Insurance and Climate Change Research Report

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This report contains resources that are related to insurance and climate change. Brief descriptions of the resources are provided as well as information regarding where the resource may be accessed.

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**Smart Solutions to Climate Change: Comparing Costs and Benefits**

Lomborg, B. (2010)

**Summary:** The failure of the Copenhagen climate conference in December 2009 revealed major flaws in the way the world's policy makers have attempted to prevent dangerous levels of increases in global temperatures. The expert authors in this specially commissioned collection focus on the likely costs and benefits of a very wide range of policy options, including geo-engineering, mitigation of CO2, methane and 'black carbon', expanding forest, research and development of low-carbon energy and encouraging green technology transfer. For each policy, authors outline all of the costs, benefits and likely outcomes, in fully referenced, clearly presented chapters accompanied by shorter, critical alternative perspectives. To further stimulate debate, a panel of economists, including three Nobel laureates, evaluate and rank the attractiveness of the policies. This authoritative and thought-provoking book will challenge readers to form their own conclusions about the best ways to respond to global warming.


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**Catastrophic Risk Financing in Developing Countries: Principles for Public Intervention**

Cummins, J.D. and Mahul, O. (2009)

**Summary:** Catastrophe Risk Financing in Developing Countries provides a detailed analysis of the imperfections and inefficiencies that impede the emergence of competitive catastrophe risk markets in developing countries. The book demonstrates how donors and international financial institutions can assist governments in middle- and low-income countries in promoting effective and affordable catastrophe risk financing solutions.


Available at:


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**Climate Change and Insurance: Disaster Risk Financing in Developing Countries**

Gurenko, E. N. (2007)

**Summary:** Climate change brings about a new set of major economic risks arising from changing weather patterns, extreme weather events and rising sea levels. Most at risk are developing countries who, despite considerable post-disaster donor aid, have been bearing the major brunt of disaster-related losses. One adaptation solution that is rapidly gaining the support of countries and international donors is a risk transfer to the global reinsurance and capital markets.
This volume, a special issue of the journal Climate Policy, explores the role that insurance-based mechanisms can play in helping developing countries prepare for climate change. It offers a unique and comprehensive perspective on the potential role of insurance solutions in global adaptation to climate change and attempts to engender debate on the role of insurance in reducing global emissions and encouraging climate-friendly corporate behaviour.


Parry, M.L., Canziani, O.F., Palutikof, J.P. van der Linden, P.J. and Hanson, C.E. (2007)

Summary: The Climate Change 2007 volumes of the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) provide the most comprehensive and balanced assessment of climate change available. This IPCC Working Group II volume brings us completely up-to-date on the vulnerability of socio-economic and natural systems to climate change. Written by the world's leading experts, the IPCC volumes will again prove to be invaluable for researchers, students, and policymakers, and will form the standard reference works for policy decisions for government and industry worldwide.


Agricultural Micro-Insurance: Global Practices and Prospects


Summary: This book has been written for people who would like to know how agricultural insurance could play a role in improving the livelihoods of the rural poor. It will be useful for development agents such as donors, development banks and development workers in NGOs, co-operatives, credit unions and microfinance institutions (MFIs). It is written for a reader who has no prior knowledge of insurance. The first chapter introduces the principles of insurance. The second chapter presents four agricultural microinsurance case studies, using the principles described in the first chapter to analyze the successes, failures and challenges of providing agricultural microinsurance in practice. The third chapter summarizes a comprehensive literature survey to establish what kinds of agricultural microinsurance products exist worldwide, and how they function. The fourth and final chapter discusses whether, given all the challenges, agricultural microinsurance can play a role in improving the livelihoods of the rural poor.


Available at: http://www.munichre-foundation.org/NR/rdonlyres/602625F3-1DAE-41AB-96DF-5DFC97D85E05/0/AgriculturalMicroinsuranceGlobalPracticesandProspects.pdf
Book Chapters

Towards Pro-Poor Adaptation to Climate Change in the Urban Centers of Low- and Middle-Income Countries


Summary: This chapter seeks to address these issues by outlining a framework of pro-poor asset adaptation for climate change. This framework provides a conceptual approach for identifying asset vulnerability to climate change of low-income individuals, households, and communities; and it considers how assets can support adaptation. Such an approach recognizes that strengthening the asset base of low-income households and communities also can contribute to building more competent, accountable local governments. A substantial part of adaptive capacity relates to the ability of local communities to make demands on local governments and, wherever possible, to work in partnership with them.


Chapter 7: Industry, Settlement and Society


Summary: The chapter (1) identifies current potential vulnerabilities and impacts of climate change on industrial, services and infrastructure sectors, human settlements, and human societies; (2) assesses the current knowledge about the costs of possible impacts; and (3) considers possible adaptive responses. In general, it emphasizes that climate change impacts, adaptation potentials, and vulnerabilities are context-specific, related to both characteristics and development pathways of the location or sector involved.


Reports on Insurance: Global to Local

Global

Advancing Adaptation Through Climate Information Services: Results of a Global Survey on the Information Requirements of the Financial Sector

Summary: This study focuses on the information needs of the financial sector with respect to direct physical risks of climate change impacts. Clearly, there are many issues for the sector relating to mitigation (i.e. the control of greenhouse gas emissions). Mitigation continues to be the top priority. However, that is not the subject of this study. This survey focuses on the climate information requirements of the financial sector as part of their and their customers’ adaptation strategies. The evidence comes from sixty financial service providers, through a survey conducted by the UNEP Finance Initiative, and the Sustainable Business Institute (SBI), Germany.


A Different World: A Follow-up to Microfinance Banana Skins 2009 ‘Confronting Crisis and Change’

Centre for the Study of Financial Innovation, (2010)

Abstract: In July 2009, the Centre for the Study of Financial Innovation published the second of its “Banana Skins” surveys of the microfinance industry, the first having been carried out early 2008. As before, the survey was sponsored by Citi and the Consultative Group to Assist the Poor (CGAP) with support from CMEF and the MIX. The purpose of the Banana Skins process is to identify the main risks and challenges facing the industry. Since the value of the process grows with successive surveys, the second provided not just a snapshot of the microfinance risk landscape at an interesting moment, given the state of the global financial industry. It also showed how risk perceptions had evolved over the intervening 18 month crisis period. The report itself was therefore thick with messages, and the debate it provoked was extremely interesting


Global Risks 2010


Abstract: After the shock to the global financial system and world economy in 2008, 2009 was a year of appraisal and adjustment. The risk landscape that this report has explored over the past five editions has in fact changed remarkably little. What has changed dramatically is the level of recognition that global risks, like the world, are now tightly interconnected and shocks and vulnerabilities are truly global, even if impact and response can still differ at the “local” level. This recognition is illustrated by the increased number of interlinkages on the 2010 Risks Interconnection Map (RIM).

Coastal Communities and Climate Change: Maintaining Future Insurability

Lloyds, (2010)

Abstract: Many coastal property owners rely on insurance to help manage the risk of flooding. However, despite widespread concerns about the affordability and availability of property insurance in coastal areas, few people are currently considering how the insurability of their homes and businesses might be affected by increases in risk due to climate change.

This report looks at the impact of climate change on flood risk at a number of coastal locations around the world, considering sea-level rise, the effect of wind speed on storm surges and, at one location, changes in land use.


Full report can be downloaded at: http://lloyds.com/~/media/Lloyds/Reports/360%20Climate%20reports/360_Coastalcommunitiesandclimatechange.pdf

The Tipping Points Report: Major Tipping Points in the Earth’s Climate System and Consequences for the Insurance Sector


Summary: The phrase ‘tipping point’ captures the intuitive notion that “a small change can make a big difference” for some systems (1). In addition, the term ‘tipping element’ has been introduced to describe those large-scale components of the Earth system that could be forced past a ‘tipping point’ and would then undergo a transition to a quite different state. In its general form, the definition of tipping points may be applied to any time in Earth history (or future) and might apply to a number of candidate tipping elements. However, from the perspective of climate policy and this report we are most concerned with ‘policy-relevant’ tipping elements which might be triggered by human activities in the near future and would lead to significant societal impacts within this century.


From Risk to Opportunity: Insurer Responses to Climate Change

Mills, E. (2009)

Abstract: This extensive report captures detailed activities by the global insurance industry with regard to managing their exposure to climate-change risks.
Climate-change is seen as the 4th most serious issue facing the industry, although the majority of other concerns are compounded by it. Trends see indicate losses are increasing by 37% per decade while predictions suggest extreme year payouts could top $400 - $1000 billion.


Full report can be downloaded at: http://insurance.lbl.gov/

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The Megacity Resilience Framework


Abstract: Since 2008, for the first time in human history, more than half of the global population lives in cities. Urbanisation is currently one of the most powerful transformation processes on our planet. Megacities are an extreme product of this development posing new challenges to and opening unique opportunities for mankind. After providing a brief overview on the global urbanisation process, the policy brief introduces vulnerability and resilience as concepts that allow for new perspectives on megacities. These perspectives are “the global and the local”, “the formal and the informal” and “the social and the ecological”. The Megacity Resilience Framework that is introduced captures these perspectives and highlights further research desiderata. The paper concludes with policy recommendations to increase resilience and sustainability of megacities.


Full report can be downloaded at: http://tolu.giub.uni-bonn.de/bohle/sites/docs/Sakdapolrak%20et%20al%20%20%282009%29%20Megacity%20Resilience%20Framework%20.pdf

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The Global State of Sustainable Insurance: Understanding and Integrating Environment, Social and Governance Factors in Insurance


Summary: The insurance industry is uniquely placed in our economies as a private market mechanism for the sharing of risk, with the global pooling of what would be risks otherwise borne solely by individuals and entities estimated at roughly USD 400 trillion. As this risk pooling is integral to the efficient functioning of markets, economies and societies, the insurance industry is a key focus of regulators and policymakers. This report is based on the pioneering global survey conducted in 2009 by the UNEP FI Insurance Working Group and its Academic Working Group on the understanding and integration of environmental, social and governance (ESG) factors in insurance underwriting and product development.

**Insuring for Sustainability: Why and How the Leaders are doing it**


**Summary:** The aims of this report are to raise awareness of the contribution that the insurance industry is already making to sustainability and to identify major challenges and opportunities that lie ahead. This is the inaugural report of the Insurance Working Group (IWG) of the United Nations Environment Programme Finance Initiative (UNEP FI). The IWG is a timely coming together of sixteen industry leaders who wish to drive sustainability.

Sustainability is defined here in broad terms – insurers making their business viable in the environmental, social and financial dimensions over the long-term. This is known as the ‘Triple Bottom Line’ – aiming to contribute positively for People, Planet and Profit.


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**South African Risk and Vulnerability Atlas**


**Abstract:** The Department of Science and Technology (DST), with research done by the Council for Scientific and Industrial Research (CSIR), on Friday launched the South African risk and vulnerability atlas. The atlas was aimed at assisting decision-makers in identifying risk, and planning and mapping a future, which would be more resilient to the changing climatic conditions in the country.


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**Strategic and Emerging Issues in South African Insurance**

Metcalfe, B. (2010)

**Abstract:** The survey is based on personal interviews with managing directors and senior executives in 30 companies. The list below shows 32 companies. This is because only one interview was conducted with both Hollard and Regent, each listed both under the short- and long-term insurance
companies. The re-insurers and cell captives are included in the overall industry charts but not in the breakouts for long-term versus short-term companies. The interviews were approximately one hour in length and were conducted in Johannesburg and Cape Town during February and March 2010.


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**Insurance and Climate Change**

*Global Insurance Industry Statement on Adapting to Climate Change in Developing Countries*  

**Abstract:** Four leading insurance climate change initiatives, whose combined membership includes more than a hundred of the world’s leading insurers across Africa, Asia, Europe, North and South America, and Oceania, have combined their members’ expertise to present this Statement. ClimateWise, The Geneva Association, the Munich Climate Insurance Initiative (MCII) and leading insurance companies within the United Nations Environment Programme Finance Initiative (UNEP FI) are collaborating to highlight the huge potential benefits of using government action to enable the knowledge and expertise from the insurance industry to play its fullest role in risk management in developing countries, particularly those most vulnerable to the impacts of climate change. This government action includes implementing national risk management processes and using limited government investment to measure and reduce those risks.


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*Willingness of Homeowners to Mitigate Climate Risk through Insurance*  

**Abstract:** Climate change is projected to increase flood risks in certain regions due to an increase in both precipitation and sea level rise. In addition, socio-economic scenarios project an increase in urbanization in flood prone areas, which results in a higher damage potential. The combined effect of climate and land use change on flood risks requires innovative adaptation policies to cope with rising risks. Increasingly, attention is paid to the role insurance can play in mitigating damage by providing incentives to policyholders to undertake damage reducing measures. The willingness of homeowners in the Netherlands to undertake measures that mitigate flood damage in exchange for benefits on hypothetical flood insurance policies is examined using surveys. The results indicate that many homeowners are willing to make investments in mitigation. In particular, approximately two-thirds are willing to invest in water barriers in exchange for a premium reduction and about a fifth are willing to replace floor types that are vulnerable to flooding with water resistant floor types. Furthermore, about a quarter are willing to move central heating installations to floors safe against flooding in favor of a reduction in the insurance premium. Estimates of the effectiveness of these mitigation measures to
limit potential flood damage in the river delta indicate that prevented damage could be substantial, namely in the order of 1 billion euro or larger. Reductions in (absolute) flood risk due to mitigation are especially large under climate change. A probit model indicates that existing arrangements for compensating flood damage, risk awareness and perceptions, and geographical characteristics are important determinants in the decision to undertake mitigation.


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**Index Insurance and Climate Change: Opportunities and Challenges in Lower Income Countries**


**Abstract:** Weather index insurance underwrites a weather risk, typically highly correlated with agricultural production losses, as a proxy for economic loss and is gaining popularity in lower income countries. This instrument, although subject to basis risk and high start-up costs, should reduce costs over traditional agricultural insurance. Multilateral institutions have suggested that weather index insurance could enhance the ability of stakeholders in lower income countries to adapt to climate change. While weather index insurance could have several benefits in this context (e.g. providing a safety net to vulnerable households and price signals regarding the weather risk), climate change impacts increase the price of insurance due to increasing weather risk. Uncertainty about the extent of regional impacts compounds pricing difficulties. Policy recommendations for insurance market development include funding risk assessments, start-up costs and the extreme layer of risk. General premium subsidies are cautioned against as they may actually slow household adaptation.


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**Adaptation to Climate Change: Threats and Opportunities for the Insurance Industry**


**Abstract:** In this paper we explore why adaptation to climate change is such a critical issue to the commercial success of the private insurance industry. We highlight both the risks arising from inadequate adaptation to the impacts of climate change, and the opportunities presented by playing a role in the global response to adaptation. We demonstrate that the success, or not, of adaptation to the impacts of climate change will be relevant to both the underwriting and investment operations of (re)insurance companies. In the short term, climate change will affect underwriting practices by necessitating risk quantification approaches that include a forward-looking view of risk that is not purely grounded in historical experience. In the longer term, insufficient adaptation in areas of rising risk could threaten the concept of insurability itself, by limiting the availability and affordability of private insurance coverage. Furthermore, we demonstrate that activities that incentivise and enable adaptation not only give rise to commercial opportunities and reputational reward, but are increasingly necessary for the sustainability of the industry.

**Insurance, Developing Countries and Climate Change**


**Abstract:** By providing financial security against droughts, floods, tropical cyclones and other forms of weather extremes, insurance instruments present an opportunity for developing countries in their concurrent efforts to reduce poverty and adapt to climate change. By pricing risk, insurance provides incentives for reducing risks and adapting to climate change; if these premiums are not affordable to the most vulnerable, donors can combine premium support with risk-reduction measures. In this paper, we examine the costs, benefits and risks of public-private (and donor supported) insurance programmes that offer affordable economic security to vulnerable communities and governments. Insurance mechanisms are of particular interest to climate negotiators seeking strategies that help vulnerable countries adapt to increasing severity and frequency of weather disasters, and we examine the case for including insurance mechanisms in a climate adaptation strategy expected to be agreed in Copenhagen in 2009. We present a proposal for this purpose that has been recently put forward by the Munich Climate Insurance Initiative (MCII), which calls for international solidarity for very low probability and high consequence weather-related events (high-risk layer). For middle-layer risks the MCII proposal calls for international support to promote sustainable, affordable and incentive-compatible insurance programmes that serve the poor without crowding out private sector involvement.


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**A Global Review of Insurance Industry Responses to Climate Change**

Mills, E. (2009)

**Abstract:** A vanguard of insurers is adapting its business model to the realities of climate change. In many ways, insurers are still catching up both to mainstream science and to their customers, which, in response to climate change and energy volatility, are increasingly changing the way they construct buildings, transport people and goods, design products and produce energy. Customers, as well as regulators and shareholders, are eager to see insurers provide more products and services that respond to the “greening” of the global economy, expand their efforts to improve disaster resilience and otherwise be proactive about the climate change threat. Insurers are increasingly recognising the issue as one of “enterprise risk management” (ERM), one cutting across the domains of underwriting, asset management and corporate governance. Their responses are becoming correspondingly sophisticated. Based on a review of more than 300 source documents, plus a direct survey of insurance companies, we have identified 643 specific activities from 244 insurance entities from 29 countries, representing a 50 per cent year-over-year increase in activity. These entities collectively represent $1.2 trillion in annual premiums and $13 trillion in assets, while employing 2.2 million people. In addition to activities on the part of 189 insurers, eight reinsurers, 20 intermediaries and 27 insurance organisations, we identified 34 non-insurance entities that have collaborated in these efforts. Challenges and opportunities include bringing promising products and services to scale, continuing to identify and fill market and coverage gaps and identifying and confirming the veracity of green improvements. There is also need for convergence between sustainability and disaster resilience, greater engagement by insurers in adaptation to unavoidable climate changes and to clarify the role that regulators will play in moving the market. It has not yet been demonstrated how some insurance lines might respond to climate change and a number of market segments have not...
yet been served with a single green insurance product or service. As insurer activities obtain more prominence, they also will be subject to more scrutiny and expectations that they are not simply greenwashing.


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**In Favour of a Proactive Insurance Approach to Climate Change**


**Summary:** The Geneva Papers is a highly respected refereed scientific journal, submitted to the strict rules governing this kind of publication. One of these rules is references – every paper is supposed to have references to show its integration into the scientific body of knowledge of the subject treated.

This poses a problem with the subject of this Special Issue – Climate Change and Insurance. There is no equivalent to the foundation of economics, such as Das Kapital by Karl Marx, or Schumpeter's books, for climate change. Climate change as a subject for historians goes back to mediaeval times, and the first known publications and pictures were European. Climate change as a scientific subject, mostly limited to meteorological observations, goes back some centuries; the main global data available is from the ships of the Royal Navy, which recorded the seawater temperature every 6 hours, the date and the geographic location. Pictures of artists, such as Brueghel, are another source of information, enabling us to see that winters in The Netherlands, for instance, were a freezing affair.


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**Insurability of Climate Risks**

Charpentier, A. (2008)

**Abstract:** The IPCC 2007 report noted that both the frequency and strength of hurricanes, floods and droughts have increased during the past few years. Thus, climate risk, and more specifically natural catastrophes, are now hardly insurable: losses can be huge (and the actuarial pure premium might even be infinite), diversification through the central limit theorem is not possible because of geographical correlation (a lot of additional capital is required), there might exist no insurance market since the price asked by insurance companies can be much higher than the price householders are willing to pay (short-term horizon of policyholders), and, due to climate change, there is more uncertainty (and thus additional risk). The first idea we will discuss in this paper, about insurance markets and climate risks, is that insurance exists only if risk can be transferred, not only to reinsurance companies but also to capital markets (through securitization or catastrophes options). The second one is that climate is changing, and therefore, not only prices and capital required should be important, but also uncertainty can be very large. It is extremely difficult to insure in a changing environment.

Preparing for Climate Change: Insurance and Small Business


Abstract: This paper considers the threat of climate change in the U.K., especially flooding, with regard to the impact that it will have on small and medium-sized enterprises and on the insurance industry itself and the role it plays. It examines the current situation facing the U.K. and then examines the responses being made to this and what can be done in the future to help resolve this issue.


Climate Change and the Insurance Sector

Dlugelecki, A. (2008)

Abstract: Climate change matters to the insurance sector. In terms of underwriting, on one scenario, the economic cost of weather losses could reach over 1 trillion USD in a single year by 2040. The impacts will be worse in developing countries. The private sector needs to work with the public sector, as part of a “triple dividend” approach that coordinates adaptation, disaster management and sustainable economic development. For asset management the indirect impacts are key. Greenhouse gas emissions have to drop by 60 per cent by 2050, which means transforming the energy economy. Finance for renewables will reach 100 billion USD a year soon. Political uncertainty is a serious blockage to market forces, and the re-evaluation of assets and project returns is happening too slowly. Finally, insurers have a duty as ubiquitous players in the economy and society to help to shape climate policies in a responsible and effective way.


Climate Change: Impacts on Insurers and how they can help with Adaptation and Mitigation


Abstract: Climate change is already affecting the global insurance industry. These changes are often seen as being negative, although opportunities also exist. Other areas of insurance coverage may also be affected in addition to property damage. The potential for third-party liability claims from climate change is less well understood but has even greater potential to affect the industry. Financial assets held to meet claims and provide a capital buffer may also be affected. Therefore the balance sheet of an insurer may be damaged from all sides. Insurers cannot force policyholders to mitigate CO2 emissions, but they can give them a choice and a number of them are already offering such policies. They can also take steps to reduce their own carbon emissions. Insurance is adaptation; there are a surprisingly large number of small to medium companies that do not have catastrophe cover, so increasing insurance penetration of these markets would be an adaptive measure. Insurers will continue to lobby governments for appropriate weather defences to keep areas insurable for as long as possible. Non-traditional forms of insurance are available (such as those based on weather indices with parametric triggers) and it may be possible to continue to offer these for longer than traditional insurance. They do bring basics risk with them, and therefore possibly reputational risk to the industry. Insurers can only pool risk; we cannot insure our way out of this problem, but we can help to spread the impacts where possible.

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**The Role of Insurers in Promoting Adaptation to the Impacts of Climate Change**


Abstract: Scientific evidence is accumulating that climate change is having an impact on the frequency, intensity and geographical distribution of extreme weather events. With these trends likely to continue for the foreseeable future, the insurance industry can help society to adapt, by limiting and managing risks associated with extreme weather, and thereby maintaining the insurability of potentially vulnerable and exposed populations. There are already examples of the insurance industry promoting efforts to mitigate the impacts of weather hazards, by disseminating information about reducing the vulnerability of properties, offering financial incentives to invest in mitigating the impacts of extreme weather, and by working in partnership with policy-makers to establish maximum thresholds of acceptable risk. However, these efforts need to be more widely promoted by insurers to make a significant contribution to society’s adaptation to climate change.


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**Climate Change and Personal Insurance**

Benoist, G. (2007)

Abstract: Global warming due to human activities triggers different consequences according to the impacted areas. In the north, it causes material damage that insurance, financial, and technical means can help to cope with. In the south, it brings about heavy human losses, accentuated by demography, lack of infrastructure, and low insurance coverage. For the moment, climate change has had little impact on personal insurance results. However, to face the worldwide multiplication of disasters and epidemics predicted by the experts, personal insurers could play an increasing role. They could establish more accurate statistics to evaluate and price the risks. They could also promote risk prevention among their policyholders. As for emerging countries, developing insurance coverage would be the best way to face the consequences of climate change.


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**Climate Change and the Global Insurance Industry: Impacts and Problems in Latin America**

Candel, F.M. (2007)

Abstract: Latin America is particularly susceptible to the consequences of climate change and has low insurance penetration. Urgent solutions are needed to establish a better socioeconomic
framework to cope with ordinary and extraordinary losses following climate-related events. Developed countries have a role to play in mitigating these losses by sharing with developing countries their long experience in scientific research and more advanced weather and climate monitoring and forecasting.


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**Climate Change and the Global Insurance Industry**


**Abstract:** Weather and climate are "core business" for the insurance industry. Many extreme weather events such as cyclones, hailstorms, bushfires and floods are projected to increase in either intensity or frequency under climate change. A changing, less predictable climate has the potential to reduce the insurance industry's capacity to calculate, price and spread this weather-related risk. However, it is important to understand the long term opportunities as well as risks associated with climate change. IAG is committed to undertaking further research to increase the scientific understanding of the impacts of climate change, to identify ways to reduce the impact that climate change is expected to have on society and to identify insurance-based incentives for a reduction in future greenhouse gas emissions. Climate change presents a strong case for the need for business, governments and community groups to work together to find sustainable solutions to this critical challenge.


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**Insurance in a Climate of Change**

Mills, E. (2005)

**Abstract:** Catastrophe insurance provides peace of mind and financial security. Climate change can have adverse impacts on insurance affordability and availability, potentially slowing the growth of the industry and shifting more of the burden to governments and individuals. Most forms of insurance are vulnerable, including property, liability, health, and life. It is incumbent on insurers, their regulators, and the policy community to develop a better grasp of the physical and business risks. Insurers are well positioned to participate in public-private initiatives to monitor loss trends, improve catastrophe modeling, address the causes of climate change, and prepare for and adapt to the impacts.


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**Insurance: Natural Hazards and Catastrophes**

**GHG Targets as Insurance Against Catastrophic Climate Damages**

Abstract: A critical issue in climate-change economics is the specification of the so-called "damages function" and its interaction with the unknown uncertainty of catastrophic outcomes. This paper asks how much we might be misled by our economic assessment of climate change when we employ a conventional quadratic damages function and/or a thin-tailed probability distribution for extreme temperatures. The paper gives some numerical examples of the indirect value of various GHG concentration targets as insurance against catastrophic climate-change temperatures and damages. These numerical examples suggest that we might be underestimating considerably the welfare losses from uncertainty by using a quadratic damages function and/or a thin-tailed temperature distribution. In these examples, the primary reason for keeping GHG levels down is to insure against high-temperature catastrophic climate risks.


Measuring Non-Catastrophic Weather Risks for Business

Pres, J. (2009)

Abstract: While many published articles touch on the problem of using weather derivatives as tools for non-catastrophic weather-risk management, few studies have looked at the problem of appropriate risk measurement. This paper aims to present and evaluate all available methods used to identify and estimate the impact of non-catastrophic weather upon commercial enterprises. Correctly defining these parameters fundamentally affects building weather cover. Analysis of already existing methods of weather-risk measurement for businesses, as presented in the literature, has shown a few disadvantages. This paper proposes an improved approach to weather risk measurement – one based on an extended econometric model. We have empirically tested all the methods proposed herein and present our conclusions.


Modelling and Interpreting the Economics of Catastrophic Climate Change

Weitzman, M.L. (2009)

Abstract: With climate change as prototype example, this paper analyzes the implications of structural uncertainty for the economics of low-probability, high-impact catastrophes. Even when updated by Bayesian learning, uncertain structural parameters induce a critical “tail fattening” of posterior-predictive distributions. Such fattened tails have strong implications for situations, like climate change, where a catastrophe is theoretically possible because prior knowledge cannot place sufficiently narrow bounds on overall damages. This paper shows that the economic consequences of fat-tailed structural uncertainty (along with uns sureness about high-temperature damages) can readily outweigh the effects of discounting in climate-change policy analysis.


Levering Insurance and Capital Markets Against Natural Catastrophes
Hill, J. (2008)

Abstract: In both reinsurance and capital markets, capacity for Asia and Pacific catastrophe risk is abundant, and the convergence of insurance and capital markets adds further support to Asia and Pacific catastrophe risk transfer. Capital markets mechanisms for risk transfer, including securitization and derivatives, may serve needs unmet by traditional insurance, but the most significant impact of convergence is its effect on the overall dynamics of risk transfer markets. By leveraging capital market capacity, reinsurers minimize the potential disruption to their capital base from large natural catastrophes, thus improving their profitability, flattening the reinsurance price cycle, and enhancing their ability to assume risk in areas such as the Asia and Pacific region.

With low insurance penetration in general and even lower use of catastrophe insurance, the challenge of growing a vibrant and self-sufficient catastrophe risk transfer market for the Asia and Pacific region appears daunting at best. This paper proposes a more optimistic view of developing Asian markets as clean slates upon which risk transfer mechanisms may be drawn anew, tailored to the particular situations of Asia and Pacific countries, and optimized to leverage global risk-taking capacity.


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**Extreme Events, Global Warming, and Insurance-linked Securities: How to Trigger the "Tipping Point"**


Abstract: Large-scale disasters have occurred at an accelerated rhythm in the past 5 years. Further, the continuous increase of exposed values in high-risk areas and the potential impact of global warming on the intensity of weather-related events shall accelerate the number and increase the scale of mega-catastrophes in the near future. That is a new era for catastrophe risk management that calls for the development of new solutions, in complement to the traditional insurance and reinsurance. The authors discuss some of the main drivers of the radical shift that happened in the insurance-linked securities (ILS) market after the 2005 hurricane season in the Atlantic basin, which has rapidly become one of the world peak zones in terms of exposure. They explain why, despite this very encouraging evolution, the market has not expanded more (contrary to credit derivatives for instance). They propose three complementary ways to increase interest in these instruments that could effectively trigger the tipping point toward a much more significant volume of capital entering the ILS market: (1) increasing investors' interest through tranching, (2) addressing the basis risk challenge through index-based derivatives, and (3) innovating through the development of new products; the authors introduce the concept of derivative solutions based on equity volatility dispersion.


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**A Method for Constructing a Social Vulnerability Index: An Application to Hurricane Storm Surges in a Developed Country**

**Abstract**: An important goal of vulnerability assessment is to create an index of overall vulnerability from a suite of indicators. Constructing a vulnerability index raises several problems in the aggregation of these indicators, including the decision of assigning weights to them. The purpose of this paper is to demonstrate a method of aggregating vulnerability indicators that results in a composite index of vulnerability, but that avoids the problems associated with assigning weights. The investigators apply a technique based on Pareto ranking to a complex, developed socioeconomic landscape exposed to storm surges associated with hurricanes. Indicators of social vulnerability to this hazard are developed and a principal components analysis is performed on proxies for these indicators. Overall social vulnerability is calculated by applying Pareto ranking to these principal components. The paper concludes that it is possible to construct an effective index of vulnerability without weighting the individual vulnerability indicators.


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Flood Insurance

*Improving Flood Insurance and Flood Risk Management: Insights from St Louis, Missouri,*


**Abstract**: This paper examines the history of St. Louis, Mo. in coping with riverine flood risk over the past 15 years, with a focus on flood insurance. Six observations from a detailed case analysis are presented. They are (1) many property owners do not buy flood insurance; (2) people underestimate flood risk; (3) we need better flood maps; (4) we have a “love affair” with levees; (5) flood risk is increasing over time; and (6) we take deep pride in rebuilding after a disaster. Policy implications are discussed.


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*Come Rain or Shine: Evidence on Flood Insurance Purchases in Florida*


**Abstract**: This article provides a detailed analysis of the operation of the National Flood Insurance Program (NFIP) in Florida, which accounts for 40 percent of the NFIP portfolio. We study the demand for flood insurance with a data set of more than 7.5 million NFIP policies-in-force (the largest ever studied) for the years 2000–2005, as well as all NFIP claims filed in Florida. We answer four questions: What are the characteristics of the buyers of flood insurance? What types of contracts (deductibles and coverage levels) are purchased? What are the determinants of claims payments? How are prices determined and how much does NFIP insurance cost?

**Flood Insurance: From Clients to Global Financial Markets**


**Abstract:** Weather-related natural catastrophes are increasing worldwide in number and intensity, and losses have reached new levels. This represents a challenge that must be faced by governments, the people concerned, and the financial sector, both nationally and globally. Flood insurance is rare in most countries, but the development of solutions to make flood risk more insurable has gained momentum. There is no ideal flood insurance scheme, as each situation is influenced by factors such as risk-adequate premium structure, adverse selection, and general risk awareness. Solutions tailored to the situation in each respective country must be found. While rich countries have to find ways to handle record losses of US$100 bn and more, poor countries need micro-insurance to provide people with at least a minimum of financial security. The insurance industry has – through the reinsurance sector – established a system to pay local monetary losses globally. In the wake of extremely expensive catastrophes, a system involving the whole financial market has great potential. Additionally, governments must prepare for disasters that threaten their people’s existence by building up national funds.


**Encouraging Adaptation to Climate Change: The Need for Long-Term Flood Insurance**


**Abstract:** The severe hurricanes in Florida in 2004, Hurricane Katrina in 2005 and Hurricane Ike in 2008 clearly demonstrate that the United States is highly vulnerable to large-scale risks from storm surge and flooding. Given the possibility of sea level rise due to global warming, we are entering a new era of catastrophes unless the increasing number of property owners located in coastal areas invest more heavily in risk-reduction measures (adaptation measures) than they do today. In this context, the current debate about how best to adapt to a changing climate raises an important policy question: how can the United States sustain itself against more devastating climate-related natural disasters in the future? Focusing on the flood risk, we recommend that Congress and the Administration revise the 1968-established National Flood Insurance Program (NFIP), which covers more than $1.2 trillion of assets today, by moving from annual insurance contracts to long-term insurance policies tied to property. Such a change will encourage people in high risk areas to think more about the long-term and invest in cost-effective adaptation measures that reduce losses from future floods and hurricanes.


**Flood Hazards, Insurance rates and Amenities: Evidence from the Coastal Housing Market**

Abstract: This study employs the hedonic property price method to examine the effects of flood hazard on coastal property values. We utilize Geographic Information System data on National Flood Insurance Program flood zones and residential property sales from Carteret County, North Carolina. Our results indicate that location within a flood zone lowers property value. Price differentials for flood risk and the capitalized value of flood insurance premiums are roughly equivalent—both exhibiting a nonlinear relationship in flood probability. Our results support the conclusion that flood zone designation and insurance premiums convey risk information to potential buyers in the coastal housing market.


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**Insurance Against Climate Change and Flooding in the Netherlands: Present, Future, and Comparison with other Countries**


Abstract: Climate change is projected to cause severe economic losses, which has the potential to affect the insurance sector and public compensation schemes considerably. This article discusses the role insurance can play in adapting to climate change impacts. The particular focus is on the Dutch insurance sector, in view of the Netherlands being extremely vulnerable to climate change impacts. The usefulness of private insurance as an adaptation instrument to increased flood risks is examined, which is currently unavailable in the Netherlands. It is questioned whether the currently dominant role of the Dutch government in providing damage relief is justified from an economic efficiency perspective. Characteristics of flood insurance arrangements in the Netherlands, the United Kingdom, Germany, and France are compared in order to identify possible future directions for arrangements in the Netherlands. It is argued that social welfare improves when insurance companies take responsibility for part of the risks associated with climate change.


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**Role of Insurance in Reducing Flood Risk**


Abstract: This paper considers the problems of flood risk management in the context of public and private insurance. It demonstrates the important role of insurance in reducing flood risk with examples from the U.K. and France. It includes a brief description of the summer 2007 floods in England.


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**What Can Cities do to Increase Resilience?**


Abstract: This paper examines climate change mitigation and adaptation from an insurance industry perspective, with particular reference to London and the USA. It illustrates how British insurers are...
increasingly shaping public policy and using new technology to manage the risks from climate change impacts and makes a plea for society to make more use of insurance expertise in future decision making. In particular, more dialogue is needed between architects, planners and insurers to adapt our buildings and cities for climate change impacts. The paper is an abbreviated and updated version of the paper presented by the author in Houston, Texas, in 2005.


Episodic Flooding and the Cost of Sea-level Rise


Abstract: Previous studies of the cost of sea-level rise focus on the economic loss to inundated property rather than increased damage from episodic flood events to non-inundated property above sea level. This study uses a unique GIS database of three geographically diverse Chesapeake Bay communities that includes 1-ft elevation contours from remote sensing data, local tax assessment records, and aerial photographs of property location. Hedonic property value models estimate the loss from complete inundation, closely following the methodology of previous studies. Increased damage from episodic flooding is estimated using elevation-rated, actuarially fair flood insurance rates. Using a 3-ft sea-level rise over 100 years scenario, damage from episodic flooding averages 9 times the estimated loss from complete inundation, and is an average of 28 times greater under a 2-ft sea-level rise scenario. Although the study areas are not representative of all coastal areas, the results suggest that current studies may substantially underestimate the cost of sea-level rise.


Vulnerability to Climate Change Hazards and Risks: Crop and Flood Insurance


Abstract: This paper reviews the widely used concepts of risk and vulnerability as they relate to climate and weather hazards, re-conceptualizes these terms in the context of climate change and illustrates this development using crop and flood insurance as examples. Government subsidization of insurance against risks associated with adverse climatic conditions and weather events, such as flood damage and crop loss, may lead to individual decisions that actually increase the susceptibility of people, property and economic activities to those risks. The processes that give rise to this phenomenon are important in understanding the vulnerability of human populations to climate change. In many regions, existing conditions that give rise to flooding or crop failure are likely to be exacerbated by climate change over coming decades. In the climate change field, vulnerability has been conceptualised as a function of exposure to risk and as an ability to adapt to the effects. In this context, crop and flood insurance are possible adaptive measures. This treatment of vulnerability compares with similar concepts in insurance and risk management whereby events that cause loss are known as perils, and physical conditions, such as climate change, that increase the likelihood of a peril occurring, are known as physical hazards. Human behaviour that increases the exposure of individuals to potential perils is known as morale hazard or moral hazard, depending on the intentions of the person. Vulnerability consequently becomes a function of hazard and responses taken to reduce risk. Examples of crop and flood insurance programs from Canada, New Zealand and the U.S.
are used to show how subsidized insurance might create a morale hazard in addition to physical hazards such as short-term weather events and long-term climate change, resulting in a higher level of vulnerability than would otherwise exist. These findings demonstrate that human behaviour affects the formation of both exposure and adaptive capacity in the context of vulnerability to climate change. Responses taken to increase adaptive capacity may in some cases be offset by individual behaviour that increases exposure.


A Nation of Policyholders: Governmental and Market Failure in Flood Insurance

Abstract: This article focuses on the two insurance systems that inadequately govern the distribution of flood risk: The National Flood Insurance Program (NFIP) and the private market for property insurance. There have been a number of studies detailing the structure and limits of these systems. However, scant attention has been directed toward the role that insurance law plays in driving the systems toward failure. What follows is a synthesis of insurance law, economics, and regulatory criticism, leading to the ineluctable conclusion that these two systems rest on a foundation of sand.

I propose a market-based alternative that draws on the comparative advantages each system offers. To the information-generating of the marketplace, we may add a more precisely targeted governmental role in subsidizing some policyholders and reinsuring others. There are inevitable tradeoffs, and my proposal has a number of drawbacks - only some of which can be guessed at here. But the alternative is a system that has proven itself unable to cope adequately with the predictable losses of a bad year, let alone the greatest natural disaster in American history.


Confronting Flood Risk: Implications for Insurance and Risk Transfer

Abstract: The UK floods in late 2000 reinforced an emerging awareness which questioned the long-term sustainability of an exclusive reliance on hard-engineered flood defences to protect the UK population against increased flood risk. The debate has subsequently focused on a broader interpretation of the risks associated with flooding. This paper explores the notion that, although social and technical issues are already being integrated to understand and manage flood, practitioners are now realising the importance of accommodating public hazard understanding and perception of risk into their management models, and there remains a need to fit such ideas to the insurance-based system of flood management in the UK.


Flood Insurance: The Challenge of the Uninsured

Abstract: Increasing concern about flooding and its potentially socially-devastating effects has reinforced the need for an effective mechanism to deal with the recovery of losses from these events. This paper highlights the problem of uninsurance in the UK and the potentially growing number of people who do not have flood insurance. A dual challenge of uninsurance is emerging: those who have been traditionally excluded from insurance cover due to price and a new phenomenon, those who live in high-risk areas who may become cost-prohibited through the introduction of risk-related premiums.


Modelling National Flood Insurance Policy Holding at the County Scale in Florida, 1999-2005


Abstract: We analyze household flood insurance purchases in Florida from 1999 to 2005, and the extent to which household insurance purchases correspond with flood mitigation activities by local governments involved in the Federal Emergency Management Agency's (FEMA) Community Rating System (CRS). Regression results indicate that household flood insurance purchases correlate strongly with local government mitigation activities, adjusting for hazard experience, hazard proximity, and community demography. Policy implications of this observed relationship are discussed, assuming four temporal order and floodplain development scenarios, with particular attention to the congruence of outcomes relative to policy objectives.


Flood Insurance and Floodplain Management: The US Experience

Burby, R. J. (2001)

Abstract: With over six million buildings located within the boundaries of the 100-yr floodplain, flood losses across the United States are widespread (88% of US counties experienced at least one flood disaster during the second half of the twentieth century). To deal with this problem, the federal government provides flood insurance through the National Flood Insurance Program, which was initiated by Congress in 1968 and amended significantly in 1969, 1973, and 1994. This article describes the US approach to flood insurance and notes a number of problems that have limited its effectiveness. Flood hazard identification is incomplete, and methods used are flawed. Mitigation has failed to contain increasing exposure to property damage in floods and coastal storms, and it has failed to markedly reduce exposure to loss of older buildings located in flood hazard areas. Market penetration of flood insurance is low, in spite of mandatory purchase requirements for new construction and the availability of subsidized insurance rates for older buildings located in flood-hazard areas. These problems, although serious, can be remedied through a variety of actions taken by governments at the federal, state, and local level.

The Demand for Flood Insurance: Empirical Evidence

Abstract: Flood damages that occur worldwide remain largely uninsured losses despite the efforts of governmental programs that in many cases make insurance available at below fair market cost. The current study focuses on the financial experience of the United States' National Flood Insurance Program (NFIP) from 1983 through 1993 to examine the hypothetical determinants of the flood insurance purchasing decision. The empirical analysis supports the hypotheses that income and price are influential factors in one's decision to purchase flood insurance. Flood insurance purchases at the state level are found to be highly correlated with the level of flood losses in the state during the prior year.


Fire Insurance

Studying Fire Mitigation Strategies in Multi-Ownership Landscapes: Balancing the Management of Fire-Dependent Ecosystems and Fire Risk

Abstract: Public forests are surrounded by land over which agency managers have no control, and whose owners expect the public forest to be a “good neighbor.” Fire risk abatement on multi-owner landscapes containing flammable but fire-dependent ecosystems epitomizes the complexities of managing public lands. We report a case study that applies a landscape disturbance and succession model (LANDIS) to evaluate the relative effectiveness of four alternative fire mitigation strategies on the Chequamegon-Nicolet National Forest (Wisconsin, USA), where fire-dependent pine and oak systems overlap with a rapidly developing wildland–urban interface (WUI). We incorporated timber management of the current forest plan and fire characteristics (ignition patterns, fire sizes, and fuel-specific fire spread rates) typical for the region under current fire suppression policies, using a combination of previously published fire analyses and interactive expert opinion from the national forest. Of the fire mitigation strategies evaluated, reduction of ignitions caused by debris-burning had the strongest influence on fire risk, followed by the strategic redistribution of risky forest types away from the high ignition rates of the WUI. Other treatments (fire breaks and reducing roadside ignitions) were less effective. Escaped fires, although rare, introduced significant uncertainty in the simulations and are expected to complicate fire management planning. Simulations also show that long-term maintenance of fire-dependent communities (that is, pine and oak) representing the greatest forest fire risk requires active management. Resolving conflict between the survival of fire-dependent communities that are regionally declining and continued rural development requires strategic planning that accounts for multi-owner activities.

Estimating Contingent Values for Protection from Wildland Fire Using a Two-stage Decision Framework


Abstract: The ongoing expansion of human populations into wildland areas dominated by flammable vegetation, and the concomitant increased frequency of uncontrolled wildfires that result in losses of property and human lives, has raised new questions about the optimal level of fire protection. The morphing of the problem conception from minimizing costs plus losses of natural resources to responding to the concerns of people whose homes are at risk has stimulated fire protection planners to account for potential changes in people's well-being beyond what is reflected by insured value. Knowing the perceived value of an increase in collective (agency-provided) fire protection that achieves a risk reduction target can contribute much to policy debates on the restructuring and funding of fire protection infrastructure and fuel management.

To evaluate the utility of contingent valuation for assessing such risk reduction value, the value of collective fire protection at the wildland-urban interface was assessed for residents of a Michigan jack pine forest. Seventy-five percent of the 265 residents interviewed chose to participate in a hypothetical market for a 50% reduction in risk and, on average, were willing to pay over $57 a year for such risk reduction. Results were consistent with a two-stage decision model: (1) participation in the hypothetical market for risk reduction, and (2) how much the risk reduction is worth. Homeowner risk perception and objectively assessed risk both influenced the probability of market participation. For market participants, willingness to pay was related to property value and household income, suggesting that value at risk and ability to pay weigh heavily in this decision.


Consumption Smoothing in Island Economies: Can Public Insurance Reduce Welfare?


Abstract: In this paper we study the effects of certain types of public compulsory insurance arrangements for aggregate shocks on private allocations in environments with limited commitment. We show that this type of insurance can improve the wellbeing of private situations, but it can also deteriorate it. We also describe how different characteristics of the environment affect the role of public insurance. Using data on the Mexican PROGRESA program, we document the impact that some government programs have in crowding out private transfers.


Risk: General
**Risk Reduction or Redistribution? Flood Management in the Mekong Region**


Abstract: In the main valleys and plains rapid economic and social development over the past several decades has altered the use of land and water in ways that profoundly affect vulnerability of households, firms and regional economies to individual flood events and longer-term changes in flood regimes. Disaster risk reduction measures usually involve structural interventions in the form of walls, channel modification, drains, pumping stations, diversions and storage dams. Institutional measures, like early warning systems, community capacity building, insurance and compensation schemes may also be supported and promoted to reduce risks of damage and burdens from losses. In this paper we review instances and conditions under which flood management policies, measures and practices in the greater Mekong region, intended to reduce risks, appear to have shifted risks onto already vulnerable and disadvantaged groups. We classify these observations into six mechanisms through which risks may be redistributed. This analysis highlights the importance of public participation and negotiation in handling various risks associated with flood management, and, conversely, why purely technical, expert-driven, approaches to flood disaster management are unlikely to succeed in reducing the risks of flood disasters.


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**Risk Management**

**Natural Disaster Risk in Asian Megacities: A Case for Risk Pooling, Cities**

Hochrainer, S., Mechler, R. (2011)

Abstract: This paper examines the characteristics of natural disaster risk in the context of megacities generally, and Asian megacities particularly. A key gap in approaches to managing megacity risk has been attention to the financial aspects, for which interest has lately been emerging in terms of exploring whether such risk may be suitable for a donor-assisted regional Asian risk pooling scheme. One suggestion concerns insuring public sector liabilities in terms of infrastructure replacement funding, liquidity support and relief to the population. Recently, this was operationalized in the Caribbean regional pooling of hurricane and earthquake risks, and by the Mexican government for earthquake risks. In both cases, central governments are the actors. We assess the rationale and applicability of such deliberations given the dynamic nature of vulnerability and risk, and discuss conditions for conducting similar transactions for Asian megacity risks. Overall, given our adopted criteria, we tentatively conclude that there may indeed be a case for risk pooling, yet the dynamics of assessing formal and informal risks as well as the specificity of conditions in respective megacities pose important hurdles that have to be overcome.


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**Community-Based Management Arrangement: A Review**

Abstract: Risk and its consequences pose a formidable threat to poverty reduction efforts. This article reviews a plethora of community-based risk management arrangements across the developing world. These types of arrangements are garnering greater interest in light of the growing recognition of the relative prominence of household- or individual-specific idiosyncratic risk as well as the increasing shift towards community-based development funding. The article discusses potential advantages (such as targeting, cost and informational) and disadvantages (such as exclusion and inability to manage correlated risk) of these arrangements, and their implications for the design of community-based social protection programs and policies.


Influential Articles, Journals, and Institutions in Risk Management and Insurance


Abstract: We use a threshold citation approach to measure the influence of articles, journals, and institutions in risk management and insurance research. The three frequently cited articles in risk management and insurance research are “Increasing Risk: I. A Definition” by Rothschild and Stiglitz (1970), “Precautionary Saving in the Small and in the Large” by Kimball (1990), and “Equilibrium in Competitive Insurance Markets: An Essay on the Economics of Imperfect Information” by Rothschild and Stiglitz (1990). Journal of Risk and Insurance, Econometrica, and Journal of Political Economy are the three influential journals in risk management and insurance research. Furthermore, the five influential institutions in risk management and insurance research are the University of Pennsylvania, Harvard University, the University of Rochester, the University of Michigan, and Massachusetts Institute of Technology.


Paying the Premium: Insurance as a Risk Management Tool for Climate Change


Abstract: This working paper aims to clarify the issues around insurance mechanisms designed to improve resilience among the poor to climate change impacts. We hope the analysis will inform the ongoing insurance discussions at the UNFCCC in the build up to the Conference of Parties in Copenhagen in December 2009.


Full article available at: [http://pdf.wri.org/working_papers/paying_the_premium.pdf](http://pdf.wri.org/working_papers/paying_the_premium.pdf)

Sustainability Risk Management

Abstract: This article features a panel discussion on sustainability risk management organized by Dan R. Anderson for the American Risk and Insurance Association 2007 annual meeting. The moderator, Mr. Dan Anderson, is the Leslie P. Schulz Professor of Risk Management and Insurance at the University of Wisconsin-Madison School of Business and author of Corporate Survival: The Critical Importance of Sustainability Risk Management. Anderson is a past president of the American Risk and Insurance Association (ARIA) and the 2007 winner of the Geneva Association/International Insurance Society Research Award, including a $10,000 stipend, for his paper, “Sustainability Risk Management as a Critical Component of Enterprise Risk Management (ERM): Global Warming—Climate Change Risks.” He also was recently presented with the Risk Innovator Award by Risk and Insurance magazine for his work in sustainability risk management. The next panelist is Kenneth E. Anderson, Director of Aon's Environmental Services Group. Mr. Kenn Anderson is a graduate of the University of Wisconsin's Risk and Insurance Management program and has spent the last 20 years advising organizations about their exposure to environmental risk and designing, negotiating and implementing appropriate environmental insurance programs to meet specific client needs. He will emphasize business opportunities associated with sustainability risk management and the availability of insurance coverage for sustainability risks.


Role of Rural Land Use Management and Coastal Risk Management


Abstract: Flood risk is influenced by the rate and speed of rural land runoff within the catchment and by flow attenuation in the floodplain. Most research to date has demonstrated that the overall flood risk benefits of multiple small scale land management changes at a large catchment scale are difficult to determine and, in some situations, may not provide significant benefits in flood events. Measures may, however, offer potential for attenuation, improving flood warning times and therefore reducing flood damages. Climate change and major legislative drivers such as the Water Framework Directive will also further drive the need to consider different approaches to how land is managed and the impact that this may have on flood and coastal risk management.


From Reactive to Proactive Management: Urban Climate Risks in Asia: Institutional Challenges, Scientific Opportunities


Abstract: Urban climate risks are the result of changing dynamics of urban development as well as current climate variability and expected changes in climate trends. Case studies of water shortages in metro Manila and flooding in Mumbai illustrate the limitations of current approaches to managing climate risks, and point to critical scientific opportunities and accompanying institutional challenges involved in establishing anticipatory risk management strategies. Currently functioning primarily in a reactive manner, urban institutions lack anticipatory systems that enable constant monitoring and evaluation of the changing dynamics of risk as well as the emergent urban vulnerabilities. Scientific advances offer the potential for time-ahead climate information to provide early warning of risks. As
policy makers gain increasing awareness of the risks to societies of climate change, they urgently need to develop a better appreciation of the role of risk framing and its management


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**Climate Change to Hit Insurers**

Williams, F. (2009)

**Extract:** Catastrophic climate change will hike up insurance companies’ losses.

What is more, the vagaries of climate mean that insurers will have to boost their capital reserves to limit risks, explained insurance-industry leaders on Sunday.

Andreas Spiegel, vice-president for risk management at international reinsurer Swiss Re, told the United Nations Environmental Programme (Unep) funding initiative summit that his company continually needs to factor in the latest scientific information on climate change when quantifying risk.


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**Weathering the Storm: Participatory Risk Assessment for Informal Settlements**


**Abstract:** Weathering the Storm reflects current international practice in participatory risk assessment. It describes an approach to risk reduction that actively engages residents of informal settlements, as well as their civil society and government colleagues.

This guide has been tailored to the disaster risk profile of the Western Cape and to the cultural and language needs of disaster risk and development practitioners in the province - although many of the issues profiled may apply in other settings. The guide simplifies participatory risk assessment methods so that they can be used for integrated disaster risk management planning at settlement level – or used by a single department like Roads and Stormwater to improve flood risk reduction measures. For the purposes of this guide, the terms ‘disaster management’ and ‘disaster risk management’ are used interchangeably.


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Abstract: This article presents the business case for insurer involvement in the sustainable energy sector and documents early case studies of insurer efforts along these lines. We have mapped these opportunities onto the appropriate market segments (life, health, property, liability, business interruption, etc.). We review steps taken by 53 forward-looking insurers and reinsurers, 5 brokers, 7 insurance organizations, and 13 non-insurance organizations. We group the approaches into the categories of: information, education, and demonstration; financial incentives; specialized policies and insurance products; direct investment; customer services and inspections; codes, standards, and policies; research and development; in-house energy management; and an emerging concept informally known as “carbon insurance”. While most companies have made only a modest effort to position themselves in the "green" marketplace, a few have comprehensive environmental programs that include energy efficiency and renewable energy activities.


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Informal Insurance in Social Networks

Abstract: This paper studies bilateral insurance schemes across networks of individuals. While transfers are based on social norms, individuals must have the incentive to comply. We investigate the structure of self-enforcing insurance networks. Network links play two distinct and possibly conflictual roles. They act as conduits for both transfers and information; affecting the scope for insurance and the severity of punishments upon noncompliance. Their interaction leads to a characterization of stable networks as suitably “sparse” networks. Thickly and thinly connected networks tend to be stable, whereas intermediate degrees of connectedness jeopardize stability. Finally, we discuss the effect of discounting on stability.


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Young, O.T. (2010)

Institutional Dynamics: Resilience, Vulnerability and Adaptation in Environmental and Resource Regimes

Abstract: Like all social institutions, governance systems that address human-environment relations - commonly known as environmental or resource regimes - are dynamic. Although analysts have examined institutional change from a variety of perspectives, a particularly puzzling feature of institutional dynamics arises from the fact that some regimes linger on relatively unchanged even after they have become ineffective, while others experience state changes or even collapse in the wake of seemingly modest trigger events. This article employs the framework developed to study resilience,
vulnerability, and adaptation in socio-ecological systems (the SES framework) in an effort to illuminate the conditions leading to state changes in environmental and resource regimes. Following a discussion of several conceptual issues, it examines institutional stresses, stress management mechanisms, and the changes that occur when interactive and cumulative stresses overwhelm these mechanisms. An important conclusion concerns the desirability of thinking systematically about institutional reform in a timely manner, in order to be prepared for brief windows of opportunity to make planned changes in environmental regimes when state changes occur.


Insuring the Low-Income Market: Challenges and Solutions for Commercial Insurers

Abstract: In many developing countries, commercial insurers are beginning to become interested in serving the low-income market by providing micro insurance. To do so, they have to overcome both operational and regulatory obstacles. Ironically, certain regulations actually give commercial insurers an advantage in serving the low-income market, by restricting competition from specialized micro insurance companies. However, this opportunity is unlikely to last indefinitely. Commercial insurers that are keen to reach out to new markets, such as the huge volume of low-income people in many countries, would be wise to move quickly to overcome key operational issues. In particular, insurers need to recognize that micro insurance is not just existing products with smaller insured sums, but rather requires a significantly different approach from conventional insurance. Key starting points include (a) improving the insurer's familiarity with the preferences and behaviour of poor persons, and (b) educating the market about insurance to create low-income.


The Perfect Storm: Hurricanes, Insurance and Regulation

Abstract: The intense hurricane seasons of 2004 and 2005 caused considerable instability in property insurance markets in coastal states with the greatest problems occurring in Florida and the Southeast. Insurers have substantially raised rates and decreased their exposures. While no severe hurricanes struck the United States in 2006 and 2007, market pressures remain strong given the high risk still facing coastal states. These developments generate considerable concern and controversy among various stakeholder groups. Government responses have varied. In Florida, political pressures prompted a wave of legislation and regulations to expand government underwriting and subsidization of hurricane risk and constrain insurers’ rates and market adjustments. Other states' actions seem more moderate. In this context, it is important to understand how property insurance markets have been changing and governments have been responding to increased catastrophe risk. This article examines important market developments and evaluates associated government policies. We comment on how regulation is affecting the equilibration of insurance markets and offer opinions on policies that are helpful and harmful.

**Looking Back and Thinking Ahead: A Decade of Cities and Climate Change Research**


**Abstract:** To many observers of climate change politics, 1997 was an important milestone because of the completion of the Kyoto Protocol negotiations. With considerably less fanfare, 1997 was also the year in which Local Environment published its first article on the topic of cities and climate change (Collier 1997). By 1997, there was a growing movement of sub-national governments and local communities working to place climate change on the local agenda. These efforts were facilitated by the creation of three transnational city networks—Climate Alliance, Cities for Climate Protection (CCP), and Energie-Cité’s—with several hundred members concentrated in North America and Europe. A decade later, the networks of communities, cities and states responding to climate change have multiplied. Existing networks have increased and diversified their membership. For example, the CCP network now has campaigns in South America, South East Asia, Australia and Japan involving over 650 local governments. New networks have also been established. Mirroring the G8 meeting in the UK in 2005, the Mayor of London hosted a meeting of twenty large cities from around the world seeking to act on climate change. In May 2007, forty large cities, under the auspices of the C40 Cities Climate Leadership Group and sponsored by the Clinton Climate Initiative, met in New York to discuss their role in mitigating climate change. While the framework of international negotiations remains important, cities are now acknowledged as a critical arena in which the governance of climate change is taking place.


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**Rationality and Institutional Contingency: The Varying Politics of Economic Regulation in the Fire Insurance Industry**


**Abstract:** Are the politics of economic regulation contingent on institutions? Drawing on arguments about institutional mediation and the institutional bases of rational action, we explore how institutions shape the dynamics invoked in two theories of regulation. We argue that institutional arrangements affect both the clarity and the content of group interests in regulation. Event history analyses of U.S. states' passage of fire insurance regulation from 1906 to 1930 support these arguments in several ways. Market-heterogeneity dynamics specified by cartel-capture theory affected the passage of regulation only under some conditions- namely, relatively depoliticized settings with little overt conflict or uncertainty about policy outcomes. In addition, interest group dynamics were conditioned by the consolidation of inter-organizational fields around a particular model of market order, which allowed divergent interest groups to converge in support of regulation. The research suggests ways of thinking about theoretical generality and specificity, regulatory politics, and the relationship between institutional theory and rationality.

**Regulating American Industries: Markets, Politics, and the Institutional Determinants of Fire Insurance Regulation**

Schneiberg, M., and Bartley, T. (2001)

**Abstract:** This article assesses three approaches to state regulation: capture theory, interest group analyses, and neo institutional research. State level event history analyses of fire insurance rate regulation from 1906 to 1930 are used. Contrary to capture theory, regulation was not driven simply by firms' interests in market control. Instead, consistent with interest group analyses, regulation was more likely when anti company forces farmers and small businesses could challenge big business politically. Further, as neo institutional research suggests, regulation was more likely when industry governance evoked legitimacy crises, when courts and professions endorsed regulation and its underlying models, and when states developed system-wide administrative capacities. Institutional conditions also mediated the effects of markets and politics on regulation. Using these findings, we develop a theory of how political and institutional conditions shape industries' governance options.


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**Reinsurance**

**Sharing the Risk of Hail: Insurance, Reinsurance and the Variability of Hailstorms in Switzerland, 1880-1932,**

Mauelshagen, F. (2011)

**Abstract:** This paper describes part of the early history of crop insurance in Switzerland as a process of adaptation to the hazard of hail. It argues that insurance is a means of socialising hazard through risk sharing and, therefore, that adaptation is an active process influenced by various decisions both within and outside the insurance market. These decisions are as much a part of the story as is the variability of hailstorms in Switzerland. A period of more extreme hailstorms, which challenged insurance provision, occurred between 1920 and 1930 and was linked by reinsurers with climatic change. Examination of this time period will lead to a discussion of insurance in the context of the current debate on global warming, its projected impacts, and possible strategies of adaptation.

List of Resources

Climate Change and Insurance
Journals
Asian Journal of Environment and Disaster Management (AJEDM) — Focusing on Pro-active Risk Reduction in Asia
This is the first journal focusing on the environment and disaster related issues in the Asian region. Asia, being the center of urban growth in the last few decades, has also created severe environmental problems, and is prone to different types of natural disasters. This journal provides a forum to communicate research findings, not only through academic research, but also incorporating field based action research.
Available at: http://www.researchpubonline.com/journals/101-ajedm/ajedm_aim.html

Geneva Papers on Risk and Insurance: Issues and Practice
Founded by The Geneva Association in 1973, this prestigious journal leads its field, publishing papers which both improve the scientific knowledge of the insurance industry and stimulate constructive dialogue between the industry and its economic and social partners.
Available at: http://web.ebscohost.com/ehost/external?vid=2&hid=110&sid=14406dd7-2cf3-4297-8074-6aa41f99ca0a%40sessionmgr111

Geneva Risk and Insurance Review
The Geneva Risk and Insurance Review aims to publish:
- Authoritative contributions regarding risk, insurance and related areas
- Theoretical papers as well as empirical and/or experimental research for global dissemination
- New innovative ideas in insurance economics
The Journal’s direction is towards economics in general, focusing on risk and insurance in particular. Although most of the papers published are theoretical, GRIR also publishes tests and competing theories in order to expand understanding of insurance economics. The editors are especially interested in new and innovative ideas and see the topic area of ‘risk and insurance’ rather broadly, encouraging papers from related disciplines.

Published twice a year, this international journal endeavours to provide a forum for the exchange of academic findings and views, whilst also supporting and encouraging research for all those in the insurance industry who search for current innovations in their sector concerning risk, uncertainty and insurance.
Available at: http://www.palgrave-journals.com/grir/index.html

Risk Analysis
Risk analysis is the science of evaluating health, environmental, and engineering risks resulting from past, current, or anticipated, future activities. The use of these evaluations include providing information for determining regulatory actions to limit risk, presenting scientific evidence in legal settings, evaluating products and potential liabilities--within private organizations, resolving World Trade disputes amongst nations, and for educating the public concerning particular risk issues. Risk analysis is an interdisciplinary science that relies on epidemiology and laboratory studies, collection of exposure and other field data, computer modeling, and related social and economic and communication considerations. In addition, social dimensions of risk are addressed by social scientists. Methods of risk analysis and the outcome of particular evaluations are regularly presented in scholarly papers that are published in Risk Analysis: An International Journal and topics are as diverse as quality of drinking water, air and land contamination, the safety of foods and drugs, automobile and infrastructure safety, and risk associated with weapons of mass destruction.


**Journal of Risk and Uncertainty**

This journal is the natural outlet for the best research in decision analysis, economics and psychology dealing with choice under uncertainty.

- Publishes both theoretical and empirical papers that analyze risk-bearing behavior and decision-making under uncertainty
- Serves as an outlet for the best research in decision analysis, economics, and psychology dealing with choice under uncertainty
- Addresses decision theory and the economics of uncertainty, psychological models of choice under uncertainty, risk and public policy, etc.

The Journal of Risk and Uncertainty features both theoretical and empirical papers that analyze risk-bearing behavior and decision-making under uncertainty. The journal serves as an outlet for important, relevant research in decision analysis, economics, and psychology.

http://www.springer.com/economics/economic+theory/journal/11166

**Journal of Risk and Insurance**

The Journal of Risk and Insurance is the flagship journal for the American Risk and Insurance Association. The JRI is the most well recognized academic risk management and insurance journal in the world and is currently indexed by the American Economic Association's Economic Literature Index, the Finance Literature Index, RePEc, the Social Sciences Citation Index, ABI/Inform, Business and Company ASAP, Lexis-Nexis, Dow Jones Interactive, and others. All back issues from volume one through the present minus the most recent three years are available on JSTOR.

The JRI publishes rigorous, original research in risk management and insurance economics. This includes the following areas of specialization:

- Industrial organization of insurance markets;
- Management of risks in the private and public sectors;
- Insurance finance, financial pricing, financial management;
- Economics of employee benefits, pension plans, and social insurance;
- Utility theory and demand for insurance;
- Asymmetric information, moral hazard, and adverse selection;
- Insurance regulation;
- Econometric, actuarial, and statistical methodology;
- Economics of insurance institutions;
- Insurance cycles and economic cycles of insurance markets;
- Both theoretical and empirical submissions are encouraged. Empirical work must provide tests of hypotheses based on sound theoretical foundations.

http://journalofriskandinsurance.org/about.aspx

Journal of Integrated Disaster Risk Management
The main objective of the IDRiM Journal is to promote knowledge transfer and dissemination of information on all aspects of integrated disaster risk management. The journal will seek to promote success models for implementation of integrated disaster risk management and comparative case studies, innovative countermeasures for disaster risk reduction, and interdisciplinary research and education in real-world localities, varying in geographic, climatic, political, cultural and social systems. IDRiM also explores implementation science for disaster reduction.

http://www.idrim.net/index.php/idrim/index

Websites:
Climate and Insurance
The National Association of Mutual Insurance Companies (NAMIC) has created this website as a resource for industry professionals to learn more about climate change and its possible implications for the property/casualty industry.
Founded in 1895, NAMIC is a full-service national property/casualty trade association with more than 1,400 member companies that underwrite more than 40 percent of the property/casualty insurance premium in the United States. NAMIC members are small farm mutual companies, state and regional insurance companies, risk retention groups, national writers, reinsurance companies, and international insurance giants. NAMIC is located in Indianapolis, Ind.

Available at: www.climateandinsurance.org

Munich Climate Insurance Initiative
The Munich Climate Insurance Initiative (MCII) was initiated by Munich Re in April 2005 in response to the growing realization that insurance solutions can play a role in adaptation to climate change, as
suggested in the Framework Convention and the Kyoto Protocol. This initiative is formed by insurers, climate change and adaptation experts, NGOs, and policy researchers intent on finding solutions to the risks posed by climate change. MCII provides a forum and gathering place for insurance-related expertise applied to climate change issues.

Insurance in A Climate of Change: The Greening of Insurance in a Warming World

This website compiled information about:

- The impacts of climate change on insurance
- The growing crisis of insurance availability and affordability
- The advent of green products and services
- Emerging trends in corporate governance and green investment, and
- The risk profiles of ‘green’ technologies and practices

http://insurance.lbl.gov/insurance.html

United Nations Environment Programme Finance Initiative (UNEP FI)

The United Nations Environment Programme Finance Initiative (UNEP FI) is a unique global partnership between the United Nations Environment Programme (UNEP) and the global financial sector.

UNEP FI works closely with nearly 200 financial institutions who are Signatories to the UNEP FI Statements, and a range of partner organizations to develop and promote linkages between sustainability and financial performance. Through peer-to-peer networks, research and training, UNEP FI carries out its mission to identify, promote, and realise the adoption of best environmental and sustainability practice at all levels of financial institution operations.

www.unepfi.org

The Geneva Association

Is the leading international insurance “think tank” for strategically important insurance and risk management issues.

The Geneva Association identifies fundamental trends and strategic issues where insurance plays a substantial role or which influence the insurance sector. Through the development of research programmes, regular publications and the organisation of international meetings, The Geneva Association serves as a catalyst for progress in the understanding of risk and insurance matters and acts as an information creator and disseminator. It is the leading voice of the largest insurance groups worldwide in the dialogue with international institutions. In parallel, it advances—in economic and cultural terms—the development and application of risk management and the understanding of uncertainty in the modern economy.
The Geneva Association membership comprises a statutory maximum of 90 Chief Executive Officers (CEOs) from the world’s top (re)insurance companies. It organises international expert networks and manages discussion platforms for senior insurance executives and specialists as well as policy-makers, regulators and multilateral organisations. The Geneva Association’s annual General Assembly is the most prestigious gathering of leading insurance CEOs worldwide.

Available at: [http://www.genevaassociation.org/](http://www.genevaassociation.org/)

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