take the lead in promoting a positive image for their brand on the issue. Although reputation damage from climate change issues is difficult to quantify, experts at Lippincott say companies in some sectors could expect to lose market share if they are seen to be behind competitors in addressing climate risks.

A number of companies from a range of industries are already promoting themselves as environmentally friendly and, specifically, climate change-friendly. Those successful at convincing consumers of their efforts to mitigate climate risk stand to gain market share at the expense of those companies seen as lagging in commitment, according to Lippincott. One way in which companies are promoting their climate awareness is through “carbon-neutral” pledges, in which they commit to running their businesses in a manner that produces no net GHG emissions (see sidebar on page 12).

Competitiveness Risks and Opportunities

A company that manages the above risks—physical, regulatory, shareholder, litigation, and reputational—more effectively than others in its industry may gain a competitive advantage. For example, if a manufacturing firm undertakes a comprehensive effort to reduce its energy consumption, it may significantly reduce energy costs, discover ways to streamline its processes, exceed shareholder expectations, and project a positive environmental image.

Many companies are now aggressively developing new products as part of environmentally friendly strategies. Sales of hybrid automobiles, for example, are robust, especially as consumers

The Carbon Disclosure Project

In February 2006, the nonprofit Carbon Disclosure Project (CDP) sent its fourth request for information to major businesses around the world asking how those companies incorporate climate change risk into their planning. The letter was signed by 211 institutional investors representing assets of more than \$31 trillion.

The European-based CDP is one example of the increasing demand from international shareholders for companies to disclose their current and future policies regarding climate change. The project also shows the growing willingness of companies to share that information.

The 2005 survey—signed by 155 institutional investors representing \$21 trillion in assets—was answered by 71 percent of the Financial Times Global 500 (FT500) companies (including MMC, Marsh's parent company), up from 59 percent in 2004 and 47 percent in 2003.

Results from the 2005 survey included:

- more than 90 percent of the 354 responding companies saying climate change posed a commercial risk and/or opportunity for their companies;
- 86 percent saying they have allocated management responsibility for climate change;
- 80 percent disclosing emissions data;
- 63 percent saying they are taking steps to assess their climate risk and to reduce their greenhouse gas emissions;
- 51 percent saying they have already implemented emissions-reduction programs; and

(continued on page 15)

deal with extreme fluctuations in gasoline prices in recent years. Demand for wind energy has propelled a growing market in wind turbines and related power-generation equipment. Architects and engineers are focusing on energy efficiency in new building design—such as London's signature, 41-story office and shopping complex, 30 St. Mary Axe, and a new 51-story skyscraper at One Bryant Place in New York City. Power producers are exploring coal gasification, a technology that produces power from coal with dramatically lower emissions. Insurers are working to understand climate risks and develop new products to mitigate them.

Conversely, a company that ignores climate risk may find itself burdened with higher energy costs, stuck with outmoded technology, mired in shareholder litigation, and panned as environmentally unfriendly.

Developing Climate Risk Management Strategies

Some potential impacts of climate change may not be felt for a number of years, such as a rise in sea levels; increased precipitation in some areas, drought in others; and so on. Other impacts, however, are already being felt, such as increasing regulatory requirements and pressure from shareholders. Companies need to develop a strategy to better understand and prepare for climate risk challenges.

For those that have already started down this path, it's important to continually assess their strategies to see where gaps or inadequacies may exist. For example, in a recent pilot survey of Marsh clients with exposure to the European Union Emissions Trading Directive, 80 percent of respondents said risk management and insurance strategies need to be better integrated with climate risk strategies.

Climate change is simply another lens through which to view risk. But it is helpful to keep in mind some of its unique characteristics, including:

- the long-term horizon of potential impacts;
- uncertainty over what, exactly, the effects will be;

The Carbon Disclosure Project

(continued from page 14)

- 13 percent saying they have reduced their emissions since the previous year.

Results from the 2006 survey will be released later this year.

Source: <http://www.cdproject.net>

- the worldwide impact, but one that may well vary depending on geography and industry;
- an evolving and conflicting regulatory regime on the international level and in individual countries; and
- potential macro impacts that could significantly alter entire regions and industries and shift the ways companies do business and the locations from which they operate.

Assess: The first step in developing a climate risk strategy is to assess where your business stands. A logical starting point is to form a climate risk management team, possibly including board oversight, to begin assessing the risks throughout the organization. The team should become versed in macro-level climate risks, then drill down to see how those could relate to the company, its suppliers, and its customers. One useful tool is to create a risk map—a comprehensive inventory ranking climate risks by frequency and severity. Another early action should be to develop a baseline assessment of GHG emissions from operations, electricity use, and products. It's important not to overlook potential strategic planning opportunities during the assessment phase.

Act: After conducting a thorough initial assessment, companies should consider adopting and enacting company-wide goals and policies—when applicable—to reduce climate risk exposures. Depending on the nature and extent of the risks identified, actions could include:

- instituting corporate-preparedness plans in light of climate risk and benefits;
- reducing GHG emissions through an assessment of internal reduction opportunities versus externally available approaches such as carbon trading;
- creating offsets—such as energy-efficiency projects—for some portion of the firm's GHG emissions;
- increasing the use of alternative energy sources; and
- identifying new products, processes, and/or services to bring to market aimed at reducing GHG emissions or mitigating global weather concerns.

Disclose: Especially in the light of continued and increasing pressure from shareholder groups, members of the public, and regulatory agencies, companies should take the time to develop a dialog with stakeholders around the issue. When feasible, climate risk initiatives should be made public.

Overall, the same basic concepts apply to corporate preparedness and business-continuity management (BCM) for climate risk as for other risks.

Corporate Preparedness

Overall, the same basic concepts apply to corporate preparedness and business-continuity management (BCM) for climate risk as for other risks. It's important to keep in mind that corporate preparedness should not be treated as an add-on to a company's operations. It should be part and parcel of the integrated planning that goes into establishing a business process in the first place. In other words, management needs always to have on hand a plan for what to do should something begin to go wrong. Operations managers and other executives with risk management responsibilities should consider the following when assessing corporate preparedness for climate risk:

- Understand the potential means by which climate risk could directly and indirectly affect their operations, resources, reputations, and financial fitness.
- Review existing corporate-preparedness plans, procedures, and policies, including BCM, risk management controls, human-resource policies, communications capabilities, public image, critical suppliers and vendors, and potential sales impacts. All existing plans should be reviewed, updated, and tested based on the threat posed by climate risk. For example, companies should ask themselves: "What currently unanticipated physical risks—such as increased likelihood of wildfire, intense storms, and so on—might climate change bring? Will the plan work in the event of a Category 5 storm? How might climate change affect our long-term sales of certain product lines? How will new emissions regulations impact our operations?"
- Assess what additional risks climate change presents to the supply chain. Will regulations affect the ability of any suppliers—including energy suppliers—to provide materials or services? Could it raise the price they charge?
- Test operations-continuity plans regularly. If a company believes that some effect of climate risk—such as a prolonged

drought or increased flooding—could affect operations, it should consider running rehearsals using scenarios to test the plan’s effectiveness.

- Try to ensure that senior managers have the skills to manage any such event before it becomes a crisis.

So what happens if climate change does indeed cause an increase in the frequency and severity of major storms, lead to more droughts, increase the number and severity of wildfires, cause certain diseases to become more prevalent, and precipitate other problems? One of the primary goals of corporate preparedness is to establish your company as one of the first to renew operations in the wake of a catastrophe.

Consider hurricanes. If they increase in severity or number, many of the basic BCM concerns remain the same. Evacuation plans need to be developed and tested. Material for boarding up and securing facilities needs to be on hand. Plans need to be in place to restart the business as soon as possible once the danger has passed. Employee and family assistance plans need to be considered.

Climate change will also have an impact on other levels of planning. A company faced with repeated battering from storm after storm—or with water shortages, a rise in sea level, and/or other difficulties—may need to consider relocating, which triggers new issues. A company that has built its facilities to withstand a Category 3 hurricane may need to consider strengthening to withstand a Category 4 or Category 5.

Companies located farther inland may, likewise, be forced to rethink their normal operations and emergency-response plans when faced with more frequent or severe storms. For example, what if a business depends on certain ports being open in order to ship products or receive supplies? Will an increase in hurricane or typhoon activity cause those ports to be out of operation more frequently or for longer periods of time? If so, does the company’s plan provide for alternative means of shipping? Or should a two- or three-week supply of needed components be stockpiled during hurricane season?

What if a change in climate leads to changes in electricity production and use? If demand for cooling drives up electricity

Insurance Availability for Renewable Energy Projects

Limited data on the commercial operating history of renewable energy projects poses a significant challenge to insurers looking to develop products and insure projects in that area. In fact, many insurers believe that improvements in actuarial data and in technical risk information could help drive new product development in the renewable energy sector.

These are some of the conclusions from a study conducted by Marsh's Renewable Energy Team in London for the United Nations Environment Program. The survey's purpose was to collect baseline information on the availability of insurance for renewable energy projects.

The majority of insurers and reinsurers participating in the survey said that a combination of brokers, insurers, project developers, and financiers are best placed to drive product development.

Among the key observations in the report: "In theory, sufficient capacity is available to meet the insurance requirements of the renewable energy industry. However, in reality, there are a number of factors which restrict how much capacity any one underwriter is prepared to commit to any one project."

Those factors include:

- availability of underwriting information, including risk-assessment and loss-prevention measures;
- technical expertise and ability to price risk in an economic and sustainable manner;
- low insured values associated with small-scale projects; and
- ease of access to developing country projects and insurance markets.

For a copy of the report, send an e-mail to warren.diogo@marsh.com.

prices or causes supply shortages in a region during increasingly warm summers, what will the impact be on a company's ability to maintain production or profitability?

What about changes in marketplaces themselves? What will it mean for a sweater manufacturer if it has been supplying northern Europe with sweaters based on people needing them six months per year, but they start needing them only four months per year? Can the business still be profitable?

The above are just some of the types of scenarios companies need to evaluate when managing climate risk. The way in which companies respond to the new operational and strategic risks and opportunities of climate change will have far-reaching impacts on corporate profitability and shareholder value.

Insurance Coverage Issues

Because businesses that sustain losses often look to insurance for potential relief, there may be a question as to whether coverage is available for damage related to climate change.

There is no current policy that provides explicit coverage for the risk of "climate change." However, there are policies that cover the types of damage that might be associated with it, such as flood, wind, freezing, heat, earth movement, or collapse. The following is a broad overview of potential issues that may arise in several common coverage areas.

Overall Insurance Industry Impacts

Evan Mills, a researcher at the U.S. Department of Energy's Lawrence Berkeley National Laboratory, recently wrote: "Virtually all segments of the [insurance] industry have a degree of vulnerability to the likely impacts of climate change, including those covering damages to property (structures, automobiles, marine vessels, aircraft); crops and livestock; pollution-related liabilities; business interruptions, supply-chain disruptions, or loss of utility service; equipment breakdown arising from extreme temperature events; data loss from power surges or outages; and a spectrum of life and health consequences" ("Insurance in a Climate of Change," *Science*, August 12, 2005).

With insurers becoming increasingly aware of climate risks and opportunities, companies have an opportunity to work with their brokers and insurance markets to craft products to address their specific needs and those of their industries.

According to the IPCC's *Climate Change 2001*: "Recent history has shown that weather-related losses can stress insurance companies to the point of bankruptcies, elevated consumer prices, withdrawal of insurance coverage, and elevated demand for publicly funded compensation and relief. Increased uncertainty regarding the frequency, intensity, and/or spatial distribution of weather-related losses will increase the vulnerability of the insurance and government sectors and complicate adaptation efforts."

Faced with this, the insurance industry can be expected to react by attempting to develop specific climate-related products, managing the exposure created by its current products, and working to mitigate the damages. Examples of changes in products might include:

- increasing premiums for coverages applicable to weather-related events and catastrophes;
- increasing the use of exclusions applicable to losses associated with climate change; and
- increasing deductibles for weather-related losses.

Examples of risk-mitigation activities might include:

- working to change building codes to make construction more likely to withstand damage;
- encouraging insureds to maintain strong loss-control policies—such as emergency-preparedness and business-continuity plans; and
- developing new insurance products that will allow for risk transfer.

With insurers becoming increasingly aware of climate risks and opportunities, companies have an opportunity to work with their brokers and insurance markets to craft products to address their specific needs and those of their industries. Challenging issues—such as carbon capture and storage—may be eased if insurers can become comfortable with underwriting the engineering approaches and understanding the risks.

Environmental Insurance

Because climate change is arguably, at its roots, an environmental issue, companies may conclude that their environmental liability policies should respond to these losses. However, at present, it appears unlikely insurers would accept these arguments.

There are a range of potential arguments insurers could be expected to make in response to such claims. Environmental liability or pollution policies typically provide coverage for damage arising from “pollution.” This is often further restricted to certain types of pollution, such as indoor-air quality, pollution at a particular site, and/or a particular pollutant involved in an industrial process. The term “pollution” is often broadly defined, but is as often restricted by policy language or case law to mean industrial chemicals or substances classified as pollutants by governmental entities and environmental laws. Many policies also contain the further restriction that coverage applies only to expenses incurred in response to a government order issued under authority of a relevant environmental statute, an argument that may be pertinent in states that have not adopted regulatory programs for greenhouse gases.

Insurers are also likely to argue that the policies apply only where it can be shown that the particular insured’s actions caused a particular and measurable harm. The scientific debate as to the causes of global climate change may present one set of issues; the nonspecific nature of the effects associated with climate change presents another. Given these concerns, it does not appear likely that insurers would simply agree that existing environmental liability policies provide coverage for the broad array of damages potentially associated with climate change.

This is not to say that claims can never be presented under these policies. Given the flexibility of modern pleading and of concepts such as nuisance, it may be possible to argue that certain kinds of claims could trigger coverage. Indeed, litigation now developing around the concept of plaintiffs’ standing to assert claims for damages from climate-related impacts contains the seeds for some of these arguments. However, these potential exceptions help to show the fact-specific nature of the coverage and the need to carefully consider both the nature of the coverage and the facts of the particular loss and claim. Another possible

Leading the Way on Climate Risk

It's not often that a work-related trip qualifies as the adventure of a lifetime. But on February 23, six employees of Marsh and its sister companies embarked on a 17-day journey to Antarctica.

"Inspire 2041" was no high-end tourist trip. Its purpose is to raise awareness of critical climate change issues while serving as an extreme exercise in leadership training. The 50-person expedition included Robert Graham from Guy Carpenter's office in Toronto, Violet Ho from Kroll's office in Beijing, Del Huse from Kroll's office in London, Patrick Leroux from Marsh's office in Montreal, Matthias Benteinrieder from Mercer Management Consulting's office in Munich, and David E. Weissner from Mercer Human Resource Consulting's office in Chicago.

The group was led by famed explorer Dr. Robert Swan—his fourth consecutive international Antarctic expedition. The MMC team helped construct Swan's "E-Base," or education base, assist in the cleanup of decades-old industrial refuse, and gain a wealth of information related to climate change and global warming—the effects of which are already clear in Antarctica.

The name "Inspire 2041" derives from the date when a United Nations treaty protecting Antarctica from development expires. Dr. Swan is hoping that future corporate leaders, like the MMC colleagues on the expedition, will acquire a taste for the last great unspoiled area left on earth and then return to their jobs and businesses to spread the word of its stunning beauty and fragility.

The team includes employees of other companies, as well as teachers, scientists, and students.

For more information on "Inspire 2041," visit <http://www.2041.com>.

ground for arguing coverage would be changes in statutory definitions of "pollution" to include various GHGs. However, at present, it seems unlikely that an insurer presented with a climate change claim under a standard environmental liability policy would simply accept coverage.

There is a possibility that such coverage may be offered by insurers in the future. But those insurers now looking at the issue are finding that the lack of both scientific certainty and actuarial data makes development and pricing of a product very difficult. Insurers are also concerned with how claims would be presented, how damages would be determined, and how compensation for alleged damage would be measured. Accordingly, it may be some time before such a specific product is available.

Property Insurance

Insurers begin every analysis of a claim under a property policy, whether for direct damage or time-element loss, by asking whether insured property (or property of the type insured) has sustained physical loss or damage from an insured event or peril. Climate change holds the potential to increase property losses dramatically if it causes more frequent and/or severe damage from hurricanes, typhoons, floods, fires, and the like. A long-term impact of increased frequency and severity of damaging weather events could be to drive up the cost of property insurance as it simultaneously reduces capacity in the areas where climate change is most likely to manifest itself, such as in coastal communities.

Organizations should work with their brokers and/or other experts to analyze insurance policies to assess how climate risks affect their businesses. It is important to ask questions such as these:

- Is the business in an area known to be affected by hurricanes, floods, or other phenomena that could be worsened by climate change?
- In the case of hurricanes and typhoons, is the property located directly on the coast, or is it inland?
- How are the buildings designed? Were they built to withstand a Category 3 hurricane in an area that could now expect a higher probability of being hit by a Category 4?

Climate Change Governance Steps

The Coalition of Environmentally Responsible Economies (CERES) identified 14 actions that major oil companies are taking in response to climate change:

- assigning a directors' committee for environmental affairs;
- conducting a board-level review of climate change strategies;
- having the chief environmental officer report directly to the CEO or to an executive committee;
- making attainment of greenhouse gas emissions targets an explicit factor in employee compensation;
- issuing a clear statement from the CEO about the company's climate change strategy;
- including a statement on climate change risks and opportunities in securities filings;
- issuing a sustainability report;
- calculating emissions savings and offsets from projects;
- inventorying emissions and reporting results to shareholders;
- establishing an emissions baseline to gauge trends;
- making projections of future emissions and setting targets to manage and control them;
- hiring a third-party auditor to certify emissions data;
- participating in an external GHG emissions-trading program; and
- purchasing or developing renewable energy sources.

Source: *Corporate Governance and Climate Change: Making the Connection* (CERES, June 2003).

- Do the facilities meet building codes? Following Hurricane Andrew in 1992, investigators discovered that much of the roof damage to buildings resulted from failures to follow existing building codes.
- What about the local infrastructure? Are there numerous ways to get customers, employees, and supplies into and out of the business? Or is there, for example, only one road across a low-lying peninsula?
- How well could the business withstand a power outage?
- Are there key suppliers or customers in catastrophe-prone areas where a loss to such entities could result in a loss of business? Have other suppliers been considered as backups?
- Are all emergency-preparedness and BCM plans up-to-date? Have they been exercised in the past six months?

These questions should not be new to planning for your property insurance needs. But they need to be cast in a new light, one that spotlights the potential for more damaging weather patterns. They should also inform other aspects of your decision making. For example, if you are planning an expansion, should you double the size of an existing facility, or would it be better to build a second plant more out of harm's way that would provide some backup should the original be forced to close for some time?

Finally, it is important to communicate with your broker and/or insurer. Your broker should know if you make upgrades to your building, purchase specialized equipment, or make other improvements to allow your business to better withstand or recover from a storm. Such preparations can play a role when an insurer determines pricing for your policy and the deductible for weather-related events. One of the immediate insurance impacts stemming from Hurricane Katrina has been an increase—sometimes substantial—in deductibles for windstorms.

Directors and Officers Liability Insurance

The increased oversight of climate risks from regulators, investors—including institutional investors in both the public and private sectors—and other public-interest groups has implications for directors and officers (D&O) liability insurance. In 2005, shareholders filed climate change resolutions with 30 companies

Recognizing climate risk as an issue and addressing it in some fashion is becoming an important consideration for company managers and boards of directors.

during proxy season, seeking greater disclosure of climate risks. Recognizing climate risk as an issue and addressing it in some fashion is becoming an important consideration for company managers and boards of directors. The most significant concerns center on how a company recognizes, analyzes, and discloses environmental and/or climate risk. Disclosure—or the failure to disclose—is central to much D&O litigation.

The Securities and Exchange Commission (SEC) has not finalized rules regarding disclosure specifically on climate change-related risks. However, the SEC does require—under Item 101 of Regulation S-K—a disclosure with respect to the effects of complying with federal and/or state provisions on the discharge of materials into the environment. Item 303 of Regulation S-K calls for additional disclosure around future trends likely to affect profitability. And it's interesting to note that the U.S. Government Accountability Office has issued a report calling for the SEC to improve and track the transparency of environmental disclosures.

Added to that is the fact that institutional investors are actively developing a private code of conduct for climate risk reporting. Some institutional investors, financial analysts, and rating agencies have issued comparative assessments of how well companies across certain industry sectors are positioned to address climate risk. Insurers are starting to take notice of all this activity, and a few have developed general questions to better assess the risk. There may soon be an increased level of underwriting activity around climate risks. At the moment, insurers' questions are focusing on areas such as the following:

- Management accountability/responsibility: Does a company allocate responsibility for the management of climate-related risks? If so, how does it do so?
- Corporate governance: Is there a committee of independent board members addressing the issues?
- Emissions management and reporting: What progress, if any, has a company made in quantifying, disclosing, and/or reporting its emissions profile?
- Regulatory anticipation: How well has a company planned for future regulatory scenarios?

Disclosure requirements and investor petitions can target any industry. Oil, gas, transportation, and other manufacturers receive

Weather derivatives are financial instruments used by companies to offset financial risk and uncertainty caused by volatility in such phenomena as temperature, rain, snow, or wind.

most of the attention around climate change. Because there has already been public-nuisance litigation against the power and oil and gas industries, insurers are starting to pay greater attention to the possibility of future litigation. But it is important to note that all industries—not just oil and gas—are in some sense affected by these developments. There are beverage companies, for example, concerned about climate change’s potential impact on water supplies and availability. And the loan portfolios of certain banks are directed toward high-risk sectors with exposure to both the regulatory and weather risks of climate change. The insurance industry itself has received attention from investor groups concerned about the overall impact climate risk has on the industry’s total portfolio.

Risk managers and other executives involved with an organization’s D&O exposures need to:

- be prepared to discuss climate risk issues with D&O insurers;
- work closely with brokers and other advisors to clearly identify areas of concern and relevant mitigation techniques;
- be proactive and work closely with brokers and insurers to address any specific language issues to try to ensure that coverage is as broad as possible; and
- keep an eye on regulatory developments.

Weather Risk Management

There are risk-transfer mechanisms outside of traditional insurance products that can be used for risks associated with climate change. Weather derivatives are financial instruments used by companies to offset financial risk and uncertainty caused by volatility in such phenomena as temperature, rain, snow, or wind. A ski resort, for example, may be able to use a weather derivative to smooth the financial risk from the potential for below-average snowfall. Also, power-price protection for utilities provides a means for hedging costly demands for peak power.

If climate change increases the uncertainty that already surrounds extreme weather, it can be expected that interest in such products will increase. Already, the use of weather risk management has increased substantially in recent years, according to the Weather Risk Management Association (WRMA). For the period from April 2004 to April 2005, the face value of all weather risk

Renewable Energy Investments Heat Up

Spurred in part by concerns about the changing regulatory environment related to climate change, renewable and alternative energy products and services are hot investment properties among venture capitalists.

Venture capital funding of renewable and alternative energy projects has increased dramatically in the last decade. In 1995, venture capitalists invested about \$2.95 million in the sector; that jumped to \$181 million in 2005, according to *The Wall Street Journal* ("Alternative Fuels Attracting Venture Capital," February 6, 2006).

Part of the investment surge comes from large pension funds that have begun to figure climate change into investment strategies. For example, the two largest pension funds in the United States have committed a total of \$450 million in private-equity investments toward the development of environmental technology.

The push for renewable energy investments also received a high-profile boost when President Bush said, in his 2006 State of the Union address, that the United States is "addicted to oil" and needs to develop new, nonpetroleum energy sources.

Among the main renewable and alternative energy sources attracting attention are wind, solar, biomass, fuel cell, coal gasification, ocean, small-scale hydro, and geothermal.

Use of Renewable Energy Sources in United States—2004

Source	Megawatts	Percent*
Wind	2,046	91.6%
Biomass	135.6	6.1%
Geothermal	35.5	1.6%
Small hydro	8.5	0.4%
Solar	8.1	0.4%

* Percent of U.S. renewable energy

Source: Marsh Environmental Practice

management instruments increased to \$8.4 billion from \$4.6 billion in the year prior, according to WRMA. The biggest users of such instruments were in the energy sector, followed by agriculture, retail, construction, transportation, and miscellaneous others, according to the survey.

Renewable Energy Risks

Demand for and investment in renewable and alternative energy sources is on the rise, driven in part by society's changing perception of climate risk (see sidebar on page 25). Renewable energy sources—such as wind, solar, wave, tidal and so on—can be intermittent, but are inexhaustible.

In addition to climate change, there are a number of political, social, technological, legal, and environmental drivers behind the growing demand for renewable energy sources, not the least of which is concern over the future instability of oil prices and the security of the energy supply. Other factors include the following:

- The Kyoto Protocol, the European Union Emissions Trading System (EU ETS), and other current and pending regulatory frameworks are driving companies to reduce their GHG emissions.
- Legislative support schemes in place in various countries include mechanisms such as tariffs, quota obligations, tradable green certificates, investment subsidies, fiscal incentives, and tendering systems. For example, the Australian government introduced the Mandatory Renewable Energy Target, which calls for reducing GHG emissions through the use of renewable energy by 6.5 million tons per year by 2020. And in the United States, a number of states require energy companies to deliver specific percentages of their power through renewable sources.

Wind power: Wind power is far and away the leader in the renewable energy market. In 2004, wind energy accounted for 91 percent of the so-called "green power markets" in the United States; U.S. wind-power generation is growing at an estimated annual rate of 31 percent. In Europe—which since 1999 has accounted for 70 percent of the world's wind power—generation grew by 18 percent in 2005 to over 40,000 megawatts (MW). A megawatt is equal to a million watts, enough energy to serve approximately 600 homes over a year.

Argentine Project Highlights Interest in Kyoto Mechanism

In September 2005, the government of Argentina announced the creation of the Argentine Carbon Fund. The government described it as the first fund in a developing country to finance projects to reduce greenhouse gas emissions in line with Kyoto Protocol's Clean Development Mechanism (CDM)

The CDM provision of Kyoto allows companies to earn credits for establishing or assisting climate-friendly projects in developing nations. Projects must be approved through a rigorous vetting system. The credits are tradable and can be used to offset emissions in developed countries.

Argentina said it believes the new fund will help develop projects that will reduce CO₂ emissions in the country by about 30 million tons per year and bring in about \$250 million in revenue to the country.

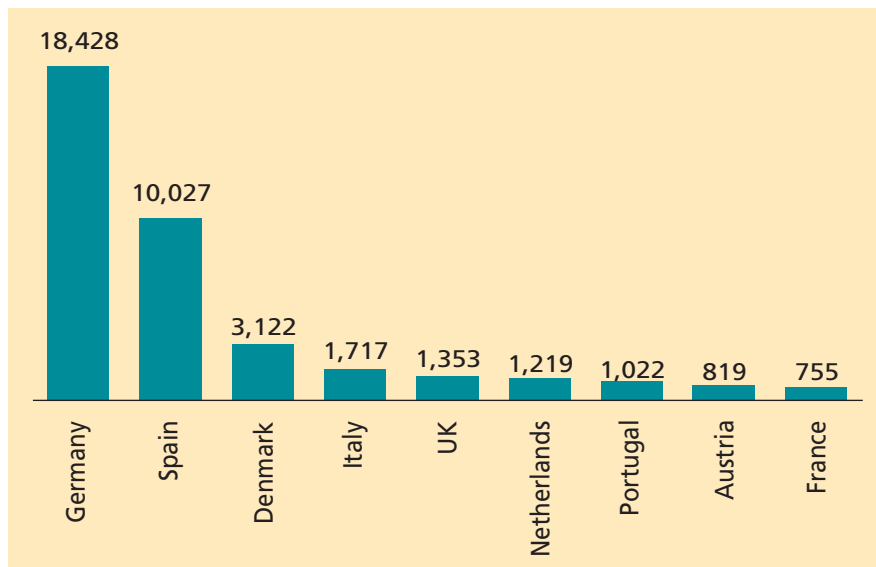
The fund will help private and public entities locate, develop, and finance CDM projects. Other countries—including Brazil and Mexico—have said they may develop similar funds, and many have already helped individual CDM projects get under way.

The projects vary widely in their scope, financing, and other details. In China, for example, several CDM projects are under way; with the sole revenue flow expected to be carbon credits—landfills, animal waste/methane projects, and more. Other projects will generate credits in addition to their normal output—steel production, chemical production, and such.

As of March 2006, 142 CDM projects had been officially registered with the United Nations body that oversees them, 10 of which had been approved for credits to be issued.

(continued on page 27)

European Leaders: Top Ten Wind Power Markets 2005



Source: The European Wind Energy Association

Power companies can use wind power to reduce GHG emissions while still meeting customers' demands. Likewise, customers with emissions-reduction goals may find that purchasing wind power provides an attractive offset. Obviously, the availability of wind at the turbine site is crucial to a project's success. And yet, relying on a steady wind to blow could be risky. In the context of climate change, wind power serves as a good example of how a weather derivative can help a company mitigate some risks.

A wind-power derivative transfers the risk of below-average energy production to a third party. The first step in structuring such a derivative is to know how much wind is likely at the site involved. This relies on data from the wind-availability study, which would have been performed by an independent source during project planning. The wind data are then combined with power-production curves for the project's wind turbines, providing an estimate of the amount of wind power that can be expected to be produced in a "normal" year.

The derivative's trigger—the point at which payments will be made to the derivative's purchaser—is entirely based on the level of power produced. For example, a derivative could be structured so that payment kicks in if low winds in a given period lead to a

Argentine Project Highlights Interest in Kyoto Mechanism

(continued from page 26)

The projects are expected to result in more than 270 million tons worth of emissions credits by the time Kyoto's first commitment period ends in 2012. At the same time, nearly 500 other projects representing 530 million tons of credits were awaiting certification.

10 percent reduction in the projected amount of power. However, if the wind is such that more power is produced, the party backing the derivative will receive—depending on the exact structure of the deal—an additional payment based on the extra revenue the energy-generating company receives. There are a number of ways to structure a wind derivative, but the bottom line is to reduce financial volatility.

Other wind-risk considerations: The wind's uncertainty is but one of the risk management considerations in developing a wind project. Many of the other risks are more “traditional” and can be managed through other insurance and risk management vehicles. Among the other risks in a wind project are the following:

- **Technology:** Wind-turbine technology continues to develop rapidly—turbines capable of producing 5 MWs of electricity are now being tested. The scope and security of the warranties offered by wind-turbine manufacturers and the ability to wrap these warranties by insurance—making sure there are no gaps between the warranties and the insurance coverage—are critical to the effective management of this risk.
- **Lightning damage:** Protection against lightning has improved significantly, but wind turbines—often twice as tall as the Statue of Liberty—remain at risk from strikes.
- **Construction-site access:** Land-based wind farms are most often built in remote areas, requiring many miles of road over often-difficult terrain. Ocean-based sites are generally several miles offshore, but in relatively shallow areas requiring specialized equipment.
- **Start-up delays:** Numerous events—from damage to equipment in transit to installation damage—can delay the expected start of a project and, thus, the flow of revenue.
- **Business interruption:** A significant risk currently affecting the wind industry is the ability to access replacement turbines following a physical loss or a breakdown. The current high demand for turbines means it can take a long time to replace inoperable machines.
- **Natural catastrophes:** Earthquakes, wildfires, high seas, and other perils may damage turbines or related equipment.

Carbon-Trading Risks

The market for carbon credits under the Kyoto Protocol's CDM and JI mechanisms provides additional opportunities and risks for companies that attempt to develop carbon credits under these programs. As emissions-trading markets grow and mature, a number of risks related to the EU ETS and the CDM/JI projects can be expected to arise, including:

- carbon-regulatory risks, such as those associated with host-country and international policies governing emissions-reduction projects such as project approval, validation, and verification;
- host-country investment and political risks that could alter climate change policies and obligations, such as host-country instability, expropriation of credits, contract frustration, credit confiscation, and more;
- technology-performance risks associated with operational aspects of the project activity;
- carbon-financing risks, including an inability to secure financing based on projected carbon-revenue streams;
- carbon-performance risk associated with variability in the generation, permanence, and ownership of emissions reductions;
- counterparty credit risks, including the failure to deliver credits as contracted;
- resource supply risks, such as possible fluctuations in fuel and weather issues;
- volumetric-related weather risks that adversely affect earnings;
- noncompliance risks, such as fines and other sanctions resulting from missed targets;

(continued on page 29)

- **Offshore wind farm risks:** Installing and operating a wind farm offshore is inherently riskier than doing so onshore. Yet offshore projects with potential production of more than 30,000 MW have been announced in North America and Europe.

Carbon Trading

The Kyoto Protocol and related developments have spurred the creation of major markets in CO₂ emissions allowances and credits. Projects to provide credits under the Clean Development Mechanism (CDM) and the Joint Implementation (JI) established under the Kyoto Protocol represent one class of traded commodity (see sidebar on page 28).

The European Union Emissions Trading Scheme (EU ETS) is the world's largest emissions-trading program. Under the program, which became operational in January 2005, participating installations are issued allowances—the right to emit a ton of CO₂—that, in total, add up to an overall cap. National Allocation Plans (NAPs) are in place, and member states are now developing Phase 2 NAPs for the 2008-2012 period. Companies that emit less than their allowances can sell the excess allowances to firms that face higher costs to reduce their emissions. These transactions involve buying and selling emissions allowances. More than 12,000 individual facilities are involved in the system, from sectors including energy, iron and steel production, minerals, and pulp and paper; and there is a possibility that the aviation and chemical industries will soon be added.

One of the biggest surprises in the first year of emissions trading in the EU ETS was the sharp rise in the price of CO₂ allowances. When the system started operation in early 2005, CO₂ allowances traded at about €8 per ton; by the end of the year, the price had increased to almost €30 per ton. The reasons for the price increase are complex, as noted by analyses prepared by NERA Economic Consulting, a Marsh sister company that has assisted the European Commission with regard to the EU ETS and assisted the United Kingdom in the development of their Phase 1 NAP. NERA also has evaluated the effects of the EU ETS on electricity prices, another major issue that has arisen as the program has been implemented.

Carbon-Trading Risks

(continued from page 28)

- price and liquidity risks, such as volatility in energy and carbon prices;
- legal liabilities, such as those stemming from legal action by shareholders, investors, or third parties;
- resource supply risks, such as possible fluctuations in fuel and resource supplies; and
- appropriateness of existing insurance policies—such as property and business interruption—and their ability to deal with the inclusion of CO₂ allowances and related improvements in profits and contingent losses and liabilities.

In a presentation at the Montreal international climate change negotiations, NERA noted that the development of the EU ETS represented “an enormous accomplishment” for the European Community as a cost-effective CO₂ reduction program to meet its Kyoto obligations. NERA noted that the EU ETS also provides the rest of the world with a model for a continent-wide emissions-trading platform.

In the United States, the voluntary Chicago Climate Exchange (CCX) began operating in September 2003 and is now the world’s second-largest carbon-emissions trading market. Its members include utilities, multinational corporations, cities, the state of New Mexico, agricultural organizations, and liquidity providers. The parent company of CCX recently formed the New York Climate Exchange and the Northeast Climate Exchange to develop financial instruments relevant to the newly created Regional Greenhouse Gas Initiative (see sidebar on page 8).

Carbon-Trading Strategy

Consider a simple example to illustrate the opportunities and risks from carbon trading under the EU ETS. Imagine that both Energy Co. ABC and Power Co. XYZ are power producers within the European Union, each with an annual allocation of 20 million metric tons of CO₂ for the 2005-2007 period. Energy Co. ABC’s long-term plan has been to move aggressively into energy production from alternative sources and otherwise reduce CO₂ emissions at costs it anticipates to be less than the market price of allowances. Based upon these changes to its operations, it expects to emit only 15 million metric tons of CO₂ in 2007.

Power Co. XYZ, on the other hand, concludes that alternative energy sources would be more expensive than purchasing allowances—although it is watching the development of coal-gasification and other low-CO₂ technology. The company expects to emit 25 million metric tons of CO₂ in 2007. Under the EU ETS, Energy Co. ABC can sell its expected 5 million tons of “excess” emissions allowances, generating additional income; Power Co. XYZ can buy 5 million tons of allowance, avoiding high-cost controls or penalties. The combined emissions of the two companies would be equal to their combined allocation of 40 million tons, with the two firms sharing in the cost savings from trading.

China's Coal Use Prompts Interest in Renewable Energy

Coal-fired power plants are one of the major sources of CO₂ emissions worldwide. China is the largest user of coal, burning some 1.5 billion tons of the world's total consumption of nearly 5 billion tons in 2004, according to the U.S. Department of Energy.

China relies on coal for about 70 percent of its energy needs. By 2025, China is expected to increase its coal consumption to more than 3 billion tons per year, with world consumption topping 8 billion tons.

Because China is considered an emerging economy, it has no emissions cap under the first round of the Kyoto Protocol. But when the first phase of the Protocol expires in 2012, China could face some pressure to reduce its emissions.

Many experts believe China could become a key market for renewable energy products if it makes a concerted effort to reduce its emissions.

China and the European Union recently signed an agreement to develop cleaner coal-power technology. The first step is to study the feasibility of developing technology to capture most of the CO₂ emitted during power production and store it underground.

But what if Energy Co. ABC's wind farm development stalls and the company actually emits 19 million tons in 2007 rather than the expected 15 million tons? Assuming the contract with XYZ stays in place, ABC would have to go into the market to make up the shortfall in its allowances or face the possibility of fines. (The EU ETS provides for a fine of €40 per ton in Phase 1.) This potential for added costs represents one of the additional risks created for companies under the carbon-trading program and should be part of any insurance considerations.

Organizations developing a carbon-trading strategy will need to take into account a number of interlinked factors related to:

- existing and future emissions profiles and how these profiles deviate from emissions-reduction targets,
- the balance between marginal abatement costs and the cost of purchasing new emissions; and
- the strategic position of emissions- and energy-intensive assets across company portfolios.

Along with the uncertainty surrounding how allowances will be allocated and the price of carbon will come new risks (see sidebar on page 30), creating a complex decision-making process across the organization. Integrating these factors into compliance strategies will require new risk management frameworks and a convergence of systems and skills across a company, including accounting, environmental, financial, legal, risk management, and trading disciplines.

Credit-delivery guarantees: A key concern being raised by project developers, investors, and carbon-credit traders is the inability to secure financing for carbon projects.

Those considering investing in such projects should consult their brokers to make certain they have undertaken adequate insurance due diligence and evaluated the availability of new insurance products in this area. One developing insurance solution specific to emissions trading for CDM and JI projects is the emergence of carbon-emissions credit-delivery guarantees (CDG). Such products provide coverage for the nondelivery of credits arising out of such triggering events as project insolvency, currency inconvertibility, host-country political and investment risk, and operational problems. These products should be



carefully evaluated as an overall risk management strategy for such projects.

The insurance will help monetize the future value of carbon credits and allow them to be incorporated into project-financing decisions. This should, in turn, reduce the project cost of capital and improve the overall project economics.

Conclusion

Climate change is a significant emerging global risk. Businesses—if they haven't already—must begin to account for it in their strategic and operational planning. Risks, which will vary by industry and geography, include the potential for physical damage due to changing weather patterns, fines and business constraints due to regulatory requirements, legal costs from possible litigation, investment risk from shareholder demands, changes in the competitive landscape as companies adapt to climate change, and possible brand damage if a company develops a reputation as a “climate change villain.”

As with most any risk, there will also be areas of opportunity. Some companies, for example, have already developed new products and technology to mitigate GHG emissions. Others are meeting with shareholders and disclosing their climate risk strategies—thus, fortifying relations with important stakeholders. Still others are making changes that anticipate potential new regulations, putting them in position to be ahead of competitors should requirements change.

Climate change is a challenge that companies will be confronting for a long time. They will need to find ways to change and to enhance their resilience in the face of the economic and physical challenges climate change poses. Others can find ways to optimize the new opportunities presented by climate change. Many of these challenges and opportunities will demand integrated management, operational and financial expertise, and risk management leadership.

Web Sites of Interest

More information on climate change can be found at the following Web sites:

- Association of British Insurers (page 5)
<http://www.abi.org.uk>
- Carbon Disclosure Project (page 14)
<http://www.cdproject.net>
- Coalition of Environmentally Responsible Economies (page 22)
<http://www.ceres.org>
- Inspire 2041 (page 21)
<http://www.2041.com>
- Intergovernmental Panel on Climate Change (page 3)
<http://www.ipcc.ch>
- Marsh
<http://solutions@marsh.com/climates>
- Mercer Investment Consulting (pages 9, 10)
<http://www.merceric.com>
- Pew Center on Climate Change
<http://www.pewclimate.org>
- United Nations Framework Convention on Climate Change (page 7)
<http://www.unfccc.int>
- United States Environmental Protection Agency
<http://www.epa.gov/climate>
- World Economic Forum (page 1)
<http://www.weforum.org>

Abbreviations and Acronyms in This Issue

- ABI: Association of British Insurers
- BCM: business-continuity management
- CDG: credit-delivery guarantee
- CDM: Clean Development Mechanism
- CDP: Carbon Disclosure Project
- CERES: Coalition of Environmentally Responsible Economies
- CO₂: carbon dioxide
- D&O: directors and officers
- EPA: Environmental Protection Agency
- ESG: environmental, social, and corporate governance
- ET: Emissions Trading
- EU ETS: European Union Emissions Trading Scheme
- FT500: Financial Times Global 500
- GHG: greenhouse gas
- IPCC: Intergovernmental Panel on Climate Change
- JI: Joint Implementation
- MW: megawatt
- NAP: National Allocation Plan
- OPIC: Overseas Private Investment Corporation
- RGGI: Regional Greenhouse Gas Initiative
- SEC: Securities and Exchange Commission
- WRMA: Weather Risk Management Association



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[Risk Alert: Climate Change](#)

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