The Role of U.S. Insurance Regulators in Responding to Climate Change[1]

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ABSTRACT:

This article addresses three key issues set forth in the National Association of Insurance Commissioners' (NAIC) Climate Change & Global Warming Task Force charter:

1. Implications of climate change on the insurance sector
2. Insurers' knowledge of potential climate change impacts
3. Recommendations on steps that regulators could take to assure that they are adequately monitoring insurers' activities with

1. This article is based on Testimony given by the author to the National Association of Insurance Commissioners' Climate Change & Global Warming Executive Task Force, NAIC Winter Meeting, San Antonio, TX, December 8, 2006. I would like to recognize the late Nebraska Insurance Director Tim Wagner (NE) and Commissioner Kreidler (WA) for their vision in taking up this important topic, and the NAIC for providing a hearing to discuss these issues. These remarks have benefited from discussions with the late Gene Lecomte (President Emeritus, Institute for Business and Home Safety), Richard Roth, Jr. (Bickerstaff, Whatley, Ryan & Burkhalter Consulting Actuaries), Ann Henstrand (Acord), and Paul Epstein (Harvard Medical School). The work described in this article was sponsored by the U.S. Department of Energy, the U.S. Environmental Protection Agency, and Ceres. The opinions expressed in this article are those of the author and do not necessarily represent the views of the sponsors.

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regard to managing the financial condition and performance of insurance markets

The physical and economic aspects of the first question are dealt with in a previous article in the journal *Science*, and are summarized here.[3] The closely related issue of insurance availability and affordability is handled in depth elsewhere.[4]

The balance of this article treats the second two questions, and offers twelve specific recommendations for activities in which the NAIC can play a leadership role.

3. Evan Mills, *Insurance in a Climate of Change*, 309 SCI. 1040-1044 (2005).

4. EVAN MILLS ET AL., CERES, AVAILABILITY AND AFFORDABILITY OF INSURANCE UNDER CLIMATE CHANGE: A GROWING CHALLENGE FOR THE U.S. (2005). Co-authors included Eugene Lecomte, President Emeritus of the Institute for Business and Home Safety, and Richard Roth Jr., former Chief Property and Casualty Actuary for the Department of Insurance, State of California. Mr. Roth also served as Chairman of the Casualty Actuarial (Technical) Task Force at the NAIC, and was active on two NAIC catastrophe insurance committees.

I.
INTRODUCTION: IMPLICATIONS OF CLIMATE CHANGE FOR INSURERS AND THEIR CUSTOMERS

The insurance sector serves as a national and, increasingly, global integrator of catastrophe costs across all sectors of the economy as well as a messenger of these impacts through the terms and price signals it projects to its customers. The insurance sector provides a critical function within the global economy by contributing to peace of mind for homeowners and the levels of certainty and risk spreading that businesses need in order to invest and grow.

At various points in history, including the Great Dust Bowl of the 1930s, the urban riots of the 1960s, and terrorism today, watershed events or trends ushered in profound structural changes within the insurance industry. While entirely different in their specifics, each of these watersheds had in common an element of acute surprise *followed by* the subsequent realization that the future would be different from the past. Global warming is the next watershed of this type. The growing destructive power of extreme weather events coupled with increasing insured exposures poses a material financial challenge to insurers. A survey of 139 insurance executives from 21 countries found that natural catastrophes were the number-two top concern and climate change ranked number four (out of a total of 33), while the majority of

other concerns (e.g. actuarial assumptions) are arguably also linked to climate change.[5]

The scientific debate is over, with the Nobel-Prize-winning Intergovernmental Panel on Climate Change, representing the definitive scientific consensus, now using the considered term "unequivocal" in describing its certainty that climate change is here. The economic context has shifted as well; reports like the UK government's "Stern Review"[6] turn on its head the conventional wisdom that taking action on climate change will harm the economy. Companies and investors now increasingly realize that, in fact, it is the *lack* of action to combat climate change that is the true threat to the economy, while engaging with the problem and mounting solutions represents not only a duty to shareholders but also a boon for economic growth.

There is growing acknowledgement that the impact of climate change on future losses is likely to be profound. The chairman of Lloyd's of London said that climate change is the number-one issue for that massive insurance group. Europe's largest insurer, Allianz, stated that climate change stands to increase insured losses from extreme events *in an average year* by 37 percent within just a decade while losses in a bad year could top $400 billion.[7]

The sky is not falling. The insurance industry can cope, especially if working in partnership with its regulators. While the challenges have been growing, insurance itself has been taking on a broader swath of risks as its appetite has broadened from a "fire-only" industry toward an "all-perils" one. Thus, there are two moving targets: the hazards and the exposure to those hazards.

Rising weather-related losses are expected (see Exhibit 1), which will have adverse impacts on insurance affordability and availability. In Florida and Louisiana alone, more than 600,000 homeowners' property policies were cancelled or not renewed in 2006. In 2007, Allstate said that climate change prompted it to cancel or not renew policies in many Gulf Coast states, with re-

5. Press Release, Centre for the Study of Financial Innovation, May 25, 2007.

6. Stern Review on the Economics of Climate Change, Treasury of the United Kingdom, Oct. 2006, *available at* http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/sternreview_index.cfm.

7. Angela Mac-Donald-Smith, *Climate Change to Boost Insured Losses, Allianz Says* (Update 1), BLOOMBERG, Sept. 18, 2007, *available at http://www.bloomberg.com/apps/news?pid=20601207&sid=aizuqfdACu68&refer=energy.*

cent hurricanes wiping out all of the profits it had garnered in 75 years of selling homeowners' insurance.[8] The company has cut the number of homeowners' policies in Florida from 1.2 million to 400,000 with an ultimate target of no more than 100,000, and has curtailed activity in nearly a dozen other states. More difficult to detect than formal withdrawals or price spikes is the "hollowing out" of coverage through increased deductibles, reduced limits, and new exclusions.

A similar crisis in availability is occurring in many commercial insurance markets such as hotels and oil,[9],[10] despite the absence of price regulation for non-household insurance. This suggests that there are factors at work beyond regulatory obstacles that limit price increases, such as the increased unpredictability that climate change has brought to the challenge of modeling and forecasting catastrophic losses. Bermuda-based ACE Limited has remarked that "[r]adical changes in natural catastrophe frequency and/or severity could eliminate certain of our markets through physical damage, price escalation, or regulatory activity. . . unpredictability could negate the use of actuarial techniques and undermine our ability to price and risk-manage product offerings."[11]

The U.S. residual markets (mandated insurance pools) contain about three million customers today, and the number is growing. Left unchecked, even more of the burden will shift to consumers and their governments, and growth of the industry itself could be slowed. As the crisis of insurance availability and affordability deepens, a new study from the U.S. Governmental Accountability Office brought into question the ability of government-backed insurance to provide a reliable alternative.[12] Restriction

8. Janet L. Conley, *Gathering Storm*, FULTON COUNTY DAILY REPORT, Sept. 18, 2007, http://www.dailyreportonline.com/Editorial/News/new_singleEdit.asp?individual_SQL=9%2F18%2F2007%4016655_Public_.htm.

9. Lloyd Dixon et al., RAND Institute for Civil Justice, *Commercial Wind Insurance in the Gulf States: Developments Since Hurricane Katrina and Challenges Moving Forward* 14 (2007).

10. Mark E. Ruquet, *Oil Producers Scramble for Coverage*, NATIONAL UNDERWRITER ONLINE NEWS SERVICE, Apr. 20, 2007, http://www.propertyandcasualtyinsurancenews.com/.

11. ACE Limited's response to the Carbon Disclosure Project 5 questionnaire (2007), http://www.cdproject.net/online_response.asp?cid=1654&id=5&exp=69&desc=S%26P+500&letter=A&year=2.

12. U.S. Government Accountability Office, *Climate Change: Financial Risks to Federal and Private Insurers in Coming Decades are Potentially Significant*, GAO-07-285 (Mar. 2007).

of insurance (be it publicly or privately underwritten) is often criticized, yet, in some cases, it can also be viewed as a recognition of previously hidden costs and as an indication of society's limited ability to pay its way around the effects of climate change.

It is sobering to note that the average annual insured losses from weather-related catastrophes now exceed that of the September 11th attacks, and yet they receive only a fraction of the attention. According to Nebraska's late Insurance Director Wagner, loss-ratios in Nebraska due to hailstorms in a bad year are higher than those in New York following 9/11. If we are concerned about terrorism, shouldn't we be equally concerned about global warming and climate change? The U.S. Department of Homeland Security views the risks of hurricanes and terrorism as similar.[13]

An international panel of insurers released a study in Nairobi stating that the global economic costs of extreme weather events are doubling every twelve years, and that a Probable Maximum Loss (PML) of $1 trillion can now be anticipated. Remarkably, their estimate of PML is up six-fold from just four years ago.[14]

Climate change, of course, conspires with settlement and land-use planning practices that magnify exposures to catastrophes. What is particularly worrisome is that the trends in human activity and our changing climate are serving to compound one another. One of the U.S. insurance industry's leading catastrophe modelers is currently helping to unravel this attribution puzzle.[15]

At the most conceptual level, seven broad concerns characterize the implications of climate change for insurers and their customers:

1. magnitude and declining predictability of extreme weather events The rising coupled with rising incidence of coupled losses previously believed to be uncorrelated (e.g. property and health/life), and the obvious conundrum this presents

13. Susanne Sclafane, *Allstate President Pleads For United Front On Cats*, NATIONAL UNDERWRITER PROP. & CASUALTY, Nov. 27, 2006, at 8.

14. ANDREW DLUGOLECKI, U.N. ENVTL. PROG. FIN. INIT., ADAPATION AND VULNERABILITY TO CLIMATE CHANGE: THE ROLE OF THE FINANCE SECTOR 14 (2006), *available at* http://www.unepfi.org/publications/climate_change/index.html.

15. Robert-Muir Wood et al., *The Search for Trends in a Global Catalogue of Normalized Weather-Related Catastrophe Losses*, *in* WORKSHOP ON CLIMATE CHANGE AND DISASTER LOSSES: UNDERSTANDING AND ATTRIBUTING TRENDS AND PROJECTIONS 188 (Peter Hoppe & Roger Pielke, Jr., eds., May 25-26, 2006).

for actuaries and those who must determine the adequacy of loss reserves;

2. While many who are sanguine about insurers' ability to adapt to climate change predicate their views on the assumption of gradual change, the reality is that abrupt climate change is a serious possibility and can lead to much more traumatic outcomes, as illustrated by the Great European Heat wave of 2003 which resulted in temperatures nearly *six standard deviations* from the long-term norm (Exhibit 2).[16] The abrupt collapse of the Larson-B ice sheet in West Antarctica – in which 720 billion tons of 650-foot-thick ice disintegrated in a five-week period – is another prominent example;
3. The sometimes astounding lack of fundamental data on insured losses and exposures, the blind-spots within existing catastrophe models, and the often insufficient ability of insurers and others to apply those models properly;
4. The largely unanticipated correlation between insurers' core business and their investments, and the potential "perfect storm" of demands for payouts and loss of consumer surplus through the impact of mega-catastrophes on financial markets;
5. The current tendency for *non*-U.S. insurers to be more advanced in their analysis of and responses to climate change, and the adverse implications this may eventually have for the global market share enjoyed by U.S. companies. Allstate has stated that they are "getting smaller everywhere around the country" in response to rising natural disasters;[17]
6. The particularly difficult business environment that will appear in the emerging markets of Asia, Africa, and Latin America where U.S.-domiciled insurers are already expanding aggressively and where climate change vulnerability and impacts will be the most severe; and
7. The threat to insurability itself, as manifested by the already apparent crisis in availability and affordability today in the U.S. A shift to reluctant and often unskilled publicly funded insurers of last resort will be appropriate in some cases, but should indeed be a measure of the *very* last

16. Christoph Schar et al., *The Role of Increasing Temperature Variability in European Summer Heatwaves*, 427 NATURE 332, 333 (2004).

17. Sclafane, *supra* note 13.

resort. It is highly preferable to find market-based solutions rather than allowing markets to fail and to plug the proverbial dike with inferior government solutions.

Outside forces have begun to prod the industry toward action. Insurance regulators under the National Association of Insurance Commissioners Task Force have met regularly in the U.S. to discuss climate change, and the subject was among the top agenda items at the 2007 meeting of the International Association of Insurance Supervisors, which represents regulators from 130 countries. Meanwhile, major institutional investors are increasingly demanding that the insurers in which they invest analyze and disclose their risks.

A. *Property and Business Interruption*

Climate change has the potential to affect virtually all segments of the P&C business – including those covering damages to property, crops, and livestock; business interruptions, supply-chain disruptions, or loss of utility service; equipment breakdown arising from extreme temperature events; and data loss from power surges or outages. Many of these are discussed at length elsewhere. The rising specter of climate-change-related liability is only now beginning to be analyzed.

1. Liability Risks

While the most widely discussed insurance-related consequences of climate change concern property damages from extreme weather events, there is an increasing awareness of the more subtle but equally material dimension of liability. Even for those who believe that the *physical* impacts of climate change may not cause observable insurance losses for some time, it is clear that liability-related claims *are* already being made. Legal triggers include nuisance, negligence, breach of statutory duty, and breach of human rights.[18] The relevant categories of insured liability include:

- Commercial general liability claims, which include negligence, personal injury, and third-party business interruption via disruptions in supply chains, transportation, utility services, and communications;

18. Christina Ross et al., *Limiting Liability in the Greenhouse: Insurance Risk-Management in the Context of Global Climate Change*, STAN. ENVTL. L.J. & THE STAN. J. OF INT'L L., Symposium on Climate Change Risk, vol. 26A/43A:251-334, available at http://blogs.theage.com.au/managementline/greenhouseliability.pdf.

- Product liability claims associated with materials or products that contribute to climate change;
- Environmental liability claims for emitters of greenhouse gases based on various impacts of climate change itself, or, secondary consequences associated with toxic releases, mold, and other consequences of the physical impacts of climate change;
- Professional liability claims, e.g., corporate directors and officers liability for those involved as emitters or arising from failure to safeguard shareholder value from the impacts of climate change;
- Political risk liability claims triggered by new government policies (e.g., carbon levies); and,
- Personal and commercial vehicle liability claims from increased roadway accidents related to adverse weather.
- Theories of legal liability that could be associated with these types of insurance liability include:
- Product liability claims;
- Claims based on negligent conduct relating to greenhouse gas emissions or failure to prepare or respond to the impacts of climate change;
- Nuisance claims based on harmful impacts of greenhouse gases;
- Claims based on statutory duties of corporate officers or directors under federal securities laws;
- Claims of breach of fiduciary duty by corporate officers or directors;
- Misrepresentation-related claims against purveyors of misinformation on climate change;[19]
- Tort, breach of contract, and related claims resulting from impacts of business interruptions on third parties; and,
- Claims based on environmental liability statutes (e.g., CERCLA) or common law for contamination resulting from climate change-related impacts.

Climate-change outcomes resulting in liability insurance claims will not in all cases result in litigation. Conversely, not all litigation related to climate change will have an insurance dimension.

Addressing climate change with litigation is both inefficient as well as expensive. In light of various federal district court decisions where the common law nuisance theory has been rejected

19. *See* Sharon Begley, *Global Warming Deniers: A Well-Funded Machine*, NEWSWEEK, Aug. 13, 2007.

as a basis for litigating corporations that emit GHGs, litigation may not be an effective avenue to controlling U.S. GHG emissions.[20] Whether climate change lawsuits are successful and GHG-emitting companies are held liable for their emissions, significant litigation costs will be incurred by defendants.[21] Controlling litigation costs is of paramount importance to members of the NAIC, in their role as overseers of insurer solvency.

Responses to climate change, whether they are in the realm of adaptation or mitigation, will entail new liabilities for insurers and their customers. These include considerations for existing and new energy technologies (e.g. nuclear power, or geological carbon sequestration), both on the supply and demand-side of the equation, as well as liabilities associated with market-based carbon-reduction strategies such as trading or offset schemes.

The insurance industry thus faces material liability exposures to both the causes and consequences of climate change, many of which have already begun to materialize. Responses to climate change, particularly in the energy sector, can be distinguished by their potential for enhancing or reducing liability. Some responses, such as a resurgence of nuclear power, appear not to be commercially insurable given persistent uncertainties about their risk characteristics and the refusal of the commercial insurers to assume more than a slice of this risk up until now.

B. *Health and Healthcare Infrastructure*

The Intergovernmental Panel on Climate Change offers a definitive review of the health implications associated with increased temperatures, extreme weather events, and other impacts of climate change.[22] This family of consequences has received far less attention from the insurance industry than those for physical property.

The life/health segment represents well over half of U.S. insurance premium volumes. Climate influences many of the most im-

20. Jennifer Rohleder & Jillian Button, *The Legal Dimensions of Climate Change Conference Report*, SUSTAINABLE DEVELOPMENT L. & POL'Y: CLIMATE CHANGE, Winter 2006, at 57.

21. Dawn T. Mistretta & Stanley B. Green, *Global Warming Litigation: Cooling Down or Heating Up in the Private Sector?*, DRI Toxic Torts & Envtl. L. Committee, Winter 2006, at 4-8.

22. *See* U. Confalonieri et al., *Climate Change 2007: Impacts, Adaptation and Vulnerability, Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, available at* http://www.gtp89.dial.pipex.com/08.pdf.

portant diseases. Climate *change* is expected to adversely impact the prevalence of vector-borne diseases, heat stress, water quality, asthma associated with increased aeroallergens such as pollens[23] and mold. Additionally, if compromised, the health of non-human systems can cause economic and insured losses for humans (e.g. forest beetle infestations leading to timber loss and wildfire). It is this last item – the health of forests, crop systems, wildlife, livestock and marine life (e.g. coral reefs) – that links directly to industries and the "health of their assets" (timber, agriculture, poultry, and fisheries; to investors and insurers), as well as to public health via deterioration of life support systems.

An in-depth treatment of health issues is provided in the study entitled "Climate Change Futures: Health, Ecological, and Economic Dimensions," (CCF Study) conducted by the Harvard Medical School's Center for Health and the Global Environment and sponsored by Swiss Re and the United Nations Development Programme.[24] The project included intensive corporate stakeholder involvement over a multi-year period and tapped 27 core authors and 24 reviewers from the fields of insurance, epidemiology, public health, veterinary medicine, agriculture, marine biology, forestry, ecology, energy systems, economics, climatology, and conservation biology. It was impressive how many people participated in the project from within Swiss Re, ranging from public affairs personnel, to research, underwriting, and asset management employees.

There are at least nine major categories of anticipated health impacts with implications for insurance, some of which are elaborated in the CCF study (coupled with recommendations for loss minimization). These include:

1. Infectious diseases (such as vectors ranging from mosquitoes carrying Malaria or West Nile Virus to ticks carrying Lyme Disease[25] to rodents carrying Hantavirus);
2. Heat stress (few in the U.S. are aware that upwards of 35,000 people died in excess of the norm due to the European Heat Wave of 2003);
3. Respiratory and coronary disease;

23. Pollen has been observed to increase by 60% with a doubling of pre-industrial atmospheric carbon-dioxide concentrations. PAUL R. EPSTEIN & EVAN MILLS, HARVARD MEDICAL SCHOOL, CLIMATE CHANGE FUTURES: HEALTH, ECOLOGICAL AND ECONOMIC DIMENSIONS 49 (2006).

24. EPSTEIN & MILLS, *supra* note 23.

25. John Brownstein, *Lyme Disease: Implications of Climate Change, in* CLIMATE CHANGE FUTURES, *supra* note 23, at 46-48.

4. Waterborne diseases exacerbated by temperature and water quality, or overwhelmed water treatment infrastructure after floods;
5. Physical injury from extreme events and natural disasters,(e.g. flooding), as well as the tendency for disease outbreaks to cluster around extreme weather events[26] (e.g. "Katrina Cough");
6. Effects of toxic materials released and distributed by extreme weather events;
7. Food poisoning (e.g. there is a strong correlation between Salmonella outbreaks and temperature);
8. Post-event mental health problems; and
9. Health consequences of malnutrition and water shortages in developing countries.

One of the strengths of the CCF Study is that it looks at the multifaceted, real-world patterns of impacts. For example, while extreme heat catastrophes can trigger health problems and loss of life, they can simultaneously cause acute crop damages, shutdowns of electric power plants, wildland fires, flooding and avalanches from abrupt melting of ice and permafrost. Elevated ocean temperatures turn kill coral reefs that protect seaside buildings from storm surge, trigger shellfish poisoning, and foster transmission of cholera via algal blooms.

In turn, each individual event within these mosaics can have multiple insurance consequences. This is seen very prominently in the case of wildfire, which results in both property loss and respiratory health problems as well as major pulses of carbon back into the atmosphere that create an undesirable positive feedback accelerating climate changes. Exhibit 4 shows results correlating the rise in western-U.S. wildfires with regional warming.

Perhaps the greatest climate-related health challenge in the U.S. is that the combination of more airborne allergens, rising temperatures, greater humidity, more particulate matter from wildfires,[27] and more dust and mold may considerably exacerbate upper respiratory disease (e.g. rhinitis [hay fever], conjunctivitis,

26. Paul R. Epstein, *Climate and Health*, SCI., July 16, 1999, at 347-48.

27. As cited in Mills, Roth, and Lecomte 2005, hospital admissions for heart and lung ailments increased significantly at the height of the wildfire season, most notably in Ravalli County. Admissions for respiratory disease went from 8.6 per 10,000 residents in 1999 to 16.4 per 10,000 during the 2000 wildfire season — a 90% increase. Admissions for heart problems went from 22.1 per 10,000 residents to 34.6 per 10,000 — a 57% increase.

sinusitis) and cardiovascular disease (due to reduced oxygen and increased carbon monoxide during fires). As much as a sixty percent increase in key pollens is expected due to the so-called "carbon fertilization" of the atmosphere. Ground-level ozone, exacerbated by warming temperatures in cities, is yet another cause of respiratory stress. Cases of asthma, already causing greater impacts than Alzheimer's disease, can be expected to sharply increase under climate change. As of the mid-1990s, the baseline cost of asthma was $13 billion per year in the U.S. alone (half of which was direct healthcare costs). If a thirty percent increase took place in the U.S., the recurring incremental cost of $4 billion per year would be on a par with that of a large hurricane.

Natural disasters also have material impacts on mental health. The World Health Organization has estimated that as a result of Hurricane Katrina, up to 2.5 million people have experienced moderate to severe psychological distress, with 25,000 to 50,000 experiencing persistent problems.[28]

Additionally, extreme weather events wreak havoc on healthcare infrastructure. More than a year after Hurricane Katrina, the incidence of serious mental health problems had doubled, but there were half as many psychiatric beds available in New Orleans hospitals.[29] As of late 2006, only two of eleven New Orleans hospitals were fully functioning. Disruptions are caused by a combination of factors, including direct damage to healthcare facilities, loss of access, disruption of utilities, and evacuation or immobility of healthcare personnel.

As urban and elderly populations are particularly vulnerable, the increasing shift of populations to cities and the rising average age of Americans will lead to increased vulnerability throughout society.

To be sure, those most vulnerable to the health impacts of climate change are the low-income, elderly, or otherwise disenfranchised populations that are infrequent buyers of insurance. It is important that insurers not be nonchalant about this. First, as our nation becomes more prosperous, these citizens will join the ranks of the insured or uninsured, as the case may be, in greater numbers. Similarly, the penetration of insurance – particularly life and health insurance – is rising at a very fast pace in

28. EPSTEIN & MILLS, *supra* note 23.

29. Ronald C. Kessler et al., *Mental Illness and Suicidality after Hurricane Katrina*, 84 BULL. WORLD HEALTH ORG. 930, 935 (2006). *See also* THE ASSOCIATED PRESS, *Mental Health Crisis Strains New Orleans*, WASH. POST, Nov. 8, 2006.

the developing world, where many of the climate-related threats to health and life are most acute.

Short of a major epidemic, life insurance losses are not likely to increase significantly as a result of climate change in the U.S. However, losses would rise from current levels and could be quite significant in emerging markets (where U.S. insurers increasingly seek to do business).

Conversely, it is important to recognize that many secondary and near-term health *benefits* arise from reductions in greenhouse gas emissions, such as the reduction in air pollution or carcinogens when energy demand is trimmed (especially particulates, ozone, nitrogen oxides, heavy metals, and sulfur dioxide) and other categories of benefits such as reduced roadway injuries and deaths where public transportation exists.

As is the case with the discussion of property losses, future health trends will be driven by a combination of many factors. Unfortunately, the factors linked with climate change are compounded by other dimensions of human behavior, such as settlement in high-risk areas, urbanization, and longer life expectancy. This fact only serves to raise the vulnerability of populations to climate change.

II.
THE STATE OF INSURERS' KNOWLEDGE AND ACTIVITIES ON CLIMATE CHANGE

With some important exceptions, U.S.-based insurers' knowledge of climate-change impacts is quite limited, at least as has been publicly disclosed. While the American Insurance Association has stated that the "insurance industry does not have the expertise to evaluate conflicting interpretations of scientific evidence or positions on climate change,"[30] a number of individual companies and their CAT modelers have in fact shown considerable initiative in this regard, as noted in our prior publications. The existing focus is, however, largely limited to the property insurance lines, with little if any attention to the implications for the health and life insurance lines. Even within the property-casualty lines, the focus is almost singularly on damage to real property. Much less consideration has been given to other lines (e.g. personal auto, marine, business interruption, crop, and liability).

30. Debra T. Ballen, *Climate Change & Insurance: Sweeping Regulations Are Not The Answer*, 21 WASH. LEGAL FOUND. 36, at 1-2 (2006).

The current emphasis on the impacts of climate change within the insurance community seems to track that of the popular media, which is myopically focused on large headline-catching events.

One worrisome trend is the often-singular focus on the Atlantic Hurricane hazard. Firstly, the North Atlantic basin typically hosts only about *five to ten percent* of the cyclonic storms and depressions globally. The 2006 activity level in the Atlantic was indeed much lower than the previous year's, but the numbers were *up* in three of the five *other* ocean basins (Exhibit 5). In fact, the number of storms (95) globally in 2006 was on a par with that of historic 2005 (99 storms), and there were actually more Category 3-5 storms in 2006 than 2005. Irrespective of whether the trend is up or down, the most important point here is that climate is the *long-term* average of weather, and climate change is associated with more *variability* in weather-related events. Thus, hurricane losses should not be expected to show a smooth trend from year to year. However, events in the Gulf of Mexico should not inadvertently be taken as a proxy of the global situation.

Large-scale events aside, the fixation on hurricanes overlooks the fact that aggregate losses from *relatively* small-scale events can have very significant cumulative impacts on insurers as well. There is a litany of types of such events. As an illustration, it is notable that Swiss Re has projected major increases in winter storm activity due to climate change.[31] It may come as a surprise to some that, thanks to the aggregate effect of relatively small events, catastrophe losses in the first half of 2006 exceeded by almost a factor of two from those from 2005.[32]

Moreover, some categories of these "small" events are themselves evolving *into* catastrophes. Among the "Top-10" potential catastrophe scenarios from Risk Management Solutions (RMS) are a Western wildfire with $5 billion in insured losses and a Northeast ice storm and blackout with $3.6 billion in insured losses.[33]

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31. SWISS RE, FOCUS REPORT: THE EFFECTS OF CLIMATE CHANGE: STORM DAMAGE IN EUROPE ON THE RISE, SWISS REINS. CO. REPORT NO. 1503160_06 at 2 (2006).

32. Meg Green, *Flirting with Disaster*, 107 BEST'S REV., Nov. 1, 2006, at 62.

33. Risk Management Solutions, *Risk & Insurance: Top 10 Risks*, 15 RISK & INS. 46-54 (2004).

A measure of the seemingly limited concern exhibited by primary insurance companies in the U.S. is their low response rate to the annual Carbon Disclosure Project (CDP) surveys, especially as compared to other U.S. industries and to insurers in other countries.

The CDP provides a secretariat for the world's largest institutional investor collaboration ($41 trillion under management) on the business implications of climate change. The CDP represents an efficient process whereby many institutional investors collectively sign a single global request for disclosure of information on GHG emissions. CDP has historically sent this request to the *Financial Times* 500 largest companies in the world, recently expanded to 2400 companies.

As can be seen from Exhibit 6, only thirty-six percent of U.S. insurers polled responded to the CDP surveys of 2003 to 2007 as compared with sixty-seven percent of those domiciled in other countries, although the U.S. response rate improved dramatically over time. And, with important exceptions – e.g. the response of the American International Group, AIG – U.S. insurer responses were more superficial than those from insurers domiciled in other regions. A recent study found that the U.S. Securities and Exchange Commission's (SEC) disclosure of climate change related risks among publicly-traded insurance companies in the U.S. is very poor, with only fifteen percent of property and casualty insurers reporting.[34]

However, a number of insurers can be commended for their initial efforts to respond to climate change. These are extensively documented in a recent report,"[35] with an overview given in Exhibits 7 and 8.

None of the companies cited in this report had what we would regard as a comprehensive strategy, and most efforts were focused on the worthwhile but longer-term goal of reducing greenhouse gases, while few were focused on nearer-term enhancements to disaster resilience.

An insurer that integrates best practices into its business will implement the following ten-point strategy:

34. Michelle Chan-Fishel, *Fourth Survey of Climate Change Disclosure on SEC Filings of Automobile, Insurance, Oil & Gas, Petrochemical, and Utilities Companies* (2005).

35. Evan Mills, *From Risk to Opportunity: Insurer Responses to Climate Change* (2007).

1. Make concerted efforts to restore and maintain the insurability of extreme weather events. This may require partnerships with governments (e.g. in cases of improved land-use planning and enforced building codes);
2. Improve modeling and other methods of analyzing risks associated with climate change;
3. Utilize terms and conditions to foster the right decisions by customers. This could range from rewarding risk-minimizing behavior to excluding climate change liabilities for those who make imprudent decisions either as emitters of GHGs or as managers of risks associated with climate change;
4. Develop new products and services to facilitate maximum customer utilization of climate-friendly technologies and practices, especially in cases where they yield loss-prevention co-benefits;
5. Invest in strategic research and development and rebalance investment portfolios to: (a) recognize climate-related risks to investments and (b) capitalize on opportunities for emerging industries that will participate in climate change solutions;
6. Actively participate in carbon markets, both as an investor and risk manager;
7. Lead by example in minimizing the insurer's own "carbon footprint." This includes minimizing the climate impacts of real estate owned by the insurer, as well as the "carbon footprint" of business operations. And, analyze and disclose exposures to climate change;
8. Take an active role in the education of customers about climate-related risks and opportunities for minimizing them;
9. Actively engage in public policy discussions about appropriate responses to climate change; and
10. Tighten terms and conditions, withdraw from markets, or increase insurance prices only when the aforementioned best practices have first been exercised to their full cost-effective potential.

Corollary best practices for rating agencies will involve assessing insurers' handling of climate risks. Other trade allies, such as brokers, agents, and risk managers, and unregulated surplus-lines writers, can reinforce the aforementioned best practices on behalf of insurance customers.

Insurance trade associations have important roles to play as well, yet are lagging significantly behind their more forward-looking members. Most associations have been silent on the issue, although the National Association for Mutual Insurance Companies (NAMIC) maintains a very balanced web-based information service.[36] In 2006, the Insurance Information Institute[37] released its first-ever public treatment of the question, which dwelled mostly on their perception of knowledge gaps. The American Insurance Association issued a meager climate change paper in 1999 (and an even briefer four-page cautionary memo to regulators in 2006).[38] These materials focus on property-casualty insurance providers, and do not treat the implications of climate change for insurance customers (i.e. availability and affordability), should insurance markets contract. The Institute for Business and Home Safety (IBHS) rarely discusses climate change, but performs important and well-known work on fortifying properties. U.S.-based insurance associations have not publicly examined the implications of climate change for the life/health lines.

III.
THE ROLE OF INSURANCE REGULATORS

The preceding characterization of the context of the climate change problem is not intended to convey a hopeless situation. The risks are real, but so are the opportunities. A small but growing cohort of insurers and reinsurers has made major strides towards constructive solutions that are consistent with their core business objectives. Insurance regulators are essential participants in this process, and the remainder of this article is intended to highlight concrete ways in which the NAIC can help maintain the availability and affordability of insurance for customers, while maintaining the financial health of the insurance industry.[39]

36. See http://www.climateandinsurance.org/.

37. L.J. Valverde, Jr. and M.W. Andrews, Insurance Information Institute, *Global Climate Change and Extreme Weather: An Exploration of Scientific Uncertainty and the Economics of Insurance* (2006).

38. Am. Ins. Ass'n, *Property-Casualty Insurance and the Climate Change Debate: A Risk Assessment* (1999). *See also* Ballen, *supra* note 31.

39. Further discussion of considerations for regulators can be found in Edward Mills, Eugene Lecomte, and A. Peara, *Insurers in the Greenhouse*, 21 J. OF INS. REG. 1, 43-78 (2006).

There are twelve potential ways in which the NAIC can make a constructive contribution toward moving forward by addressing various market failures. These initiatives serve the goals of:

- Analysis and capacity building
- Promoting disaster-resilience and loss prevention
- Maintaining insurance availability and affordability
- Minimizing litigation over climate-related liabilities
- Safeguarding insurer reserves and customer surplus

In pursuing these initiatives, the NAIC would benefit from reaching out to include insurers who possess knowledge and skill for evaluating and addressing climate risks, as well as local and federal governments, lending institutions, insurance consumer groups, other regulatory bodies (e.g. the SEC and the accounting regulators at the FASB), the scientific community, NGOs, and other entities such as energy utilities with an interest in managing the risks of climate change.

A. *Stay current on the science*

Although climate change is one of the more dynamic and rapidly developing areas of science, many commentators refer to decade-old information as "state of the art," typically resulting in omission of key knowledge and overstatement of the uncertainties. Some parties exaggerate *or* ignore uncertainty through selective reporting – although their ranks are thinning. The experience gathered by the NAIC through years of their involvement in the regulation of insurance companies places them in a position to advance suggestions that would shrink the legitimate remaining uncertainties.

To invoke a metaphor, it is critical that policymaking bodies such as the NAIC not focus their attention on the hole in the donut as evidence that there is no donut.[40] An example of this could be the statistics on Atlantic hurricanes, discussed above, i.e., a quiet year in the Atlantic does not necessarily mean a quiet year in the world. Insurance is a globalized market, so this is a material distinction even for U.S.-domiciled insurers.

For an authoritative synthesis of the peer-reviewed climate literature, insurance regulators should become familiar with the Fourth Assessment of the Intergovernmental Panel on Climate Change (IPCC), released in 2007 by the United Nations. The

40. Peter Gleick, *On Truth, Fact, Values, Climate Change, and Doughnuts*, ENVTL. NEWS NETWORK, Dec. 29, 2005.

IPCC reports uniquely synthesize the existing scientific literature on climate change and provide summaries for policymakers that are accessible to non-specialist audiences. Several of the chapters in this assessment discuss the relevancy of climate change for insurance.

B. *Require that insurers collect and analyze more comprehensive data on weather-related losses and their insurance implications*

The full magnitude of current weather-related insurance losses is *unknown*. And, as the old saying goes, "you cannot manage what you don't measure." I am particularly concerned by the ways in which the existing arbitrary floor of $25 million of insured losses per event understates, skews, and erodes the value of the Property Claim Services (PCS) data upon which insurers and their regulators heavily rely.[41] For example, thanks to this cutoff, no winter storms were included in the PCS statistics for the 46-year period from 1949 to 1974, and few were included thereafter.[42] Yet, each year these events collectively yield losses on a par with those of a large hurricane. Relaxing the $25-million limit within PCS, or creating a new data-gathering activity would be of considerable value. While large catastrophe losses are relatively well documented, scant information exists for other important "small-scale" events such as lightning strikes, soil subsidence, weather-related vehicle accidents, power outages, and health-related losses linked to climate and weather parameters. Relevant insurance loss data should be more readily available in the public domain and to the scientific community, preferably at no cost (which is currently not the case).

Research on the insurance-climate nexus is also confounded by the lack of readily available data on U.S. insurers' insurance premiums, exposures, and losses for the business they do *outside* of the U.S. This information is much needed, as most climate-change risks are located in the emerging markets which many U.S. insurers regard as growth markets.

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41. According to the Insurance Information Institute, when the floor was raised from $5M in 1996 to $25M in 1997, the number of catastrophes fell from 41 in 1996 to 25 in 1997, mostly due to this reclassification. See http://www.iii.org/media/hottopics/insurance/xxx/.

42. K. E. Kunkel, R. A. Pielke Jr. & S. A. Changnon, *Temporal Fluctuations in Weather and Climate Extremes That Cause Economic and Human Health Impacts: A Review*, 80 BULL. OF THE AM. METEOROLOGICAL SOC'Y 1077 (1999).

Lastly, there is no comprehensive database on insurance policy cancellations or other indicators of changes in insurance availability. In a previous report,[43] in order to estimate the scale of the problem we were required to manually assemble snippets of information from news reports and other "grey literature," which no doubt yielded an underestimation of the full scope of the issue.

Anti-trust laws could serve to be an unintended barrier in this regard, a problem that the NAIC should take a leadership role in resolving.

C. *Raise the standards of practice for catastrophe modeling and create a non-propriety modeling and data-collection entity*

In order to assess exposures of insurers and their customers, catastrophe ("CAT") models should effectively integrate the processes of climate change. Risk Management Solutions has begun to do so, and other modeling firms are following suit, but there is much more work to do. The models and their embedded assumptions should be subject to peer review – by an appropriately composed team – and validation, and should be transparent to regulators. Regulators should not be expected to do this in-house. The Florida Commission on Hurricane Loss Projection Methodology is the only state that has a formal system for vetting models.[44]

At their best, existing CAT models, however, only cover a subset of insurance-relevant climate change impacts. For example, implications for life/health lines are barely if at all captured in current models. These voids should be filled with new modeling methods or supplemental tools.

New uses should also be sought for CAT models. An important, albeit antiquated, example was the All-Industry Research Advisory Council's (AIRAC) report in 1986, which surprised the insurance community by quantifying a previously unrecognized effect of multiple mega-catastrophes on insurer solvency.[45] This work has not been replicated or updated over the intervening twenty-plus years. Another area that merits analysis is the degree to which insurer investments may unexpectedly decline in value

43. Mills & Lecomte, *supra* note 36.

44. See http://www.sbafla.com/methodology/.

45. Evan Mills, *Catastrophic Losses: How the Insurance System Would Handle Two $7 Billion Hurricanes* 73 (All-Industry Research Advisory Council 1986).

if they have not been thoroughly vetted for climate risk issues. As U.S. insurers do more and more business overseas, regulators must assess those correlated risks, which will be vastly higher than those in the U.S.

Risk modeling and data are a public good, and creating a new public-domain modeling activity could improve economic efficiency by reducing redundant expenditure by individual insurers and make life easier for regulators who now have to individually vet models or make multi-billion-dollar decisions based on faith in undisclosed assumptions and methodologies. There are enormous opportunities to build better bridges between the extensive scientific community in analyzing climate risks and solutions, and those working in insurance and the actuarial sciences. Such an entity could, for example, periodically replicate the aforementioned AIRAC study to gain better insight into the relationships between climate change and insurer solvency. Insurers would logically co-fund the entity, but oversight would be by the NAIC or some other public entity. This activity could prove very helpful in implementing a number of the other recommendations listed here. There would no doubt continue to be a complementary role for the CAT modeling industry.

D. *Support risk-based pricing based on improved understanding of climate-related risks in combination with insurer accountability and attention to availability and affordability issues*

Poorly differentiated premiums do not send the desired signals to risk-taking customers. For example, many people live on the edge of a wildland-urban interface in California, yet pay the same fire premiums as much less at-risk houses in their area. More actuarial (or "risk-based") pricing certainly raises issues of affordability, but also can be geared to encourage better behavior (e.g. managing fuel loads around structures). The NAIC should encourage states to adopt ratemaking approval processes that help to ensure that underwriting decisions are based on an intention for long-term market participation where consumers receive realistic price signals and insurers, in turn, provide risk-management services instead of being "fair-weather" friends. Contexts deemed uninsurable should be treated as such, so that insurance does not inadvertently encourage mal-adaptation to climate change.

With the preceding processes in place, ratemaking and the setting of other terms and conditions would send the correct signals to insureds. Rates based rigidly on past experience are at odds with the science, but the need to avoid unsubstantiated increases is also real. Rates should send clearer signals regarding climate and weather-related risks faced by consumers, and could more effectively foster risk-reducing behavior than present rates. This said, the problems now being seen in the market cannot simply be blamed on rate regulation. It is clear in the aftermath of Hurricane Katrina that unregulated surplus, commercial, and energy industry insurance lines – as well as unregulated reinsurers – had severe problems as well, as evidenced by Florida's recent creation of a Joint Underwriting Association to deal with commercial insurance.[46],[47] While risk-based pricing is important, it alone is no panacea for our growing climate woes.

E. *Promote the development of climate friendly insurance products and premium incentives through model laws and/or regulations.*

Insurers are providing differentiated premiums, financial incentives, and even financing to encourage risk-reducing behavior, e.g. mileage-based insurance. The NAIC could adopt model laws for state legislators or regulations for state insurance regulators, who ultimately decide whether to adopt them. An example would be to call for separate ratings of low-emissions vehicles or green buildings, keep track of loss experience, and ultimately utilize the results to propose differential treatment of customers owning these cars or buildings. Another arena where significant growth and innovation can be expected is micro-insurance in developing countries.[48] Barriers to these activities should be proactively identified and remedied. Insurers interviewed by the Iowa

46. M.E. Ruquet, *Florida Property Market Crisis Growing*, NATIONAL UNDERWRITER PROP. & CASUALTY, Aug. 7, 2006, at 6.

47. For more on this, see discussion in Mills & Lecomte, *supra* note 36, at 10.

48. As described in greater detail in Mills, *supra* note,35, the Munich Climate Insurance Initiative (led by Munich Re) is identifying insurance-related climate change solutions such as micro-insurance and conducting pilot projects and education within the industry. A number of individual insurers and reinsurers are offering micro-insurance products, among them Eureko Re (Netherlands), Pakisama Mutual Benefit Association (Philippines) AIG-Uganda (Uganda), and Trinity Life Assurance Company (Tanzania). Swiss Re created one such project in 2007—which it calls the Climate Change Adaptation Program—that utilizes model results and satellite data to determine when up to $2 million in weather-derivative claims are to be paid in response to severe drought conditions causing food shortages in selected

Department of Natural Resources cited difficulties in gaining regulatory approval for premium credits as a key barrier to promoting climate change responses.[49] State insurance regulators are operating in a new era with respect to climate change and it is therefore necessary for them to make a special effort to encourage insurers to make sound recommendations that can quickly be evaluated by regulators.

F. *Take the lead on a coordinated national effort to improve disaster-resilience through the adoption, enforcement, and implementation of improved building codes.*

Improved building codes are one of the key strategies for climate-change adaptation, and their benefits have been well documented. Regulators would likely find willing partners in the insurance industry here. Burby's post-Katrina analysis revealed that per-capita catastrophe losses were three-times lower in areas where building codes and comprehensive land-use planning were utilized.[50] However, to be effective, building codes must be enforced. The Insurance Services Office Building Code Effectiveness Grading Scale[51] has been used to reward effective codes via insurance discounts or surcharges. Unfortunately, there is a disconnect between codes and practice. Regulator efforts to support training and enforcement would help improve the efficacy of codes. There are usually ample opportunities to go beyond code, and the NAIC could play a role in that respect as well.

As exemplified by the work of the insurer-funded Institute for Business and Home Safety (IBHS) in the U.S. and the Institute for Catastrophic Loss Reduction (ICLR) in Canada,[52] there are many strategies for improving the disaster resilience of homes and businesses. The engineering-oriented FM Global has stated that the nearly 500 locations damaged by Hurricane Katrina that had implemented all of their recommended hurricane-loss-pre-

villages in Kenya, Mali, and Ethiopia representing 400,000 inhabitants. Swiss Re's earlier weather-risk products had been sold to 320,000 small farmers in India.

49. Iowa Dept. of Natural Resources, *Insurance Industry Participation in Promotion of Building Energy Codes*, Aug. 2006.

50. R.J. Burby, *Hurricane Katrina and the Paradoxes of Government Disaster Policy: Bringing About Wise Governmental Decisions for Hazardous Areas*, ANNALS AM. ACAD. POL. & SOC. SCI., Mar. 2006, at 171.

51. Initiated by the Insurance Institute for Property Loss Reduction ("IIPLR"), under the leadership of Eugene Lecomte.

52. Paul Kovacs, *Hope for the Best and Prepare for the Worst: How Canada's Insurers Stay a Step Ahead of Climate Change*, POLICY OPTIONS, Dec./Jan. 2006, at 53-56.

vention methods experienced only one-eighth of the losses of those who had not done so.[53] These benefits came at a bargain, with $500 million in losses avoided via customer investments of only $2.5 million.[54] FM Global had some of the best underwriting results among U.S. insurers during the year of Hurricane Katrina. Other studies have corroborated that mitigation is highly cost-effective.[55]

G. *Promote "Rebuilding Right" following losses*

Insurers can promote risk-prevention strategies in the context of rebuilding after losses.[56] "Rebuilding Right" in the aftermath of Hurricane Katrina is an immediate opportunity, which could involve everything from wetlands restoration to safer buildings. The flip side of this coin is that following losses, properties should only be insured again if they meet appropriate standards. Insurers can facilitate this with financial incentives/signals, and perhaps direct customer financing of loss-prevention upgrades. There are many opportunities for *simultaneously* securing near-term enhancements in disaster resilience while contributing to reduced greenhouse-gas emissions for the long term.[57] A subset of these measures can directly enhance disaster resilience,[58] e.g., the ability of facility-integrated solar power systems to avert business interruptions following outages on the electricity grid or the resistance of foam insulation (as opposed to less-efficient fiber-based products) to water-logging after floods.[59] Without the latter strategic measures, nearer term tactical measures will only largely serve to defer rather than avoid the ultimate consequences of climate change. For example, Fireman's Fund and AIG are offering insurance terms that encourage rebuilding to

53. David Dankwa, *FM Global Touts Underwriting by Engineering as Superior*, BEST'S REV., June 2006, at 93.

54. Meg Green, *Preparing for the Worst*, BEST'S REV., Apr. 2006, at 40-44.

55. Multihazard Mitigation Council, Nt'l Institute of Building Sciences, *Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Savings from Mitigation Activities*, (2006).

56. Danny Parker, *Post-Hurricane Opportunities*, HOME ENERGY, Mar./Apr. 2005, at 24-27.

57. Evan Mills, *The Insurance and Risk Management Industries: New Players in the Delivery of Energy-Efficient Products and Services*, 31 ENERGY POL'Y 1257-1272.

58. Evan Mills, *Synergisms between Climate Change Mitigation and Adaptation: An Insurance Perspective*, 12 MITIGATION & ADAPTATION STRATEGIES FOR GLOBAL CHANGE (SPECIAL ISSUE) 809-842 (2006).

59. Robert Wendt and Heshmat Aglan, *After The Flood—There's Hope*, HOME ENERGY, Sept./Oct. 2004, at 18-23.

meet current "green construction" standards, some facets of which also make buildings more disaster-resilient.

H. *Promote partnerships with policyholders for loss mitigation*

Examples include insurer loans for building retrofit paid for with loss mitigation discounts. There is a huge need for better consumer education and information. The insurer-funded Institute for Business and Home Safety is engaged in such activity for some property-casualty lines, but at a very modest level given the need. Their "Fortified. . . for safer living" guidelines provide one framework for identifying eligible measures. Insurers have pre-existing and regular (quarterly or semi-annual) correspondence with customers, providing a ready channel for transmitting loss-prevention information.[60] One of many examples of information that could be conveyed is the U.S. Environmental Protection Agency's Excessive Heat Events Guidebook.

Several studies have reviewed examples of ways in which insurers have collaborated with public entities on land-use planning.[61] In 2004, the Insurance Australia Group (IAG) developed a partnership with local government planners in New Zealand to determine the most appropriate flood planning levels for the future. IAG provided modeling results indicating changes in extreme rainfall, which the local government used to determine the likely changes to future flood levels. This was then incorporated into their flood mitigation program, e.g., planning for higher levee banks. IAG also conducts wind and hail-related research intended to help improve roof designs and construction.[62] In the UK, the Association of British Insurers has also advised local planning authorities on better integrating rising flood risks in East London.[63] In the U.S., AIG is serving on the steering committee of the Heinz Center's "The Nation's Coasts: A Vision for the Future," which seeks to create a more viable approach to sustainability for coastal communities and surrounding regions. CEA, the European Insurance and Reinsurance Federation, has

60. See http://www.epa.gov/heatisland/about/heatguidebook.html.

61. DLUGOLECKI, *supra* note 14, at 24-28.

62. L. Stagnitta K. Forster, *Is Climate Change for Real and If So What is the Cause, Likely Impact, and Remedy?* (Ins. Australia Group 2005).

63. Ass'n of British Insurers, *East London Sub-Regional Development Framework: Consultation*, July 2005.

reviewed examples from several countries and calls for strengthened public-private partnerships.[64]

I. *Safeguard reserves and surplus based on an understanding of climate change, and encourage prudent investments in technologies and industries that will be part of the solution.*

One way to accomplish this is to revise risk-based capital requirements to provide credits for "climate friendly" investments, including carbon trading. Effectively, a dollar invested in climate-friendly investment is weighted higher, which means insurers investing in these new directions enjoy a higher Return on Equity or a given level of revenues because the overall required level of capital is lower. Climate change brings huge new opportunities for investors. Legendary venture capitalist John Doerr has called clean technology "the largest economic opportunity of the 21st century." Conversely, investments in polluting industries are likely to become more risky. As shown in Exhibit 8, ten insurers have already collectively invested $6 billion in this arena.

J. *Communicate industry needs and priorities to federal and local governments with lead responsibility for implementation*

This ranges from updating antiquated flood plain maps, to performing climate change research, implementing appropriate public-health measures, reducing the emissions of greenhouse gases. Many of the solutions require improved public/private partnerships between insurers, other segments of the private sector, and local/federal government. As an example, the American Insurance Association offered six such recommendations to the Organization for Economic Cooperation and Development (OECD) for mitigating catastrophe risk.[65] These included early warning systems, better land-use planning, improved building codes and catastrophe-resistant reconstruction, improved coordination and planning of national and international relief efforts, assistance in catastrophe contingency planning, and support for pre and post-event mitigation and response.

64. CEA: The European Insurance and Reinsurance Federation, *Reducing the Social and Economic Impact of Climate Change and Natural Catastrophes: Insurance Solutions and Public-Private Partnerships* 40, July 2007.

65. *Property-Casualty Insurance*, *supra* note 38.

NAIC, through its international activities, can seek audiences with insurance regulators in other countries to learn how they have responded to the climate change issue. The International Association of Insurance Supervisors would be a natural partner in this regard.

K. *Encourage or require public disclosure of insurer risk analysis of climate change.*

The process of assessing and disclosing climate risks contributes to insurers' ability to evaluate the impacts of climate change on their business, leading insurers to take steps to address the risks and opportunities that climate change presents. Meanwhile, disclosure enables consumers and investors to gauge whether to purchase a policy from or invest in a particular insurance company, and it helps regulators to meaningfully monitor the financial condition of insurance companies and the progress they are making towards addressing climate change risks.

While no one wants to impose more "check-box" requirements on insurers, the large void of information on insurer perspectives and precautionary activities in light of climate change complicates the decision-making environment for customers, shareholders, and regulators. Regulators could develop a non-onerous process for securing insurer disclosures in this regard.

The existing climate disclosure activities (e.g. the Carbon Disclosure Project) tend to be targeted towards investor-owned companies; the NAIC should also include other categories of insurers such as mutual companies.

L. *Encourage or require insurers to minimize their own carbon footprint.*

Leadership by example is important both symbolically and practically. Some insurers already participate in the national ENERGY STAR Program and other initiatives to trim energy use and GHG emissions in their own operations. One U.S. insurance broker, Rutherfoord, has already gone carbon-neutral in its operations, and another dozen around the world have already done so or are in the process. Managing energy use and trimming energy expenditures is also in the interest of shareholders and customers.

Insurers appropriately point out that they are not a "heavy" industry when it comes to emissions. Yet the use of electricity in buildings (such as insurers' offices) and business travel are major

contributors, in aggregate, to global emissions. Carbon-intensity varies by a factor of *seven* among insurers: from 1.2 to 8.3 tons per employee per year for the 20 insurers reporting that information to the most recent Carbon Disclosure Project survey (Exhibit 9).

IV.
CONCLUSION

Insurance is a form of adaptive capacity for the impacts of climate change, although the sector itself must adapt in order to remain viable. Managing risks and controlling losses is central to the insurance business, and is evident in the industry's early history. While the primary focus in recent years has been on *financially* managing risks (through exclusions, price increases, alternative risk transfer, etc.), *physical* risk management is rightfully receiving renewed attention from insurers and regulators, and could play a large role in helping to preserve the insurability natural hazards and their consequences.

EXHIBIT 1. Examples of impacts resulting from projected changes in extreme climate events, and associated insurance implications (Adapted from IPCC/Vellinga et al., 2001)

Projected Changes during the 21st Century in Extreme Climate Phenomena	IPCC Assessment of Change Likelihood[a]	Representative Examples of Projected Impacts[b]	Peril or Hazard	Insurance-sector Impacts ("+" = increased losses "-" = reduced losses)							Insurance Customer Impacts		
				Property (structures; industrial)	Property (autos/marine/aircraft)	Liability: Business Interruption	Crop	Health	Life	Public Insurance/Assistance	Pricing	Exclusions	Availability
Higher maximum temperatures; more hot days and heat waves[d] over nearly all land areas	Very Likely	Increased hospitalizations over broad demographic range; incidence of death and serious illness in older age groups and urban poor	Heatwave					+	+	+			
		Increased heat stress in livestock and wildlife	Heatwave				+			+			
		Increased risk of damage to a number of crops	Heatwave				+			+			
		Increased soil subsidence	Subsidence	+		+				+			
		Decreased ice in northern maritime shipping lanes	Float ice		-								
		Increased roadway accidents (slower reaction time)	Road conditions		+								
		Increased electric cooling demand and reduced energy supply reliability	Power Outage			+				+			
Higher (increasing) minimum temperatures; fewer cold days, frost days, and cold wavesdover nearly all land areas	Very Likely	Decreased cold-related human morbidity and mortality	Coldwave					-	-	-			
		Decreased risk of damage to a number of crops, and increased risk to others	Heatwave				-			-			
		Extended range, reproduction, and activity of some pest (e.g. pine beetle) and disease vectors	Infestation	+		+	+	+	+	+			
		Increased avalanche risk	Avalanche	+		+							
		Increased permafrost melt	Subsidence	+		+				+			
		Increased incidence of lightning	Lightning	+	+	+	+			+			
More intense precipitation events (Very Likely[e] over many areas)	Very Likely, over many areas	Increased flood, landslide, avalanche, and mudslide damage	Flood, landsclide, avalanche, mudslide	+	+	+				+			
		Increased soil erosion; mudslides	Rain							+			
		Increased flood runoff could increase recharge of some floodplain aquifers	Flood				-			-			
Increased summer drying over most mid-latitude continental interiors and associated risk of drought	Likely	Increased roadway accidents (driving conditions, visibility)	Road conditions		+			+	+				
		Decreased crop yields	Drought				+			+			
		Increased damage to building foundations caused by ground shrinkage	Subsidence	+									
		Decreased water resource quantity and quality	Drought			+	+	+		+			
		Increased risk of wildfire	Wildfire	+	+	+	+	+	+	+			
Increase in tropical cyclone peak wind intensities, mean and peak precipitation intensities[e]	Likely	Increased risks of property damage, business interruption, loss of human life, infectious disease epidemics	Wind, disease	+	+	+	+	+	+	+			
		Increased coastal erosion and damage to coastal buildings and infrastructure [tidal surge insured under NFIP]	Tidal surge							+			
		Increased damage to coastal ecosystems such as coral reefs and mangroves	Tidal surge	+	+	+	+	+	+	+			
Intensified droughts and floods associated with El Ni~o events in many different regions	Likely	Decreased agricultural and rangeland productivity in drought- and flood-prone regions	Drought				+			+			
		Decreased hydro-power potential in drought-prone regions	Drought			+				+			
Increased intensity of mid-latitude storms[d]	Little agreement between current models as of 2001. Subsequent research (Knutson/Tranberth/MIT/ABI) has shown increased likelihood of hurricane damages	Increased risks to human life and health	Storm					+	+	+			
		Increased property and infrastructure losses	Storm	+	+	+	+			+			
		Increased damage to coastal ecosystems, including loss of mangroves and coastal wetlands	Storm	+	+	+				+			

a Likelihood refers to judgmental estimates of confidence used by Intergovernmental Panel on Climate Change (IPCC) Third Assessment Report (TAR), Working Group I: very likely (90-99% chance); likely (66-90% chance). Unless otherwise stated, information on climate phenomena is taken from the IPCC Summary for Policymakers, TAR WGI.
b These impacts can be lessened by appropriate response measures.
c Based on information from chapters in the IPCC Third Assessment Report; high confidence refers to probabilities between 67 and 95% as described in Footnote 6 of TAR WGII, Summary for Policymakers.
d Information from IPCC Third Assessment Report, Working Group I, Technical Summary, Section F.5.
e Changes in regional distribution of tropical cyclones are possible but have not been established.

EXHIBIT 2. Departures from normal temperatures during the Great European Heatwave of 2003. (a) June-August temperature anomaly with respect to the 1961–90 mean. Color shading shows temperature anomaly (degrees C), bold contours display anomalies normalized by the 30-yr standard deviation. (b) Distribution of Swiss monthly and seasonal summer temperature for 1864–2003. The fitted Gaussian distribution is indicated in green. The values in the lower left corner are the standard deviation and the 2003 anomaly normalized by the 1864–2000 standard deviation. Source: Schar et al, 2004, in *Nature*.

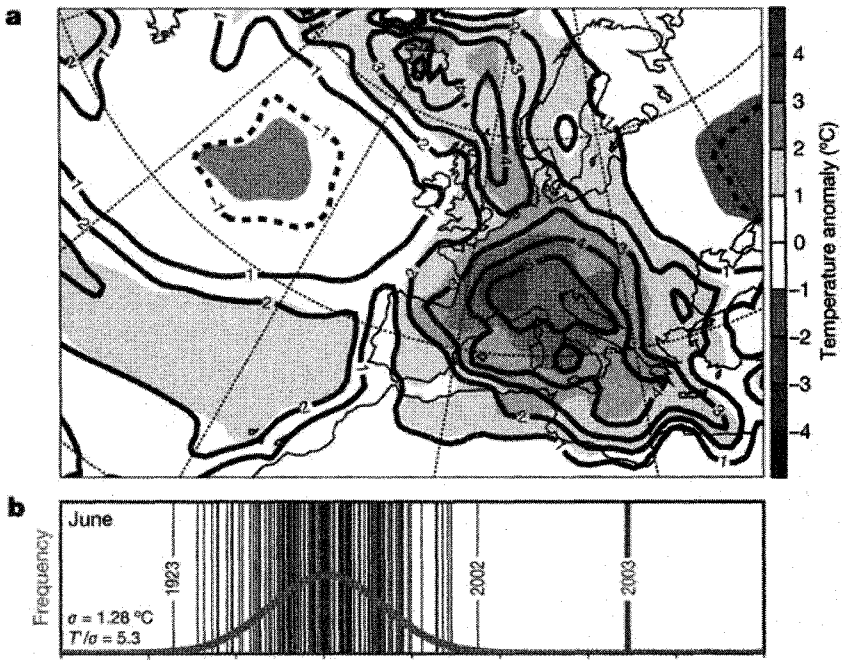


EXHIBIT 3. Health Implications from the Climate Change Futures (CCF) Study

Infectious & Respiratory Diseases

Malaria is the deadliest, most disabling and most economically damaging mosquito-borne disease worldwide. Warming affects its range, and extreme weather events can precipitate large outbreaks. The CCF study documents the fivefold increase in illness following a six-week flood in Mozambique, explores the surprising role of drought in northeast Brazil, and projects changes for malaria in the highlands of Zimbabwe.

West Nile virus (WNV) is an urban-based, mosquito-borne infection, afflicting humans, horses and more than 138 species of birds. Present in the US, Europe, the Middle East and Africa, warm winters and spring droughts play roles in amplifying this disease. To date, there have been over 17,000 human cases and over 650 deaths from WNV in North America.

Lyme disease is the most widespread vector-borne disease in the US and can cause long-term disability. Lyme disease is spreading in North America and Europe as winters warm, and models project that warming will continue to shift the suitable range for the deer ticks that carry this infection.

Asthma prevalence has quadrupled in the US since 1980, and this condition is increasing in developed and underdeveloped nations. New drivers include rising CO_2, which increases the allergenic plant pollens and some soil fungi, and dust clouds containing particles and microbes coming from expanding deserts, compounding the effects of air pollutants and smog from the burning of fossil fuels.

Extreme Weather Events

Heat waves are becoming more common and more intense throughout the world. The CCF study explores the multiple impacts of the highly anomalous 2003 summer heat wave in Europe and the potential impact of such "outlier" events elsewhere for human health, forests, agricultural yields, mountain glaciers and utility grids.

Floods inundated large parts of Central Europe in 2002 and had consequences for human health and infrastructure. Serious floods occurred again in Central Europe in 2005. The return times for such inundations are projected to decrease in developed and developing nations, and climate change is expected to result in more heavy rainfall events.

Health Impacts in Natural and Managed Systems

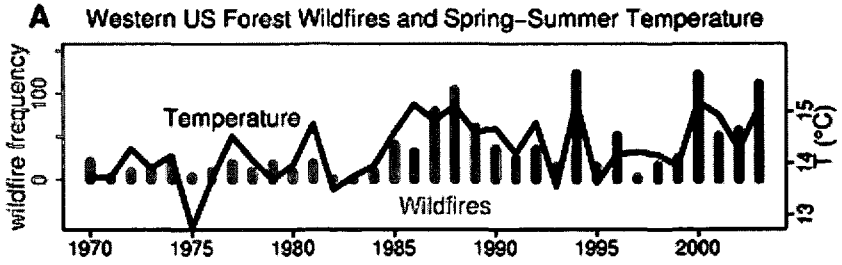
Forests are experiencing numerous pest infestations. Warming increases the range, reproductive rates, and activity of pests, such as spruce bark beetles, while drought makes trees more susceptible to the pests. The CCF study examines the synergies of drought and pests, and the dangers of wildfire. Large-scale forest diebacks are possible, and they would have severe consequences for human health, property, wildlife, timber and Earth's carbon cycle.

Agriculture faces warming, more extremes and more diseases. More drought and flooding under the new climate, and accompanying outbreaks of crop pests and diseases, can affect yields, nutrition, food prices and political stability. Chemical measures to limit infestations are costly and unhealthy.

Marine ecosystems are under increasing pressure from overfishing, excess wastes, loss of wetlands, and diseases of bivalves that normally filter and clean bays and estuaries. Even slightly elevated ocean temperatures can destroy the symbiotic relationship between algae and animal polyps that make up coral reefs, which buffer shores, harbor fish and contain organisms with powerful chemicals useful to medicine. Warming seas and diseases may cause coral reefs to collapse.

Water, life's essential ingredient, faces enormous threats. Underground stores are being overdrawn and underfed. As weather patterns shift and mountain ice fields disappear, changes in water quality and availability will pose growth limitations on human settlements, agriculture and hydropower. Flooding can lead to water contamination with toxic chemicals and microbes, and natural disasters routinely damage water-delivery infrastructure.

EXHIBIT 4. In the past decade, wildfires in the American West have increased by 4-fold in number and 6-fold in area burned, with the trend very tightly correlated with rising temperatures.[66] The problem is exacerbated by other climate factors such as earlier snowmelt and longer fire seasons. Changes in forest management do not explain the trends. The photograph shows an array of simultaneous wildfires in Southern California in 2003 in which approximately 3,800 homes were burned and about $3 billion in insured losses incurred.[67]



66. A.L. Westerling et al., *Warming and Earlier Spring Increase Western U.S. Forest Wildfire Activity*, 313 SCI. 5789, 940 – 94 (2006).

67. Glenn McGillivray, *The New Normal: Billion-Dollar Bruisers*, CANADIAN UNDERWRITER, July 2007, *available at* http://www.canadianunderwriter.ca/issues/PrinterFriendly.asp?story_id=35867111536&id=189254&RType=&PC=&issue=07012007

EXHIBIT 5. Worldwide Hurricanes in 2005 & 2006

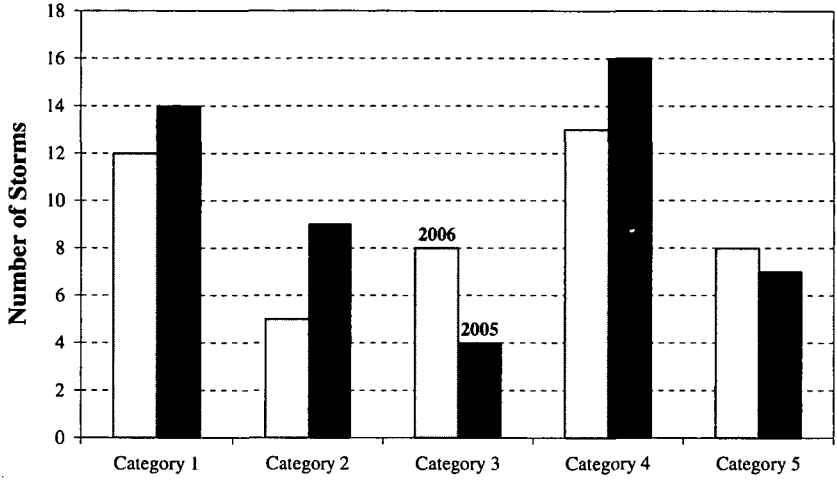


EXHIBIT 6. Insurance Sector Responses to the Carbon Disclosure Project Surveys

Insurance sector responses to the Carbon Disclosure Project surveys
(as of October 9, 2007)

Insurance Company - USA		2007	2006	2005	2004	2003
Aetna Inc	USA		-	-	-	-
Aflac	USA	0	X	0	X	0
Allstate	USA		0	X	X	
Ambac Financial Group	USA	0	0	-	-	-
American International Group	USA					
Aon	USA			-	-	/
Berkshire Hathaway	USA	0	0	0	X	0
Chubb*	USA	0	X	/	0	X
Cigna	USA		-	-	-	-
Cincinnati Financial	USA		/	-	-	-
Hartford Financial Services	USA		/	X	X	X
Jefferson-Pilot	USA	-	0	-	-	-
Lincoln National	USA	-	X	-	-	0
Loews Corporation	USA	-	0	-	X	0
Marsh & McLennan	USA				0	-
MBIA	USA			-	-	-
Metlife	USA	0	X	0	0	0
Progressive	USA		X	X	X	X
Prudential Financial	USA		X	X	X	X
Regions Financial Corp.	USA	0	-	-	-	-
Safeco	USA			-	-	-
St. Paul Travelers	USA					0
Torchmark	USA	-	0	-	-	-
UnumProvident	USA	-		-	-	-
N-total (US)		19	21	11	12	13
N-Answered questionnaire		13	7	3	2	2
% Answered questionnaire		68%	33%	27%	17%	15%

* Chubb had a pending post-deadline response as of 9 Oct 2007

Grand Total (World)	44	75	29	29	27
N-Answered questionnaire	34	39	17	14	9
% Answered questionnaire	77%	52%	59%	48%	33%

Key & Stats for All Years:		Total-N	%	US-N	US%	Other-N	Other-%
Surveyed		204		76		128	
Answered Questionnaire		113	55%	27	36%	86	67%
Declined to Participate	X	39	19%	21	28%	18	14%
Provided Information	/	8	4%	3	4%	5	4%
No Response	0	43	21%	24	32%	19	15%
Not in given round of CDP	-						
Count total				120		305	
Count not surveyed				44		177	

Source: http://www.cdproject.net
* = had promised a reply, but none submitted

Declined for submission to be public information

Insurance Company - Other		2007	2006	2005	2004	2003
ACE Limited	BM		0	-		0
Admiral Group	UK	-		-	-	-
Aegon	Netherlands			/	0	X
AGF	France				-	-
Allianz	Germany					
AMB Generali Holding AG	Germany	-	0	-	-	-
Amlin	UK	-	X	-	-	-
AMP Limited	Australia	-		-	-	-
April Group*	France	-	0	-	-	-
Aviva	UK					
AXA Asia Pacific Holdings Limited - AXA Group	Australia	-		-	-	-
AXA Group	France					
AXA Konzern AG - AXA Group	Germany	-		-	-	-
Benfield Group	UK	-	0	-	-	-
Brit Insurance Holdings	UK	-	0	-	-	-
Cathay Financial Holding	Taiwan	0				-
Catlin Group LD Coms	UK	-	/	-	-	-
China Life Insurance	China	X		-	-	-
Cnp Assurances	France			-	-	-
E-L Financial	Canada	-	0	-	-	-
Euler Hermes	France	-		-	-	-
Fairfax Financial Holdings	Canada	-	0	-	-	-
Fortis	Belgium		-	-	-	-
Friends Provident	UK	-		-	-	-
Generali	Italy	-	/	X	X	X
Great West Lifeco	Canada	X	X	0	X	-
Hannover Ruckversicherung AG	Germany	-		-	-	-
HBOS	UK		-	-	-	-
Helphire Group	UK	-	0	-	-	-
Hiscox	UK	-		-	-	-
HSBC	UK		-	-	-	-
Hub International	Canada	-	X	-	-	-
Industrial Alliance Insurance	Canada	-	X	-	-	-
ING Group	Netherlands		-	-	-	-
Insurance Australia Group Limited	Australia	-		-	-	-
KBC Group	Belgium		-	-	-	-
Kingsway Financial Services	Canada	-	0	-	-	-
Kookmin Bank	South Korea	0	-	-	-	-
Legal and General	UK			-	-	-
Lloyd's TSB	UK		-	-	-	-
Manulife Financial	Canada				/	/
Mitea Holdings	Japan					-
Mitsui Sumitomo Insurance	Japan				-	-
Munich Re	Germany					
Nipponkoa Insurance Co Ltd	Japan	-	0	-	-	-
N mberger Beteiligungs-AG	Germany	-	X	-	-	-
Ping An Insurance*	China	-	0	-	-	-
Promina Group Limited	Australia	-	X	-	-	-
Prudential plc	UK					
Qbe Insurance Group Limited	Australia	-	X	-	-	-
RAS	Italy	-				
Resolution	UK	-		-	-	-
Royal & Sun Alliance	UK	-		-	-	-
Scor	France	-		-	-	-
Sompo Japan Insurance	Japan	-		-	-	-
Sun Life Financial	Canada	-			X	X
Swiss Re	Switzerland					
T&D Holdings	Japan	-		-	-	-
Tower Ltd	New Zealand	-	0	-	-	-
XL Capital	UK	-	0	X		X
Zurich Financial Services	Switzerland					0
N-total (non-US)		25	54	18	17	14
N-Answered questionnaire		21	32	14	12	7
% Answered questionnaire		84%	59%	78%	71%	50%

EXHIBIT 7. Survey of insurer activities in response to climate change. Key: * For these three columns, a maximum of 1 is tallied, as there is too much subjectivity in assigning weights to each individual activity. ** Multiple-year responses to a given disclosure initiative (e.g. Carbon Disclosure Project) are counted once.

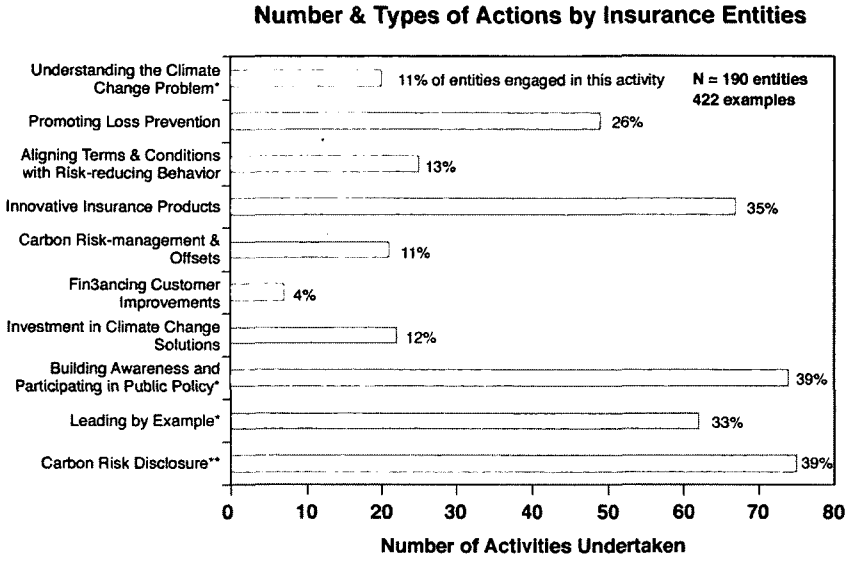
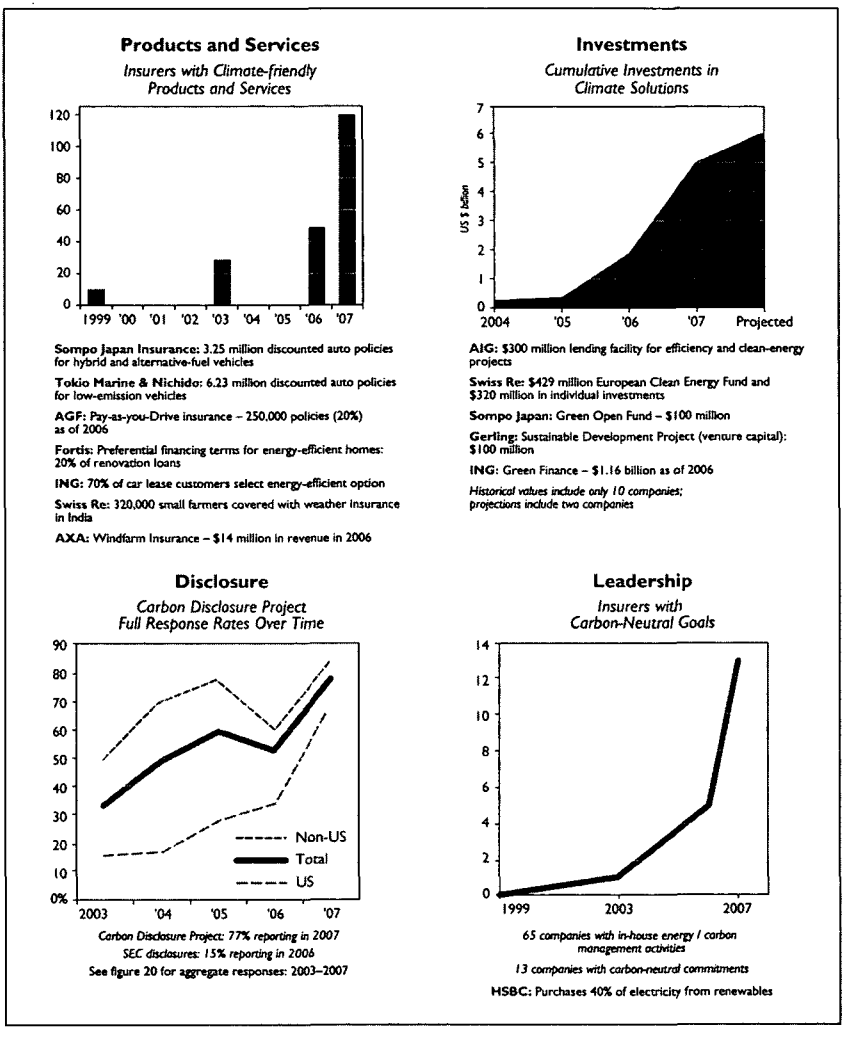


EXHIBIT 8. Examples of insurer "climate-friendly" activities and trends.[68]



68. Ross et al., *supra* note 18.

EXHIBIT 9. Range of carbon footprints for global insurers.
Source: Carbon Disclosure Project company filings: 2007